ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

CAPITAL UNIVERSITY OF SCIENCE AND TECHNOLOGY (CUST)

ZONE-V, ISLAMABAD

Sponsored by: M/S Educational Excellence (Pvt) Ltd

Submitted to: Pakistan Environmental Protection Agency (Pak-EPA)

Submitted by: Resilience Gateway (Pvt) Limited

Head Office Address: Plot No.1, First Floor, Street-34, Bella Road

G-10/1, Islamabad.

E-mail: info@resiliencegateway.pk

Ph: +92 051 844 2244.

Website: www.resilient.pk

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LIST OF ABBREVIATIONS

GOP	Government of Pakistan
PAK EPA	Pakistan Environmental Protection Agency
DG	Director General
ICT	Islamabad Capital Territory
CDA	Capital Development Authority
MCI	Metropolitan Corporation Islamabad
RG	Resilience Gateway
IEE	Initial Environmental Examination
EIA	Environmental Impact Assessment
GIS	Geographic Information System
EMMP	Environmental Management and Monitoring Plan
CO	Carbon Monoxide
CO_2	Carbon Dioxide
VOC's	Volatile Organic Compound
NEQS	National Environmental Protection Agency
NOC	No Objection Certificate
PEPA	Pakistan Environmental Protection Act 1997
STP	Sewerage Treatment Plant
PM	Particulate Matter
ES	Endangered species
NCS	National Conservation Strategy
UNEP	United Nations Environment Program
WHO	World Health Organization
SPM	Senior Project Manager
EO	Environmental Officer
HSEO	Health, Safety and Environment officer
PPE	Personal Protective Equipment

EXECUTIVE SUMMARY

General

M/s Educational Excellence (Pvt.) Limited has initiated a project for the expansion of Capital University of Science and Technology (CUST), Islamabad. The primary objective of the proposed project is to accommodate the increasing number of students and to strengthen the university's academic, administrative, and support infrastructure.

The proposed project site is situated in Mouza Sihala, Zone-V, Islamabad, adjacent to the Islamabad Expressway. The total project area comprises 182 kanals and 1 Marla, of which 80 kanals were previously approved by the Capital Development Authority (CDA), under which several academic blocks were constructed. The university has now obtained revised approval of the as-built layout plan for the entire campus. Accordingly, environmental approval from the Pakistan Environmental Protection Agency (Pak-EPA) will cover the complete area of 182 kanals and 1 Marla as per the revised layout plan.

The allowed ground coverage for the project is 30% with FAR 1:2.2 in accordance with the Clause 2 of the "Policy for Establishment of Private Educational Institutions in Zone-2, Zone-4, and Zone-5, Islamabad," as notified in Gazette via S.R.O 81(1)/2017. The revised and extended layout plan of the project area is shown in **Figure 2.** The calculation of land use distribution is as under:

Table 1 Land use distribution of the project

Sr. No.	Land use	Area (Kanal)	%Age
1	As-Built Area	19.10	10.49
2	Proposed Blocks	12.44	6.83
3	Masjid	1.83	1
4	Auditorium	6.95	3.82
5	Warden House	0.83	0.46
6	Hostel	4.12	2.26
7	Playground and Green Area	66.14	36.33

8	STP	1	0.55
9	Parking	20.86	11.46
10	Footpath	21.41	11.76
11	Roads	27.37	15.04
Total Area		**182.05**	**100**

As the proposed Project is located within the Islamabad Capital Territory, the Pakistan Environmental Protection Act, 1997 is the core environmental legislation applicable to the Project.

To comply with the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000) under the Pakistan Environmental Protection Act, 1997, **M/s Educational Excellence (Pvt.) Limited (The proponent of the project)** has entrusted **Resilience Gateway (Pvt.) Limited** with the assignment of carrying out an Environmental Impact Assessment (EIA) study for the proposed expansion of **Capital University of Science and Technology (CUST), Islamabad.**

The purpose of this Environmental Impact Assessment (EIA) Report is to identify, assess, and evaluate the potential environmental and social impacts of the proposed project. The report outlines appropriate mitigation measures, implementation and monitoring mechanisms, and compliance strategies to ensure environmental sustainability. Furthermore, it aims to initiate the process for obtaining environmental approval (No Objection Certificate – NOC) from the Pakistan Environmental Protection Agency (Pak-EPA).

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

According to the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000, the proposed Project falls under Category "II" of Schedule-II relating to urban development and institutional infrastructure, which requires submission of an Environmental Impact Assessment (EIA) prior to commencement of construction activities. Furthermore, during the screening and scoping session with Pakistan Environmental Protection Agency (Pak-EPA), it was also advised that an EIA study be

conducted for the proposed Project to ensure comprehensive assessment of potential environmental impacts and compliance with regulatory requirements.

The major laws, policies, and guidelines applicable to the Project include:

- Pakistan Environmental Protection Act, 1997
- Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000
- National Environmental Quality Standards (NEQS), 2010
- National Environmental Policy, 2005
- National Climate Change Policy, 2012
- National Water Policy, 2018
- National Conservation Strategy, 1992
- Solid Waste Management Guidelines, 2005
- Pakistan Labour Policy, 2010
- Building Code of Pakistan, 2007

Relevant international environmental guidelines and occupational health and safety standards have also been considered in the preparation of this EIA Report. A summary of applicable policies, acts, and guidelines is provided in Chapter 2 of the EIA Report.

PROJECT DESCRIPTION

The proposed Project involves the expansion and development of Capital University of Science and Technology (CUST), Islamabad, to provide improved educational facilities and accommodate approximately 7,000 students and about 600–800 faculty members and administrative staff. The Project includes the construction of academic buildings, administrative blocks, parking areas, green spaces, and associated infrastructure.

The Project site is located in Mouza Sihala, Zone-V, adjacent to the Islamabad Expressway, Zone-V, Islamabad. The Project area covers approximately 182.05 kanals. The construction phase of the proposed Project is expected to be completed within Thirty-Six (36) months.

During the peak construction phase, approximately 120–150 workers will be employed on site. During the operational phase, the university will accommodate approximately 7,600–7,800 persons including students, faculty, and administrative staff.

The estimated operational water demand of the Project is approximately **123,200 gallons per day,** of which approximately **98,560 gallons per day** will be generated as wastewater. Wastewater will be treated through proposed Sewage Treatment Plant (STP) and reused for landscaping purposes.

The Project is expected to generate **approximately 7,528 kg/day of municipal solid waste during operation.** Proper waste segregation, collection, and disposal mechanisms will be implemented in coordination with relevant municipal authorities.

The Project design incorporates sustainable features, including solar energy utilization, rainwater harvesting, wastewater recycling, and tree plantation, to reduce environmental impacts and promote resource efficiency.

BASELINE ENVIRONMENTAL CONDITIONS

Baseline environmental conditions were assessed through field surveys and site visits, environmental monitoring and testing, and review of relevant secondary data, providing a comprehensive understanding of the existing environmental and ecological status of the project area.

Physical Environment

The physical environment of the proposed Project Study Area was assessed using both primary and secondary sources, including field surveys, environmental monitoring, and review of relevant literature. The key parameters evaluated include physiography and topography, geology, soil, seismicity, climate and meteorology, water resources, solid waste management, and land use pattern of the Project area.

According to the Building Code of Pakistan, 2007, the Project site falls within Seismic Zone 2B, indicating low to moderate seismic risk, with peak ground acceleration (PGA) ranging from 0.16 g to 0.24 g. The climate of the area is characterized by hot summers and cool winters. Summer extends from April to September, with temperatures ranging between approximately 28°C and 42°C, while winter extends from November to March, with temperatures ranging between approximately 3°C and 18°C.

Water supply for the proposed Project will be primarily met through groundwater, extracted through three bore wells strategically located within the university campus. Sustainable measures such as rainwater harvesting will be incorporated in project. Apart from that Sewage Treatment Plant (STP) has been proposed for treatment of

wastewater. Solid waste generated from the Project will be managed through proper collection and disposal in coordination with relevant municipal authorities.

Environmental monitoring of ambient air quality, noise levels, and groundwater and surface water quality was conducted at the Project site to establish baseline conditions. The results indicate that all parameters are within the permissible limits of National Environmental Quality Standards (NEQS), 2010. The environmental monitoring reports for surface and groundwater, air quality and noise monitoring are attached to **Annexures-B, C & D** respectively.

Ecological Environment

The ecological environment of Islamabad includes subtropical scrub vegetation and planted urban greenery. The project site mainly consists of open land with limited vegetation. No protected wildlife species, critical habitats, or ecologically sensitive areas are present within the project site.

Socio-economic Environment

The study area is situated in Mouza Sihala, Zone-V, adjacent to Islamabad Expressway, Zone-V, Islamabad, within the existing campus of Capital University of Science and Technology (CUST). The surrounding area comprises a mix of educational institutions, residential settlements, agricultural land, and open spaces. The Soan River flows to the north and northwest of the Project site, while Ling Stream is located towards the south, forming important natural drainage features of the area. Kahuta Road, a major access route, is located to the south of the Project site and provides connectivity to Islamabad and adjoining areas.

The immediate surroundings of the Project site include residential areas of Sihala village, scattered commercial establishments, and institutional buildings. Educational facilities are present within and around the vicinity of the Project site, along with small-scale commercial outlets and community services. Agricultural fields and open land are also present in the surrounding areas, reflecting the semi-urban character of Mouza Sihala.

The Project site is well connected through the existing road network and is accessible via Kahuta Road and internal access roads. No protected areas, wildlife sanctuaries, or environmentally sensitive institutional clusters are present in the immediate vicinity of the proposed Project site.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Project is expected to have the following major positive impacts due to the construction and expansion of the proposed Capital University of Science and Technology (CUST), Islamabad:

- Enhancement of higher education infrastructure by providing modern academic, administrative, and support facilities.
- Improved access to quality education for students by accommodating increasing student enrollment.
- Promotion of academic excellence through provision of improved learning environment, laboratories, and educational resources.
- Generation of employment opportunities during construction phase for skilled, semi-skilled, and unskilled labor.
- Creation of permanent employment opportunities for academic, administrative, and support staff during operational phase.
- Contribution to local and regional socio-economic development through educational advancement and associated economic activities.
- Improvement in physical environment through plantation, landscaping, and development of organized campus infrastructure.
- Promotion of sustainable development through incorporation of solar energy systems, wastewater treatment, rainwater harvesting, and environmentally responsible design measures.

i. Design & Planning Phase

Potential Impacts

- Inadequate architectural planning or improper integration of new buildings with the existing campus infrastructure may affect the visual appearance and functional efficiency of the university environment.
- The Project site lies within Seismic Zone 2B; therefore, seismic events of low to moderate magnitude may pose structural risks if not properly addressed in the design phase.
- Improper planning of internal water supply and storage systems may lead to risks of drinking water contamination and affect water quality during operation.

- Improper sitting and planning of construction camp facilities may result in localized environmental disturbances, including waste generation, sanitation issues, and pressure on nearby infrastructure.

Mitigation Measures

- All structural and architectural designs will be prepared in accordance with Capital Development Authority (CDA) regulations, Building Code of Pakistan, and relevant engineering standards to ensure safety, functionality, and aesthetic compatibility with the existing campus.
- Seismic considerations will be incorporated into the structural design to ensure that buildings are capable of withstanding anticipated seismic loads in accordance with national seismic design standards.
- Proper planning and design of water storage, distribution, and plumbing systems will be ensured to prevent any risk of contamination and maintain safe drinking water quality.
- Construction camp areas will be carefully selected within the Project boundary and will be provided with proper sanitation, waste management, and utility arrangements to minimize environmental and social impacts.

ii. Construction Phase Impacts and Mitigation

Potential Impacts

- Construction activities such as excavation, grading, and material handling may cause soil erosion and soil degradation at the project site. Dust generation from exposed surfaces may also affect the surrounding environment and campus area.
- Operation of construction machinery, vehicles, and generators may result in deterioration of ambient air quality due to exhaust emissions and increased particulate matter during the construction phase.
- Use of heavy construction equipment may generate noise and vibration, which may temporarily disturb nearby academic activities, students, staff, and construction workers.
- Site clearance activities may lead to the removal of existing vegetation and cutting of trees, resulting in temporary loss of green cover and ecological disturbance within the campus.

- Construction activities may expose workers to occupational health and safety risks, including accidents such as falls, equipment injuries, and fire hazards, potentially causing injuries and financial losses.

Mitigation Measures

- Excavated soil will be properly managed and stored at designated locations within the Project site and reused where feasible for backfilling and landscaping. Dust emissions will be controlled through regular water sprinkling and proper site management practices.
- All construction machinery, vehicles, and equipment will be properly maintained and operated efficiently to minimize exhaust emissions. Unnecessary idling of vehicles will be avoided to reduce air pollution.
- Construction equipment will comply with NEQS noise standards, and noisy activities will be limited to daytime hours to minimize disturbance. Proper maintenance of equipment will also help reduce noise and vibration levels.
- Vegetation removal will be minimized to the extent possible, and compensatory plantation will be carried out as part of the Project's landscaping plan to restore green cover within the campus.
- Occupational health and safety measures will be implemented at the construction site, including provision of personal protective equipment (PPE), worker training, and implementation of emergency response procedures to prevent accidents and ensure worker safety.

iii. Operational Phase Impacts and Mitigation

Potential Impacts

- Increased vehicular movement by students, faculty, and staff may contribute to traffic congestion on access roads and result in localized air pollution due to exhaust emissions.
- Generation of municipal solid waste from academic, administrative, and residential activities may lead to environmental pollution if not properly managed and disposed of.
- Operation of standby generators during power outages may result in emissions of air pollutants such as CO, NOx, SOx, PM_{10}, and CO_2, which may affect ambient air quality.

- Wastewater generated from campus facilities may pose a risk of soil or groundwater contamination if not properly treated and managed.
- Improper handling or disposal of waste may affect campus aesthetics and create unhygienic conditions, potentially affecting the health and well-being of students, staff, and visitors.

Mitigation Measures

- Traffic within the campus will be properly managed through designated parking areas and internal road planning to minimize congestion and ensure smooth vehicular movement. Plantation along roads and open spaces will help reduce the impact of vehicular emissions.
- Solid waste generated from the campus will be segregated at source and collected in designated waste bins placed at appropriate locations. Waste will be regularly collected and disposed of through coordination with relevant municipal authorities in accordance with approved waste management practices.
- Standby generators will be installed at appropriate locations and operated only when required. Regular maintenance of generators will be ensured to minimize emissions. Plantation of trees and development of green areas will help act as natural buffers and improve environmental quality.
- Wastewater generated from the campus will be treated through proposed Sewage Treatment Plant (STP), and treated water will be reused for landscaping and horticulture purposes to prevent environmental contamination.
- A comprehensive Environmental Management and Monitoring Plan (EMP) will be implemented to ensure proper environmental management, regular monitoring, and compliance with National Environmental Quality Standards (NEQS), 2010.

STAKEHOLDER CONSULTATION

The stakeholder consultation process was conducted in accordance with the Pakistan Environmental Protection Agency (Pak-EPA) guidelines for environmental assessment. Public consultations were carried out to obtain feedback from relevant stakeholders regarding the proposed expansion of Capital University of Science and Technology (CUST), Islamabad. The stakeholders consulted during the study included

representatives of the Project proponent (M/s Educational Excellence Pvt. Ltd.), Capital University of Science and Technology (CUST) administration, Pakistan Environmental Protection Agency (Pak-EPA), Capital Development Authority (CDA), local community representatives of Mouza Sihala, nearby residents, NGO's and other relevant stakeholders in the Project vicinity.

The key concerns raised by stakeholders during the consultation meetings are summarized below:

- Construction activities should be properly planned and managed to minimize disturbance to nearby residents and existing university operations.
- Movement of construction vehicles and transportation of materials should be controlled to avoid traffic congestion and safety risks.
- Adequate measures should be taken to control dust emissions and maintain air quality during construction activities.
- Construction waste should be properly collected, managed, and disposed of at designated sites.
- Construction materials and machinery should be stored within the Project boundary to avoid obstruction and environmental disturbance.
- Tree cutting should be minimized, and compensatory plantation should be carried out as part of the Project landscaping plan.
- Proper safety measures should be implemented to ensure protection of workers, students, and nearby residents.
- All existing utilities, if encountered during construction, should be properly managed and relocated in coordination with the relevant authorities.

ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

The Environmental Management and Monitoring Plan (EMP) has been developed to define the mitigation measures, monitoring requirements, implementation procedures, and institutional responsibilities for managing potential environmental impacts of the proposed Project. Environmental monitoring will be carried out during both the construction and operational phases to evaluate the effectiveness of the proposed mitigation measures and to ensure compliance with applicable environmental regulations and standards.

The EMP provides a structured framework for implementation of environmental protection measures throughout the Project lifecycle. It identifies potential environmental impacts and outlines appropriate mitigation measures through an environmental mitigation and management matrix, ensuring that environmental considerations are integrated into Project planning, construction, and operational activities.

An environmental monitoring plan has also been included as part of the EMP, specifying the parameters to be monitored, monitoring locations, frequency, and responsible entities. Training programs will be conducted to enhance the capacity of contractors and Project personnel to effectively implement environmental management measures during construction and operational phases. All necessary approvals and permits will be obtained from the relevant regulatory authorities prior to commencement of Project activities.

The EMP also includes provisions for environmental management costs associated with implementation of mitigation measures, monitoring activities, plantation, waste management, and health and safety measures. These provisions ensure that adequate financial and institutional resources are available for effective implementation of the EMP and long-term environmental sustainability of the Project.

CONCLUSION AND RECOMMENDATIONS

Based on the findings of the Environmental Impact Assessment, the proposed project of the Capital University of Science and Technology is environmentally viable and sustainable. The project will provide significant educational, social, and economic benefits while contributing to sustainable development.

Potential adverse impacts identified during construction and operational phases are limited, site-specific, and manageable through implementation of the proposed mitigation measures and Environmental Management and Monitoring Plan.

It is concluded that the proposed project will not result in significant adverse environmental impacts, provided that the recommended mitigation measures are properly implemented.

It is recommended that the Environmental Management and Monitoring Plan be fully implemented and integrated into project design, construction, and operational

activities. Regular environmental monitoring and compliance reporting should be conducted to ensure continued environmental protection and sustainability.

CHAPTER 1. INTRODUCTION

1.1. General

Capital University of Science and Technology (CUST) is an educational institute project sponsored by M/s Educational Excellence (Pvt) Ltd, located in Mouza Sihala, Zone-V, Islamabad. In response to increasing student enrollment and expanding academic requirements, the university has proposed the expansion of its existing campus. The total project area comprises 182 kanals-1Marla, of which 80 kanals were approved by the Capital Development Authority (CDA). Since 80 kanals were approved previously so, several blocks were constructed under that approval. The university has now obtained a revised approval of as-built layout plan of the university. Accordingly, the environmental approval from Pakistan EPA will now cover the entire **182 kanals and 1 Marla** as per this revised layout plan.

The project has been designed in compliance with the planning standards established by the Capital Development Authority (CDA), as specified in Clause 2 of the Policy for Establishment of Private Educational Institutions in Zone-2, Zone-4, and Zone-5, Islamabad, notified vide S.R.O. 81(1)/2017.

Owing to the scale of the proposed development and its location within the Islamabad Capital Territory, the project has the potential to interact with the surrounding physical, biological, and socio-economic environment. Accordingly, this Environmental Impact Assessment (EIA) has been prepared in compliance with the Pakistan Environmental Protection Act (PEPA), 1997, to identify potential environmental impacts and to propose appropriate mitigation measures for environmentally sustainable development of the university campus.

To comply with the review IEE/EIA regulations of 2000, as per the Pakistan Environmental Protection Act of 1997, M/s Educational Excellence (Pvt) Ltd., has entrusted Resilience Gateway (RG) Pvt. Limited with the assignment of conducting an Environmental Impact Assessment study for the proposed project of Capital University of Science and Technology (CUST), Zone-V, Islamabad.

1.2. Need for EIA Study of the Proposed Project

The Pakistan Environmental Protection Act of 1997 mandates that an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) be

conducted before the commencement of any project that may have environmental implications. Section 12 (1) of the Act states:

"No proponent of a project shall commence construction or operation unless he has filed withthe Federal Agency an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Federal Agency approval in respect thereof."

According to the Pakistan Environmental Protection Agency (Pak-EPA) (Review of IEE and EIA) Regulations 2000, the proposed project falls under Schedule II, which requires an EIA. Following consultations with Pak-EPA, it was advised to proceed with an EIA for the Capital University of Science and Technology (CUST), Islamabad.

1.3. The Proponent and Consultant

The proponent of the project is M/s Educational Excellence (Pvt) Ltd., while the Consultant is Resilience Gateway (RG) Pvt. Limited. The details are given as under:

A. Proponent Contact Details

Ghulam Mustafa -Site Engineer
M/s Educational Excellence (Pvt) Ltd.,
Phone: +92 344 4062000
Signatures: ----------

B. Consultant Contact Details

Resilience Gateway (RG)Private Limited
Street 34, House-1, Bela Road, G10/1, Islamabad
Phone: +92 051 844 2244
Signatures: ----------

1.4. Scope of EIA Study

The scope of this Environmental Impact Assessment (EIA) study includes:

1. **Understanding Operational Processes**
    - Review and analysis of the proposed and current operational processes of the university.
2. **Data Collection and Literature Review**
    - Collection and review of all relevant existing data, studies, research papers, and previous reports related to educational institutions.

- Field investigations to collect baseline environmental and socio-economic data using structured questionnaires.

3. **Stakeholder Engagement**
    - Consultations with various stakeholders, including affected communities, to understand concerns and gather inputs.
4. **Environmental and Social Impact Assessment**
    - Prediction, identification, evaluation, and categorization of potential significant bio-physical and socio-economic impacts on the local environment during both the construction and operational phases of the project.
    - Assessment of social sensitivity and ecological considerations relevant to the project site.
5. **Mitigation and Monitoring Measures**
    - Recommendation of appropriate mitigation measures to minimize, eliminate, reverse, or compensate for identified adverse environmental and social impacts.
    - Development of monitoring plans to ensure effectiveness of mitigation measures and ongoing environmental compliance.
6. **Environmental Management Plan (EMP)**
    - Preparation of a comprehensive Environmental Management and Monitoring Plan, integrating all recommended measures and monitoring strategies for sustainable project implementation.

1.5. Purpose of EIA Report

The primary purpose of preparing the EIA report is to review and ensure compliance with relevant by-laws, regulations, standards, and guidelines related to environmental assessment. This report aims to determine whether the project is likely to cause significant adverse environmental and social impacts, and to propose mitigation and remedial measures to make the project environmentally friendly and sustainable during its construction and operational stages. Additionally, it initiates the process of obtaining a NOC from the concerned EPA.

1.6. Study Team

A multidisciplinary team was formed to conduct the study. The team comprises the

following professionals:

Mr. Taimoor Ul Haq	Town Planner/ Chief Executive Officer
Mr. Taimur Khalid	Development Expert
Ms. Nida Naeem	Team Lead
Mr. Majid Malik	Manager Planning & Regulatory Affairs
Ms. Hajra Maalik	Senior Environmentalist
Mr. Azaz Ul Haq	Surveyor
Mr. Ali Raza	Surveyor/MTO
Mr. Ghulam Mustafa	Site Engineer (CUST)

1.7. Study Approach & Methodology

1.7.1. Study Approach

The study was conducted in accordance with Environmental Protection Agency (EPA), Government of Pakistan (GOP) regulations, guidelines for Environmental report preparation and public consultation. The study was based on both primary and secondary data and information. Discussions were conducted with a range of stakeholders, including government officials, academic, environmental experts, local residents, and workers at nearby shops, community representatives, and the management of nearby industries. The primary objective of this approach was to gather comprehensive insights into the stakeholders' perceptions of the project and its potential environmental impacts.

1.7.2. Methodology

The following methodology was adopted for carrying out the EIA study of the proposed Project:

a. Orientation

Meetings and discussions were held among the members of the Environment Consulting Team. This activity was aimed to achieve a common ground of understanding various issues of the study.

b. Planning for Data Collection

Following the clarification and understanding gained in the previous step, a detailed data acquisition plan was developed for internal use by the Environment Consulting Team. The plan includes the identification of specific data requirements and their sources, the establishment of time schedules and responsibilities for data collection, and the outline of logistics and other supporting needs necessary for the effective execution of the data acquisition plan.

c. Data Collection

In this step, primary and secondary data was collected through field observations, environmental monitoring in the field, concerned departments and published materials to establish baseline profile for physical, biological and socio-economic conditions. These activities are as under:

- Scoping Sessions
- Detailed Site Visits
- Individual Interviews & Household Survey
- Analysis of Maps & Plans
- Literature Review & Desk Research
- Public Consultations; &
- Laboratory Analyses

d. Physical Environment

Information was gathered on the existing physical environment, particularly related to geology, topography, soils, hydrology and drainage, water quality, air quality and noise of the Project Area.

Geology, Topography & Soils

A review of relevant literature on geology, topography and soils in the Project Area was conducted.

Hydrology & Drainage

A literature review and hydrology study of the area was conducted to identify the components of the hydrological cycle that are likely to impact on the project and the possible impacts that the project could have on the hydrologic cycle. Field assessments included a determination and verification of all the existing inflows into nearby drain, assessment of drainage issues, interviews with local community members, and round-table discussions with stakeholders.

Water Quality

The objective of the water quality monitoring is to determine existing situation of both surface and ground water quality before construction. It has been observed that the water and air quality are the important environmental variables to be affected in this project. The extent of surface water and groundwater contamination in the Project Area was assessed based on the test results of chemical and microbiological parameters for surface and groundwater. Dissolved oxygen (DO), pH and conductivity measurements were taken in-situ at all sampling stations. Analyses were performed in the certified lab and testing reports are attached to **Annexure-B**

Air Quality

Ambient air quality measurements are essential to provide a description of the existing conditions, to provide a baseline against which changes can be measured and to assist in the determination of potential impacts of the proposed construction on air quality conditions. Ambient air quality was continuously monitored for Carbon Monoxide (CO), Sulphur Dioxide (SO2), Nitrogen Oxides (NOx), Particulate Matter (PM10), for 24 hours by a certified testing laboratory. The ambient air quality reports are attached to **Annexure-C.**

Noise

Noise level readings were monitored at 3 sampling points for 24 hours continuously hourly basis by EPA certified lab. The noise reports are attached to **Annexure-D.**

Biological Environment

The status of the flora and fauna of the study area were determined by an ecological survey, a review of literature relevant to the study area, and an assessment of terrestrial environments.

Flora

The vegetative communities in the Project Area were identified and classified into community types. Identification was carried out of dominant tree species, assessment of stage of growth (mature or sapling) and assessment of canopy cover.

Fauna

Information on fauna was gathered from existing literature on reported species as well as observations in the field.

Socio-Cultural Environment

The environment team utilized a combination of desk research, field investigations, census data, structured interviews, maps, and reports to generate the data required

for description of the existing social environment and assessment of the potential impact of the proposed project. Data was gathered on the following aspects of the social environment:

- Population & Demographic overview of the study area
- Occupation, Income and Expenditure
- Education and Literacy
- Solid Waste Management & Water Availability in the Area
- Land Use and Available Facilities
- Traffic, Transportation and Access Roads
- Social Setup
- Recreational Activities
- Archaeological and Cultural Heritage

e. Identification and Evaluation of Environmental Impacts

The impacts of the proposed project on the physical, biological and socio-economic environment prevalent in the Project Area were visualized at the design, construction and operational phases.

f. Mitigation Measures and Implementation Arrangements

The adequate mitigation measures and implementation mechanisms were proposed so that the proponent could incorporate proposed mitigation measures beforehand in the design phase.

1.8. Structure of the Report

This report has been structured into following sections;

Chapter 1 *"Introduction"* briefly presents the project background, scope, methodology and need of the EIA study.

Chapter 2 *"Legislative Framework, Environmental Regulations and Guidelines"* provides a brief about national environmental policies, statutory obligations and roles of institutions concerning EIA study of the proposed Project.

Chapter 3 *"Project Description"* furnishes information about the location and components of the proposed Project, Project Implementation schedule, and cost of the project.

Chapter 4 *"Description of the Environment"* establishes baseline conditions for physical, biological and socio-economic conditions prevalent in the Project Area.

Chapter 5 *"Involvement of Stakeholders/Public Consultation"* identifies the main stakeholders and their concerns raised through scoping sessions, and presents the measures to mitigate the social impacts.

Chapter 6 *"Screening of Potential Environmental Impacts and Mitigation Measures"* identifies,predicts, and evaluates the impacts of the project activities during the construction and operation stages of the project and recommends the measures to mitigate potential environmental impacts of the proposed project.

Chapter 7 *"Environmental Management and Monitoring Plan"* provides an overall approach for managing and monitoring environmental-related issues and describes the institutional framework and resource allocations to implement the EMMP along with the environmental monitoring plan.

Chapter 8 *"Grievance Redressal Mechanism GRM"* to allow local communities, employees, out growers, and other affected stakeholders to voice their concerns and seek resolution if they perceive negative impacts arising from the project's activities

Chapter 9 *"Conclusions and Recommendations"* presents the outcome of the study and major observations of EIA and suggestions for environmental management and pollution control.

CHAPTER 2. LEGISLATIVE FRAMEWORK, ENVIRONMENTAL REGULATIONS AND GUIDELINES

2.1. General

This part of the report deals with the relevant policy, legal and administrative framework instituted by the Government of Pakistan for the protection of environment. All the relevant provisions of these policies and legal frameworks have been duly considered in this EIA study. The Project "Capital University of Science and Technology (CUST), Islamabad is expected to comply with all national and international legislation relating to the environment and obtain all the required regulatory clearances.

These regulations impose restrictions on activities to minimize/mitigate likely impacts on the environment. Compliance is required at all stages of the project implementation including design, construction, and maintenance phase, to ensure no significant adverse environmental implications are envisaged from the implementation of the project activities. The study is organized in light of laws, regulations and guidelines most relevant to scope of the project so that it becomes compliant with national legislation relating to the environment.

2.2. Applicable Environmental Legislations/ Bylaws and Policies in Pakistan

A concise overview of the key strategies, policies, acts, and legislation relevant to environmental management is presented, as summarized in Tables 1. These frameworks guide planning, regulation, and sustainable development, highlighting the legal and policy measures that ensure effective environmental protection and compliance

Table 1 Overview of Environmental Strategies and Policies and their relevance to the Project

Sr. No.	Policy / Strategy	Brief Coverage	Relevance to the Project
1	**National Environmental Policy, 2005**	The National Environmental Policy was launched by the Government of	Applicable as the proposed project is subject to environmental assessment requirements

		Pakistan in March 2005 to provide a comprehensive framework for addressing environmental issues. **Section 5** of the policy focuses on integrating environmental considerations into development planning. **Clause (b) of sub-section 5.1** states that EIA-related provisions of the **Pakistan Environmental Protection Act, 1997** shall be diligently enforced for all developmental projects.	under **Section 12 of PEPA-1997**, including preparation and approval of an EIA.
2	**National Water Policy, 2018**	The National Water Policy emphasizes efficient management and conservation of existing water resources, optimal development of potential water	Relevant to the project in relation to drinking water demand, sewage disposal, and wastewater management during construction and operation.

		resources, reduction of non-revenue water, and improved urban water management including drinking water supply, sewage disposal, and wastewater treatment.	
3	**National Climate Change Policy, 2012**	This policy provides a framework for addressing climate change adaptation and mitigation, focusing on sector-specific measures to manage current and future climate risks in Pakistan.	Applicable as project activities may contribute to local climate impacts and greenhouse gas emissions.
4	**National Conservation Strategy (NCS), 1992**	The National Conservation Strategy outlines Pakistan's primary approach towards sustainable development, conservation of natural resources, and efficient management of	Relevant to pollution prevention during construction, biodiversity conservation, and plantation and landscaping activities.

		land, water, and biological resources.	
5	**Pakistan Labour Policy, 2010**	The Labour Policy aims to ensure the social and economic well-being of labour through a legal framework covering labour rights, skill development, employment generation, and manpower export.	Applicable as labour will be employed during construction and operation of the proposed project.
6	**National Disaster Risk Reduction Policy, 2013**	Developed by the **National Disaster Management Authority (NDMA)** to strengthen disaster preparedness, mitigation, and response mechanisms through coordinated planning and stakeholder participation.	Applicable as the project site is located near the **Sawan River**, a disaster-prone area requiring disaster risk management planning.
7	**Handling of Hazardous Substances Rules, 2000 (PEPA)**	These rules regulate the generation, collection, storage, transportation, treatment, disposal,	Applicable as hazardous substances may be used or generated during construction and

		and handling of hazardous substances under a licensing framework issued by the Federal Agency.	operational phases of the project.
8	**Islamabad Capital Territory Building Control Regulations, 2023**	These regulations govern construction activities within Islamabad Capital Territory and ensure compliance with approved Master Plans, Functional Plans, and allotment conditions.	Applicable as the proposed project involves construction of buildings within ICT.
9	**Islamabad Fire Prevention and Life Safety Regulations, 2010**	These regulations provide requirements for fire prevention and life safety measures in buildings and premises located within ICT.	Applicable during construction and operational phases to prevent and control fire risks.
10	**Standard Operating Procedures for Management of Sanitation Services in Islamabad, 2008**	These SOPs assign the Capital Development Authority (CDA) responsibility for planning, provision, and supervision of sanitation services and solid waste	Applicable for efficient management of solid waste and sanitation services at the project site.

		management within ICT.	
Main Legislation/Acts Related to Environment and Their Relevance to the Project			
Sr. No	**Act**	**Brief Coverage**	**Relevance to Project**
1	**Pakistan Environmental Protection Act, 1997**	The Pakistan Environmental Protection Act, 1997 is comprehensive legislation and provides the legislative framework for protection, conservation, rehabilitation and improvement of the environment. The 'environment' has been defined in the Act as: (a) air, water and land; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms; (d) the ecosystem and ecological relationships; (e) buildings, structures, roads, facilities and works; (f) all social	The provision of the act is applicable for the proposed Project for conducting an IEE/EIA according to section 12 and to obtain environmental approval from the Pak-EPA.

		and economic conditions affecting community life; and (g) the interrelationships between any of the factors specified in sub-clauses 'a' to 'f'.	
2	**Pakistan Environmental Protection Agency, (Review of IEE and EIA) Regulations, 2000**	These regulations set out: • Key policy and procedural requirements for filing an EIA; • Purpose of environmental assessment; • Goals of sustainable development; • The requirement that environmental assessment be integrated with feasibility studies; • The jurisdiction of the Federal and Provincial EPA's and Planning & Development (P&D) Departments;	The provisions of these regulations are applicable for environmental screening of the Project, which implies that an EIA is required for the proposed Project. The process described in the regulation will be useful for CUST to follow the procedure to file an EIA with Pak EPA and to understand its review process along with timelines to be followed.

		• The responsibilities of proponents; • Duties of responsible authorities; Provides schedules of proposals that the Project requires either IEE or an EIA;	
3	**National Environmental Quality Standards (2010)**	The National Environmental Quality Standards (NEQS) will be applicable to the Project. Article 11(1) of the PEPA 1997 states that "Subject to the provisions of this Act and the rules and regulations made thereunder no person shall discharge or emit or allow the discharge or emission of any effluent or waste or air pollutant or noise in an amount, concentration or level which is in excess of the National Environmental Quality Standards".	All Projects to be implemented in Islamabad must comply with NEQS during all the phases i.e. construction and operation.

4	**National Clean Air Act, 2000**	The act aims to control vehicular emissions, pollution from industry, and indoor air pollution in rural and urban areas.	This act will trigger if vehicles and machinery used for construction activities emanates air pollutants above the permissible limit.
5	**Seismic Building Code of Pakistan 2021**	The Building Code of Pakistan (Seismic Provisions-2021) shall apply for engineering design of buildings, like structures and related components.	This Code is applicable to the proposed Project as it includes the formation of structures.
6	**Building code of Pakistan, Fire Safety Provisions, 2016**	Building Code of Pakistan-Fire Safety Provisions-2016 provide rules for fire prevention, life safety in relation to fire and fire protection of buildings and structures as prescribed. Building Code of Pakistan-Fire Safety Provisions-2016 is applicable in the design of proposed expansion.	Building Code of Pakistan-Fire Safety Provisions-2016 is applicable in the design of proposed expansion. The Project contractors are bound by regulations to consider this for the activities which involve the related activities.
7	**Explosives Act, 1884**	It provides regulations for handling,	Under the Explosives Act, the Project contractors are bound by regulations

		transportation and use of explosives.	on handling, transportation and using explosives during construction activities.
8	**Pakistan Antiquities Act 1975**	The protection of cultural resources in Pakistan is ensured by the Antiquities Act of 1975. NOC would be requested from DG Archeological Department for construction within 200 feet of cultural heritage sites.	The law will be applicable to the Project mainly due to its provision, if any accidental archaeological discoveries may occur during the excavation works
9	**Pakistan Penal Code, 1860**	The Code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization.	The provisions of the Penal Code, 1860 are applicable to the Project in terms of penalties for effecting human lives and public property.
10	**The Protection against Harassment of Women at the Workplace Act, 2010**	The Protection Against Harassment of Women at the Workplace Act (2010) refers to sexual harassment at the workplace.	This Act will be applicable to the Project if women are employed for the construction of the proposed Project.

11	**Labour Laws as part of Constitution of Pakistan 1973,**	The Constitution of Pakistan contains a range of provisions with regards to labour rights, in particular Article 11, Article 17, Article 25, Article 37(e). Labour law is controlled at both provincial and national levels with compulsory employment agreements containing the terms set out by the labour laws.	The labour laws will be relevant as it would deal with employment of labour for the construction of proposed Project.
12	**Employment of Children Act, 1991**	In accordance with this Article11 (3), the Employment of Child Act 1991 prohibits child labour (a child is under 14 years old).	The relevance of this act to the Project will be to prohibit child employment for construction of the proposed Project.
13	**Guidelines for the Preparation and Review of Environmental Reports, 1997**	These guidelines describe the format and content of IEE/EIA reports to be submitted to Pak-EPA for obtaining NOC.	The guidelines are applicable for the preparation of the EIA.
14	**Guidelines for Solid Waste Management, 2005**	Guidelines for Solid Waste Management	The provision of these guidelines is applicable for waste generation

		(2005) are in draft form (Pak-EPA)	during construction works of the proposed Project.
15	**Cutting of Trees (Prohibition) Act, 1975**	The Act was enforced in 1975 to place restrictions on cutting of trees without replacement plantations.	This act is applicable to the subject Project if the cutting of trees is involved.
16	**National Disaster Management Act (NDMA), 2010**	The Act applies to whole Pakistan including tribal areas of FATA. The Act was passed in backdrop of 2010 and 2022 Floods in Pakistan and strengthens Disaster Management system.	This act is applicable to the proposed Project and the project will require special consideration of disaster and risk management strategies as per the Act.
17	**Pakistan Occupational Health and Safety Act 2018**	An act to ensure safe and healthy working conditions for the people at work; by authorizing enforcement of the rules and regulations developed under the Act;	This act will be applicable to the proposed Project in term of the health and safety during the construction and operational phases.

Compliance Procedure for Obtaining Environmental Approval / NOC from Pak-EPA

The Review of IEE and EIA Regulations, 2000, outlines the preparation, submission, and review process for IEE and EIA reports. The proposed Project requires an EIA before construction to initiate Pak-EPA's environmental approval process. Pak-EPA

will confirm within ten working days if the submission is complete and may request revisions if needed. The agency aims to complete IEE reviews within 45 days and EIA reviews within 90 days. Under Article 12(4) of PEPA 1997, approval must be communicated within four months, after which the study is deemed approved if it complies with the Act and regulations

International Conventions /Agreements /Standards Relevant to the Project

Pakistan is a member of several international organizations, including the United Nations Organization (UNO), Organization of the Islamic Conference (OIC), South Asian Association for Regional Cooperation (SAARC), and Economic Cooperation Organization (ECO); therefore, it is required to comply with international environmental protocols and obligations. Details of the major protocols, their ratification by Pakistan, and their relevance to the proposed Project are presented below.

Sr. No.	Agreement/Convention	Ratification	Description/Relevance
1	**United Nations Framework Convention on Climate Change (UNFCCC) Amended, 2015.**	Pakistan ratified this convention on June 1, 1994	The objective of the Convention is to stabilize greenhouse gas concentrations at a level that prevents dangerous anthropogenic (human-induced) interference with the climate system. In line with this objective, due consideration has been given to greenhouse gas emissions during the proposed Project's design, and these aspects have been duly

			addressed by the EIA team.
2	**UNESCO Convention on the Protection of the World's Cultural and Natural Heritage, 1972**	Pakistan ratified this convention on 23 July 1976.	The Convention concerning the Protection of the World Cultural and Natural Heritage requires parties to adopt a general policy for the protection of natural and cultural heritage. Accordingly, due consideration has been given to archaeological sites and local norms, where applicable, during the proposed Project design and by the EIA team. These aspects will also be taken into account during Project implementation
3	**Convention on Conservation of Migratory Species of Wild Animals, 1979**	Pakistan signed this convention in 1981 and ratified it in December 1987.	The Convention on the Conservation of Migratory Species focuses on the protection and preservation of migratory species.
4	**Paris Agreement, 2015**	Pakistan has ratified Paris Agreement, 2016.	The agreement aims to enhance countries' capacity to address the

			impacts of climate change and to align financial flows with a low greenhouse gas emissions and climate-resilient pathway. This convention is relevant to the proposed Project, which has been designed with a focus on protecting the natural environment.
5	**Kyoto Protocol, 1992 and its Amendments, 2012**	Pakistan has ratified Kyoto Protocol in 2005	The Kyoto Protocol aims to reduce greenhouse gas emissions that contribute to climate change. The proposed Project has been designed to support this objective by minimizing its impact on the climate.

2.3. Legislative Implications to the Proposed Project

The implication of the above-mentioned legislation to proposed project of Capital University of Science and Technology will be as follows:

- Regular monitoring of the Project shall be conducted, and progress reports will be submitted to the Director General, Pak-EPA, for inclusion in the Annual Report.
- M/s Educational Excellence (Pvt) Ltd., as the project proponent, shall ensure that both the construction and operational phases of the Project are carried out in accordance with the recommendations of the EIA report.

- The Environmental Management Plan (EMP) will be fully implemented and incorporated as part of the contractual agreement with the contractor

CHAPTER 3. DESCRIPTION OF THE PROJECT

3.1. General

This chapter provides an overview of the proposed project of Capital University of Science and Technology (CUST), Islamabad project. It outlines the project's location, key features, and objectives, reflecting the growing academic and infrastructural needs of the university. The main components, including academic blocks, hostels, parking, and supporting facilities, are described in detail. Furthermore, the various phases of development and planned implementation are highlighted to provide a clear understanding of the project's scope.

3.2. Objectives of the Project

The objectives of the proposed Project are:

- Enhance the university's infrastructure to support current and future academic growth, providing modern classrooms, laboratories, administrative offices, and student facilities.
- Ensure efficient connectivity and spatial organization by integrating the new extension with the existing campus through well-planned circulation routes, zoning, and separation of academic, administrative, and recreational functions.
- Promote sustainability and resource efficiency by incorporating groundwater-based water supply, on-site sewage treatment, solar energy systems, rainwater harvesting, green open spaces, and pedestrian-friendly pathways.
- Maintain and support an enrollment of approximately 7,000 students, ensuring that the extension meets regulatory standards and accommodates future growth without compromising the quality of education or campus operations.
- Create a comprehensive and inclusive campus environment that balances academic, administrative, recreational facilities, including sports courts and parking, while fostering a healthy, safe, and conducive environment for learning and personal development.

3.3. Description of the project

3.3.1 Location of the Project

Capital University of Science and Technology (CUST) is an educational project, located in Mouza Sihala, Zone-V of Islamabad, adjacent to the Islamabad Expressway, Zone-V, Islamabad. The total project area comprises 182 kanals and 1 Marla, of which 80 kanals were previously approved by the Capital Development Authority (CDA), under which several academic blocks were constructed. The university has now obtained revised approval of the as-built layout plan for the entire campus. Accordingly, environmental approval from the Pakistan Environmental Protection Agency (Pak-EPA) will cover the complete area of 182 kanals and 1 Marla as per the revised layout plan and the total covered area is 985,980.6 sq.ft. The project site is illustrated in **Figure 1.**

The site has already been selected and designed following a comprehensive assessment of various factors, including topography, existing physical features (such as roads, river, existing infrastructure, and natural drainage channels), proximity to key urban nodes, and compliance with relevant regulatory requirements.

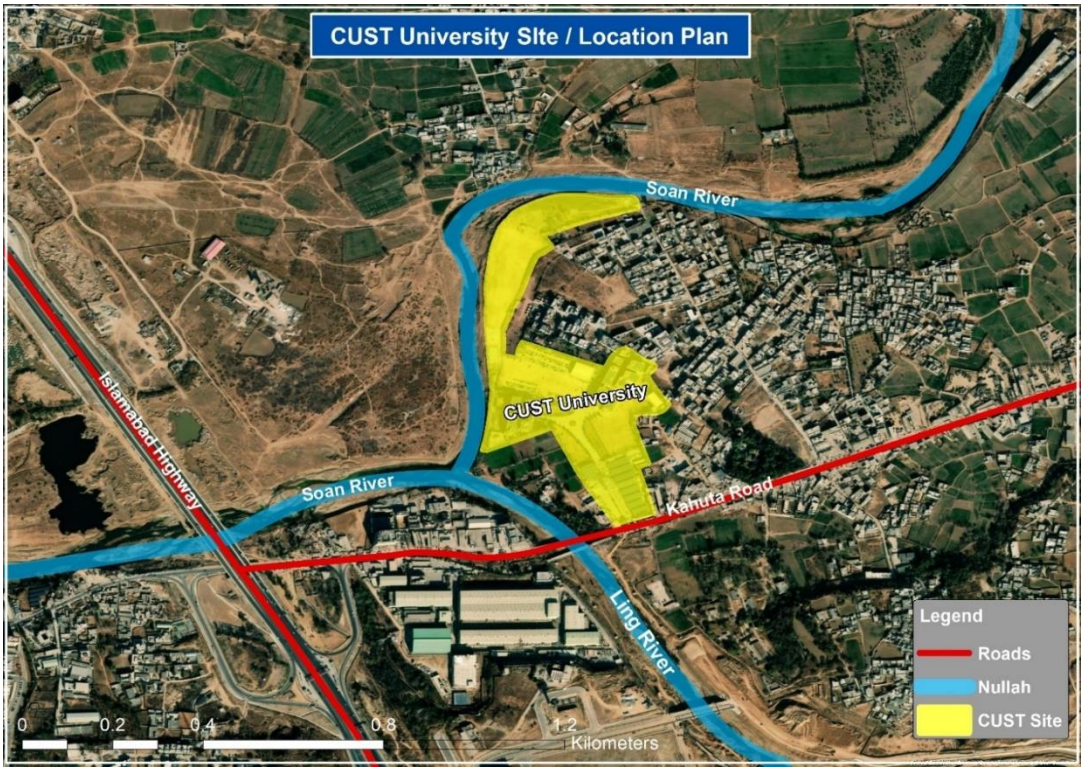


Figure 1 Location Map of the Project

Coordinates of the Project Site:

Latitude-**33.547125**, longitude **-73.185802**

Latitude**-33.546576**, longitude **-73.182545**

Latitude-**33.548708**, longitude -**73.182059**

3.3.2. Land Use Distribution of the Project

The allowed ground coverage for the project is 30% with FAR 1:2.2 in accordance with the Clause 2 of the "Policy for Establishment of Private Educational Institutions in Zone-2, Zone-4, and Zone-5, Islamabad," as notified in Gazette via S.R.O 81(1)/2017. The revised and extended layout plan of the project area is shown in **Figure 2.** The calculation of land use distribution is as under:

Table 2: Land Use Distribution of the Project

Sr. No.	Land use	Area (Kanal)	%Age
1	As-Built Area	19.10	10.49
2	Proposed Blocks	12.44	6.83
3	Masjid	1.83	1
4	Auditorium	6.95	3.82
5	Warden House	0.83	0.46
6	Hostel	4.12	2.26
7	Playground and Green Area	66.14	36.33
8	STP	1	0.55
9	Parking	20.86	11.46
10	Footpath	21.41	11.76
11	Roads	27.37	15.04
Total Area		**182.05**	**100**

The ground coverage of the project is 45.27 kanals, accounting for 24.87% of the total project area which is within the permissible limit of 30%. With all blocks designed as ground plus three floors, the total covered area amounts to 985,980.6 sq.ft.

3.3.3. Parking Requirements and Calculations of the Project

The parking area for the university project has been calculated in accordance with Clause 2 (vii) of the applicable regulations which is calculated as under:
No. Of car spaces required for university= 878,169.6 sqft /1,000=878 cars
No. Of car spaces required for residential area= 107,811 sqft /1,500=72 cars
Total no. of car parking requirement= 950 cars
Car space required= 950 *250= 237,500 sq.ft.

3.3.4. Project Administrative Jurisdiction

The proposed Project lies in Islamabad Capital Territory of Pakistan.

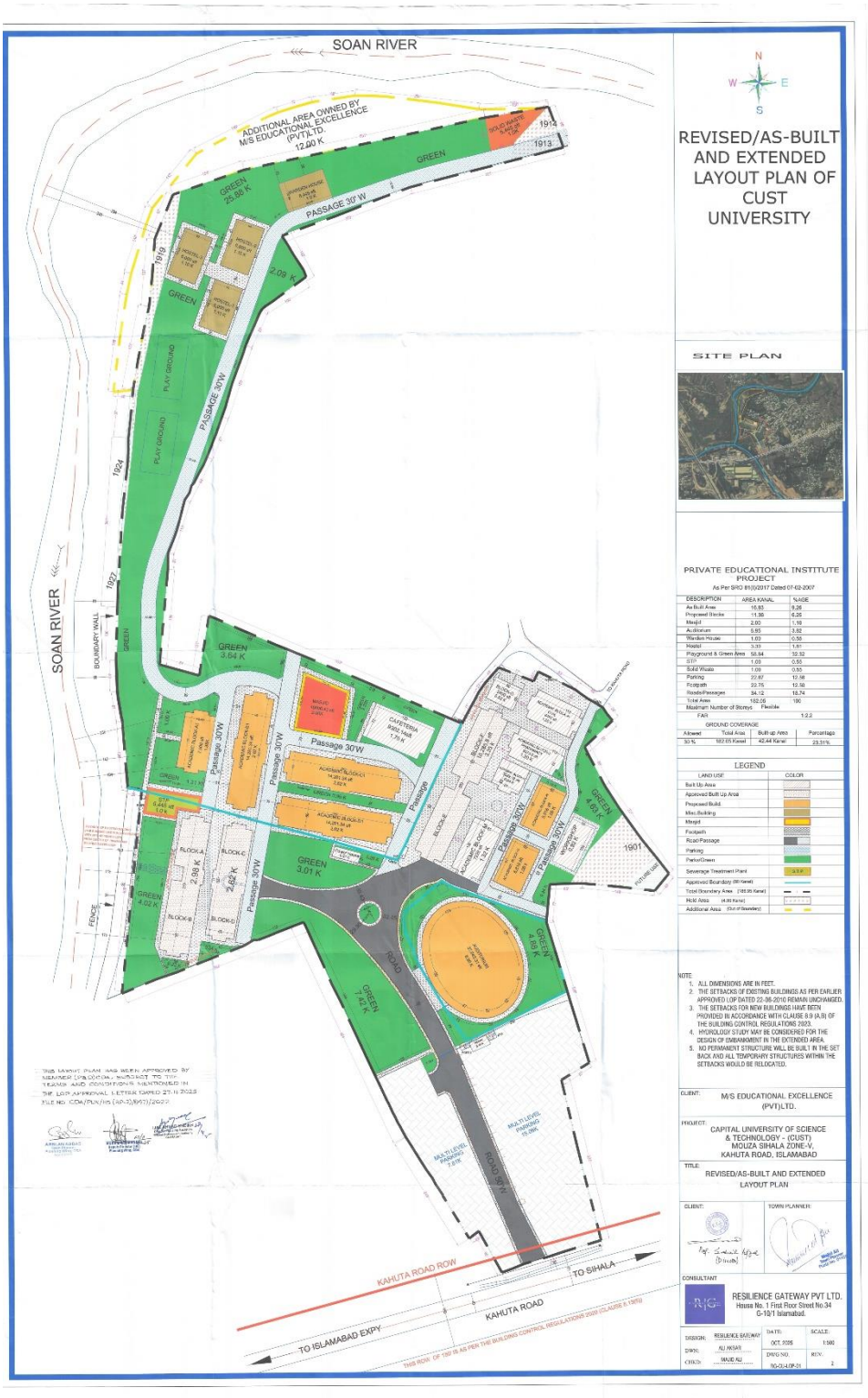


Figure 2 Layout Plan of the Project

3.4. Estimated Cost of the Project

The estimated cost of the project is 273,075,000 pkr.

3.5. Construction Camp

A construction camp will be established for the construction of proposed Project components and will be located within the premises of proposed Project. However, if construction camp is to be located outside the project boundary, following criteria shall be adopted by the Contractor to identify and for the establishment of the construction camp sites before start of the construction:

- There will be no or minimum resettlement issues for the location of the camps.
- Camp site will be away from the residential areas and sensitive receptors.
- Selection of sites for construction camps shall be near the project area having proper access to the nearby main/link road.
- The camps must be in a place where the drainage from and through the camps will not threaten any domestic or public water supply.
- Camp site must be adequate in size to prevent overcrowding of necessary structures; and
- The camp site will not damage any nearby property, vegetation, and other amenities and public infrastructure.

3.5.1. Manpower

The total manpower required for the proposed project will be estimated by the contractor during the construction stage. However, based on the consultant's previous experience with similar projects, the peak construction workforce is estimated to be approximately 120-150 workers. This workforce will include skilled, semi-skilled, and unskilled labor engaged in site preparation, civil and structural works, installation of utilities, and finishing activities. All construction personnel will remain within the area of possession throughout the construction period.

3.5.2. Drainage Facilities for the Construction Stage

During periods of heavy rainfall, stormwater generated at the construction site will be managed through the designated surface drainage system to prevent water accumulation, flooding, and soil erosion. The contractor will ensure proper site grading

and controlled discharge of stormwater into the existing drainage network to maintain effective drainage conditions at the project site.

Wastewater generation during the construction phase will be minimal and primarily associated with domestic use by construction workers. To manage sanitation requirements, temporary toilet facilities connected to a cesspit or septic tank system will be provided at the construction site. The contractor will ensure proper operation and maintenance of these facilities, and direct discharge of untreated wastewater into surface water drains or surrounding areas will not be permitted.

3.6. Features of the Project

3.6.1. Water supply

Construction Phase

The total water demand for construction workers and laborers during the construction phase of the proposed CUST project is based on a per capita requirement of 60 gallons per person per day. Considering a peak workforce of 150 personnel, the total calculated water demand is:

150 x 60 = 9,000 gallons/day

Additionally, approximately 10% of this water is considered unaccounted for due to minor losses such as spillage or evaporation:

10% of 9,000 = 900 gallons/day

Therefore, the total water demand for laborers during the construction phase, including unaccounted losses, is:

9,000 +900 = 9,900 gallons/day

The source of water will be groundwater, provided through approved arrangements, and will be used exclusively for drinking, sanitation, and domestic purposes of the construction workforce.

Operation Phase

The water requirements for the university campus have been calculated in line with the Capital Development Authority (CDA) guidelines for water supply. With a total area of 182.05 kanals and an estimated combined enrollment of 14,000 students

(7,000 currently enrolled and 7,000 projected for the extension), the daily water demand has been calculated at 112,000 gallons, based on a consumption rate of 8 gallons per day per student. An additional 10%, equivalent to 11,200 gallons, is included to account for unaccounted water, bringing the total daily requirement to approximately 123,200 gallons.

To meet this demand, a multi-source water supply strategy has been adopted. The primary source is groundwater, extracted through three bore wells strategically located within the campus. Each bore well is connected to an individual storage tank where water is first collected. This water is then pumped to a central overhead tank for systematic distribution across the campus. The system is designed to be efficient and reliable, with the existing infrastructure capable of serving both the current and proposed extensions of the project.

3.6.2. Emergency and Disaster Management

As part of the Emergency and Disaster Management strategy for the university's existing infrastructure, comprehensive safety protocols have been established to safeguard both students and staff. Fire extinguishers have been strategically installed throughout the premises to address fire-related incidents, while emergency exits, along with external ladders, ensure swift and safe evacuation during emergencies. A trained and dedicated response team has also been appointed to manage such situations and guide occupants to designated safe zones.

As the project site is located along the left bank of the Soan River, as identified in the detailed hydrological and flood risk study conducted for Capital University of Science & Technology (CUST), the area is inherently influenced by riverine flood dynamics. The study, undertaken using HEC-HMS and HEC-RAS modelling tools, evaluated flood hazards based on a 100-year return period design storm and established the maximum computed High Flood Level (HFL) as the governing parameter for infrastructure planning and flood resilience. Considering the hydraulic influence of the upstream river bend and the proximity of the Ling River confluence and Kak Bridge, proactive flood mitigation and river stabilization measures are essential to ensure long-term structural safety.

Based on the flood modelling analysis, the following measures should be adopted:

- Adopt the maximum modelled 100-year High Flood Level (HFL) from the six cross-sections as the controlling flood level for campus development. The conservative controlling level is:

HFL_max ≈ 403.73 m (1324.9 ft).

- Set minimum Finished Floor Levels (FFL) with freeboard:
    - For standard institutional buildings:

      Minimum FFL = HFL_max + 1.0 m (404.73 m / 1328.2 ft).
    - For critical facilities (IT rooms, power supply, labs, emergency services, dorms):

      Minimum FFL = HFL_max + 1.5 m (405.23 m / 1329.8 ft).
- The freeboard accounts for modelling uncertainty, debris blockage at bridge openings, local afflux effects at the bend, and potential future geomorphic adjustments.
- Apply planning control inside the campus (risk-based zoning):
    - Keep critical buildings outside the mapped maximum inundation footprint where feasible.
    - Use the riverside strip for flood-compatible uses (open space, parking, sports fields, landscaping).
    - Ensure at least one flood-safe access/egress route above 404.73 m (1328.2 ft).
- Design foundations near the riverbank considering local scour depth, particularly near the upstream bend where hydraulic attack is concentrated.
- Provide engineered revetment / riprap pitching with filter layer and launching apron along the outside of the upstream bend to prevent lateral erosion toward campus land.
- Consider properly designed spurs to shift the high-velocity core away from the left bank and stabilize the channel alignment.
- If critical facilities remain near the river corridor, provide a setback levee designed to:
    - **404.73 m (1328.2 ft) for standard protection**
    - **405.23 m (1329.8 ft) for critical infrastructure**

- Considering the design flood peak of **4067.1 m³/s (143,626 cusec)** at Kak Bridge, ensure regular debris clearance and channel maintenance near bridge openings to prevent unexpected stage rise during extreme events.

3.6.3. Management of Wastewater Generation & Disposal

As per Clause 3(viii) of the Regulations for Establishment of Private Educational Institutions in Zone-2, 4 & 5 of Islamabad Capital Territory, 2017, framed Under Section 51 of the Capital Development Authority (CDA) ordinance 1960 (No. XXIII of 1960) notified vide S.R.O 81(I)/2017, the institute is required to establish a state-of-the-art sewage treatment plant (STP) within its premises to ensure that all sewage is properly treated before discharge. In compliance with this requirement, the approved layout plan provides for an on-site STP covering an area of approximately one Kanal, which will be designed to treat about 80% of the total water consumption of the project. Sewage from the campus will be conveyed through RCC pipes with a minimum diameter of 6 inches to the STP via the trunk sewer for primary treatment. Septic tanks should be provided for all institutional buildings to ensure safe collection and preliminary treatment of wastewater. No untreated sewage will be discharged into existing nullahs or water streams, and the treated effluent will be recycled and reused for irrigation and landscaping purposes, promoting sustainable water management and environmental protection.

3.6.4. Energy Consumption

Construction Phase

The main source of electricity/electric power during construction phase will be diesel generators for construction camp and construction machinery.

Operation phase

The university's total annual electricity demand is estimated at 1,147,968 kWh, with the majority (1,112,288 kWh) supplied by on-site solar energy and the remaining 35,680 kWh sourced from the national grid (IESCO). By utilizing solar power for nearly 97% of its electricity needs, the university avoids approximately 527 tons of CO_2 emissions per year, compared to sourcing all electricity from the grid. This demonstrates a highly sustainable energy strategy, reducing reliance on fossil fuels, minimizing carbon

footprint, and supporting the institution's commitment to environmental sustainability and clean energy practices.

3.6.5. Solid Waste Management

Construction phase

Waste generated during construction would include mostly construction material (mainly wood, concrete, metal), empty cement bags, excavated earth and general packaging waste. Waste will be stored within the site until transfer to the waste disposal site. Domestic solid waste during operational phase will be collected at solid waste collection point and from that point, and it will be carried out by university hired contractors.

Operation phase

The total solid waste generated within the university campus, based on a population of 15,056 people (14,000 students and 1,056 faculty and staff) and a generation rate of 0.5 kg/person/day, is estimated to be approximately 7,528 kg/day (≈7.53 tons/day). Solid waste generated within the educational facility will be managed through a structured and efficient three-tier system to ensure environmental sustainability and public health safety. Initially, waste bins will be strategically placed throughout the campus to facilitate the organized collection of all non-liquid and non-gaseous waste. Subsequently, an internal transport mechanism will routinely gather the collected waste and transfer it to a designated temporary dumping site within the university premises. Finally, a contracted waste management service will collect the waste from this site and transport it to the official municipal dumping facility. This systematic approach not only streamlines waste handling but also aligns with the best environmental practices and regulatory standards.

3.7. Rainwater Harvesting

Sustainability remains a core principle of the project, with the inclusion of resource-efficient systems such as groundwater-based water supply, solar systems on-site sewage treatment, and rainwater harvesting. Open green spaces and pedestrian-friendly pathways are incorporated to support a healthy and inclusive learning environment.

The proposed educational building project has been thoughtfully planned with a strong focus on sustainability, integrating an effective rainwater harvesting system. This system is designed to collect rainwater from rooftop surfaces, channeling it through a network of gutters and downpipes into designated storage tanks. Basic filtration mechanisms ensure that debris is removed, making the water suitable for non-potable uses such as landscape irrigation, toilet flushing, and cooling systems. This initiative not only reduces reliance on municipal water supply but also lowers overall water consumption and minimizes wastewater generation. Moreover, by managing storm water runoff and reducing flood risks, the rainwater harvesting system enhances the project's environmental resilience and reinforces its commitment to sustainable and efficient campus operations.

3.8. Project Timeline

The development starts soon after the approval from the competent authorities. The estimated time of development is 36 months.

3.9. Restoration and rehabilitation plans

There are no existing human settlements on the proposed CUST expansion site, and no significant structures require relocation or dismantling. Upon completion of the construction phase, all temporary infrastructure and facilities will be decommissioned, and the site will be restored to a functional campus environment. This will include:

- Removal of the temporary construction camp, storage areas, and labor facilities.
- Closure and proper management of all temporary waste pits, and reinstatement of vegetative cover in areas where lawns, open spaces, or other greenery that might be disturbed.
- Restoration of walkways, sports areas, and landscaped zones as per the approved landscape plan.
- Planting trees within and around the project premises to enhance campus greenery and environmental quality.

All decommissioning and restoration activities will be carried out in accordance with prevailing environmental management laws and regulations, ensuring that no

adverse impacts occur to the surrounding environment or human health, and that the campus maintains a safe and sustainable environment for its students and staff.

CHAPTER 4. DESCRIPTION OF BASELINE ENVIRONMENT

4.1. General

This chapter details the existing baseline environmental conditions of the Study Area, which are crucial for the design, execution, and infrastructure development stages of any project. It includes a comprehensive analysis of physical, biological, ecological, and socio-economic factors, based on desk studies, field visits, and consultations with relevant authorities. This assessment establishes a foundation for evaluating potential project impacts, aiding in the development of effective mitigation measures, and ensuring that the project aligns with prevailing environmental and social conditions for long-term success.

4.2. Physical Environment

4.2.1. Topography

Islamabad is situated on the northern edge of the Potohar Plateau, characterized by an uneven terrain where the land gradually rises from 500 to 600 meters above sea level, with the highest elevation reaching 1,600 meters above mean sea level. The land generally slopes towards the south and is composed mainly of alluvial deposits, including clay, silt, and gravel caps. These plains have been formed through historical and ongoing riverine processes, resulting in variable thickness of alluvial deposits. Much of the area exhibits undulating topography, frequently interrupted by gullies and ravines. The Korang River has been dammed at Rawal to form Rawal Lake, while a dam constructed on the Soan River has resulted in the formation of Simly Lake.

Within this regional setting, the proposed Capital University of Science and Technology (CUST) campus is located in the mouza Sihala, Islamabad. The Project site is bordered by open and undeveloped land and agricultural fields towards the west, with the Islamabad Highway located further west of the site. To the north and northwest, the site is bounded by the Soan River, beyond which residential settlements are present. Kahuta Road runs along the southern boundary of the site and provides primary access to the campus, while the eastern and southeastern sides are characterized by densely built residential areas, along with a local nullah (Ling River) flowing in the vicinity of the Project area.

4.2.2. Geology

The geological structure and stratigraphy of the Islamabad-Rawalpindi area are highly complex, owing to the convergence and collision of the Pakistan-India and Eurasian tectonic plates, a process that began around 20 million years ago. The geological history of this region shows a long period of mild geological fluctuations and slow sediment deposition as the Pakistan-India plate drifted northward. This was followed by more intense tectonic activity and rapid sedimentation after the plates began to converge. As a result, the period from the Middle Jurassic to the Lower Miocene, spanning approximately 150 million years, is represented by only 675 meters of predominantly marine sedimentary rocks, while the last 20 million years have produced over 7,572 meters of continental sedimentary rock.

The sedimentary rocks exposed in the Islamabad area range in age from the Middle Jurassic to the Quaternary. The area can be divided into three distinct structural zones:

- **In the north, the mountainous Margalla Hills** consist of Jurassic through Eocene limestone and shales that are complexly folded and thrust along the Hazara fault zone. Uplift of these mountains probably formed a major topographic barrier during the last 1 million year.
- **South of the mountains**, a southward-sloping piedmont bench, the piedmont fold belt, is underlain primarily by truncated folds in the sandstone and shale of the Rawalpindi Group.
- **In the southernmost** part of the area, the Soan River flows generally along the axis of the Soan syncline.

Islamabad is located at the southern margin of the **Hazara fault zone**, which is an arc of thrusted and folded rocks extending west southwestward from the Himalayan syntaxis. The area features a complex system of thrust faults, particularly in the Margalla Hills, where multiple thrust sheets repeat the pre-Miocene marine section, with faulting and folding extending beneath the Piedmont fold belt and into the Kala Chitta Range.

The **Piedmont fold belt south** of the mountain front is likely tectonically active, despite sparse exposures. In this area, the Pleistocene Lei Conglomerate, which overlies the Murree Formation sandstone (lower Miocene), is folded at Shakar Parian Park in Islamabad and tilted along a thrust fault in the Kuldana Formation (lower Eocene)

near Golra. This faulting may connect to the southward over thrusting along the Kala Chitta Range, extending towards Rawalpindi and possibly hidden beneath Quaternary deposits near the Khalri Murat Range.

The Soan syncline is an asymmetric, faulted fold that extends regionally, plunging west southwestward. It contains fluvial sandstone, claystone, and conglomerate of the Siwalik Group, with dips of 60°–85° on the north limb and 45°–70° on the south limb. **Figure 3.** Shows the geology of the study area.

4.2.3. Soil

The subsurface strata of Islamabad are mainly covered with layers of lean clay (CL) in medium stiff to stiff in-situ state. The presence of silt, gravel, and sand are also observed in quite good percentage. In areas with depositional landforms, the surface can be:

- The surface is generally sand and gravel, and there is little or no soil development
- The surface typically consists of fine sand, silt, and clay, with relatively high organic content, resulting in fertile soil. The slopes in these areas are generally less than 4 percent.
- Beneath the terrace surface, a thin layer of fine-textured soil typically overlays channel deposits of sand and gravel. The terrace surfaces generally have a slope of less than 10 percent, but the erosional scarps along the sides of the terrace are much steeper.
- The soil in this area is fertile and alluvial soil. Alluvial consists of silt, sand, clay, and gravel and often contains a good deal of organic matter.
- Where the color of the alluvial soils varies from light grey to ash grey. Its shades depend on the depth of the deposition, the texture of the materials, and the time taken for attaining maturity. Alluvial soils are intensively cultivated.

4.2.4. Seismology

The bedrocks in Islamabad are highly faulted, folded and over thrust due to the uplifting of Himalayas in Pliocene epoch. Main Boundary thrust is the main fault that is widely fractured and some epicenters of the earthquake are also situated on this fault. The area is a part of the active Himalayan foreland–fold and thrust belt region in the

collision zone between Indo-Pakistan and Eurasian plates. The area has a good history of earthquakes in the past. In A.D. 25, an earthquake estimated of intensity IX destroyed the ancient city of Taxila that is located some 25km from the study area. The October 8, 2005, earthquake with recorded magnitude of 7.9 on Richter scale caused vast destruction in Northern parts of the country and caused the collapse of a residential plaza in the study area. According to Building Code of Pakistan (BCP, 2007), the project sites lies in seismic zone 2B with a maximum Peak ground acceleration (PGA) value of 0.24g. **Figure 4.** Shows the seismic zoning map of Islamabad with the Project Area falling under Seismic Zone-2B

4.2.5. Climate and Meteorology

When designing and implementing developmental projects, it is important to consider seasonal climatic conditions. Climate factors such as air temperature, precipitation, humidity, and evaporation play a significant role in the construction process. To fully understand the impact of climatic stresses, it is essential to account for daily and seasonal temperature changes, site altitude, direct solar radiation, and precipitation. The climate of the region is classified into four major seasons, summer season (April to June), monsoon season (July to August or mid-September), post-monsoon season (mid-September to November), and winter season (December to March). June is the hottest month, and January is the coldest month of the year.

The mean monthly temperature is estimated at the project area by analyzing metrological Department data of the climate station located at Islamabad Airport. Mean monthly temperature varies from 39°F in January to 101°F in June at this station. The minimum temperature generally drops below freezing point in the months of December and January. The highest maximum temperature at Islamabad was recorded 101°F in the month of June and lowest, 39°F & 43°F was recorded in the month of December and January.

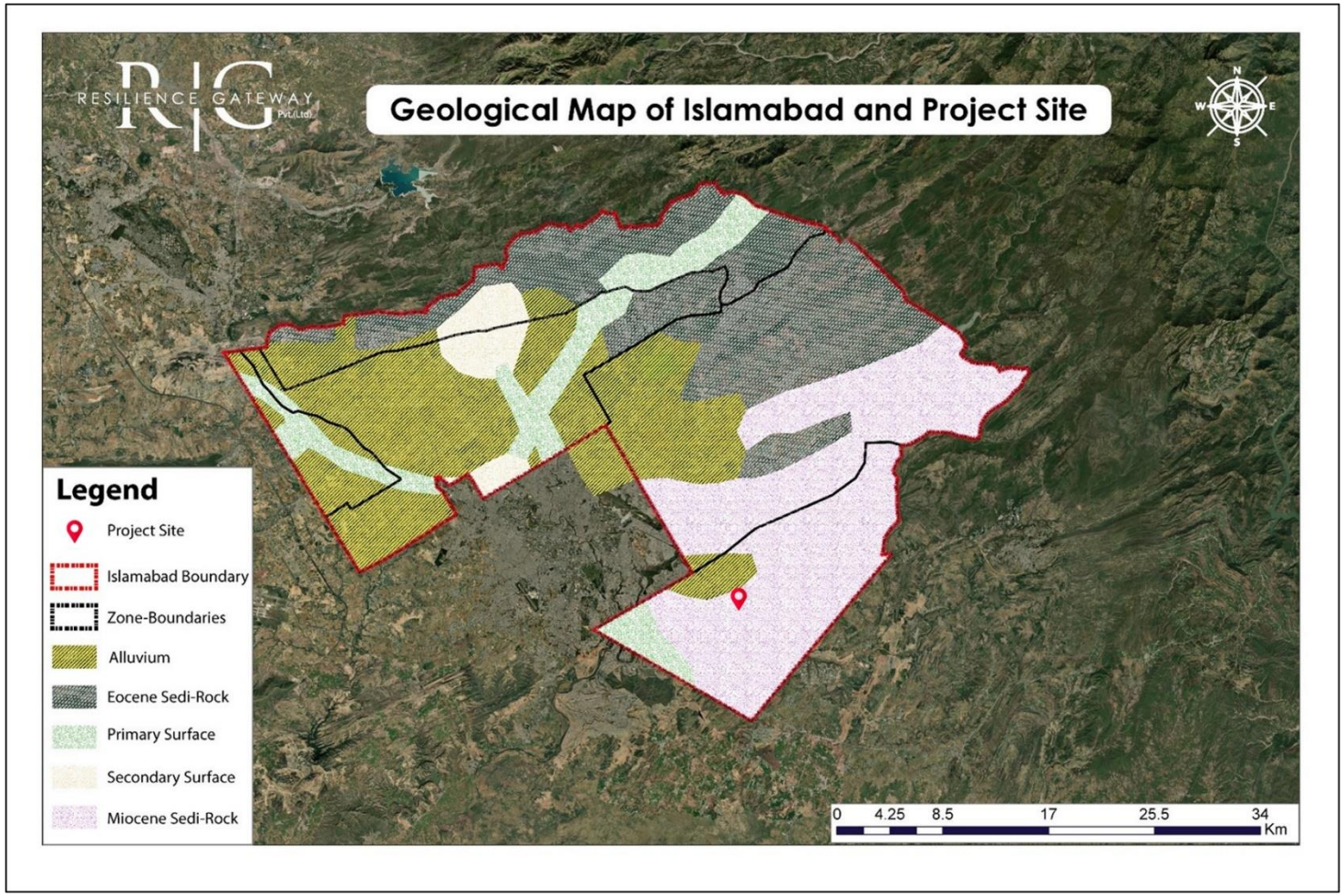


Figure 3 Geological Map of the Project

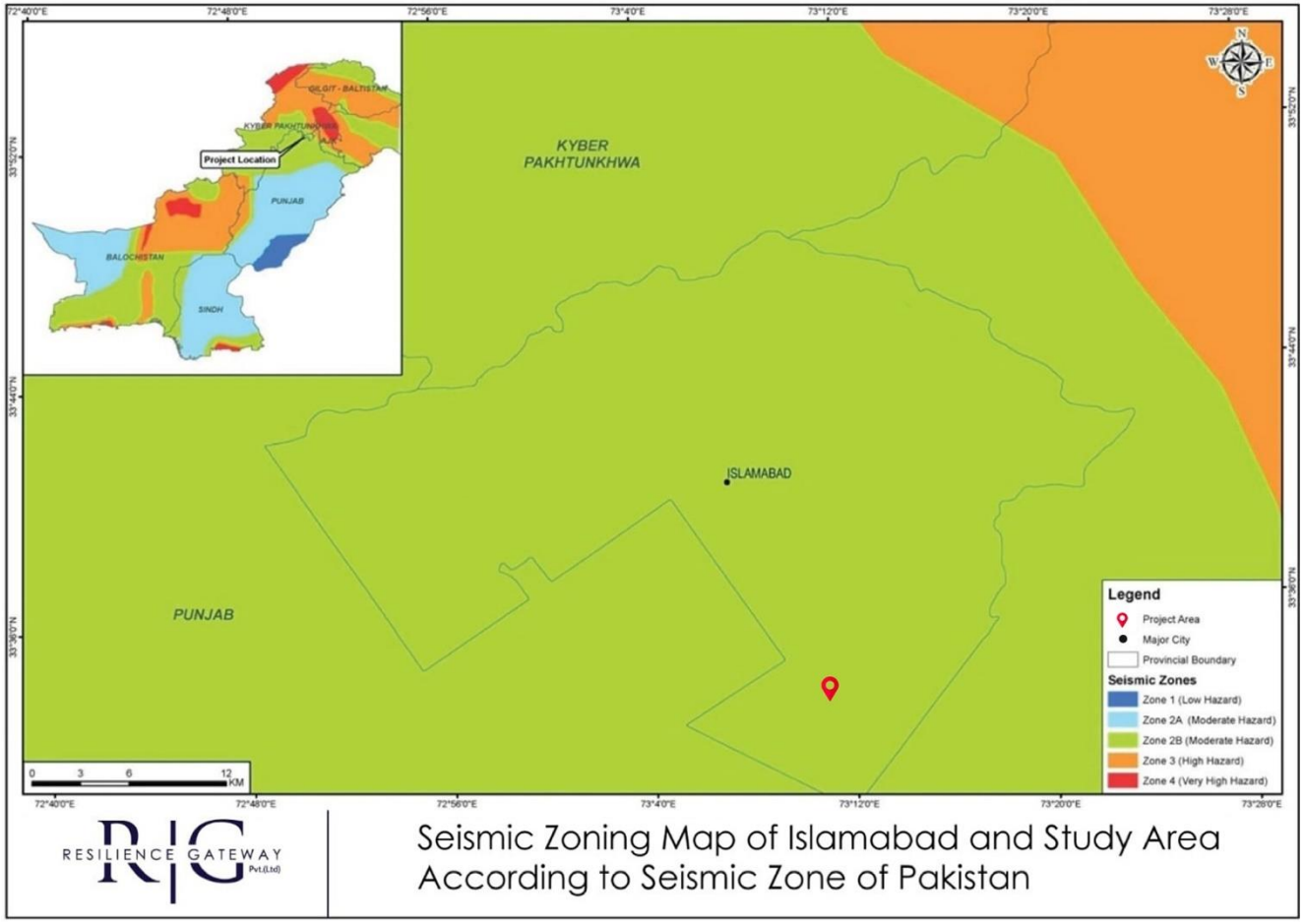


Figure 4 Seismic Map of the Project

4.3. Solid Waste Management

The solid waste is collected and transported by the Sanitation Directorate of Capital Development Authority (CDA) and Metropolitan Corporation Islamabad (MCI) from federal capital on daily basis. The city produces approximately 500–600 tons of waste per day, amounting to about 200,750 tons annually. The Directorate of CDA handles the collection of 60% of this waste, while the rest is managed by private contractors.

The Sanitation Directorate of CDA and MCI are responsible for delivery of adequate sanitation and garbage disposal services within municipal limits of Islamabad. The main functions of the directorate and MCI include sweeping, door to door garbage collection, transportation and safe disposal of solid waste, functioning and maintenance of public toilets, clearance of nullahs / streams in coordination with Environment Wing and Directorate of Roads and Directorate of Maintenance.

CDA, Directorate of Sanitation, CDA and MCI is providing sanitation services in the municipal limits of Islamabad.

It includes residential sectors, Industrial Area, Model Villages, Highways and Avenues, Commercial and Blue Areas, Faisal Masjid, Open Spaces, Public Places, Daman-e-koh, Shakarparian, Haj Complex, Industrial Exhibition, Religious Gatherings and Melody Food Park.

The proposed project area is located in Zone-V, Mouza Sihala with total solid waste generation per day is 7.5 tons. Solid waste on campus will be collected in strategically placed bins and moved to a temporary storage site. A contracted service will then transport it to the municipal dumping facility, ensuring safe and sustainable waste management.

4.4. Existing Baseline Environmental Conditions

4.4.1. Ground Water Scenario of Islamabad

Groundwater resources in the Islamabad-Rawalpindi region are primarily stored in and discharged from the Quaternary alluvium deposits. Recharge occurs mainly through precipitation and is supplemented by nearby streams. The precise quantity of available groundwater remains uncertain. Previous reports have estimated its availability at 86 million gallons per day (MGD) (HESC, 2014). The Capital Development Authority (CDA) currently operates 180 tube wells to supply groundwater to Islamabad. Additionally, private and municipal wells contribute to meeting water demand, though the exact number of private wells is difficult to determine. A NESPAK study conducted in 2007

identified 129 tube wells in Islamabad, with a combined daily discharge of approximately 63 MGD. Groundwater extraction is further facilitated by a public bore well network, which consists of approximately 200 bore wells.

4.4.1.1. Groundwater quality of project area

For establishing baseline conditions, water samples were collected and analyzed for microbiological and chemical parameters like Temperature, Total dissolved solid, Electrical Conductivity, and pH through EPA certified Environmental Laboratory. The water samples were tested for different parameters, and the samples were safe for drinking. All the parameters were within the permissible limits is enclosed in **Annexure-B.**

4.4.2. Ambient Air Quality

The prime objective of the baseline air quality study was to establish the existing ambient air quality of the project area. The locations for air quality monitoring were carefully selected, taking into account sensitive receptors such as nearby settlements along the proposed project site.

The level of smoke, Stack emission, and oxides of carbon, nitrogen and Sulphur in the Project area are also estimated to be below the maximum allowable levels in the NEQS. Nitrogen oxides (NO_x), a mixture of Nitric oxide (NO) and Nitrogen dioxide (NO_2), are produced from natural sources, motor vehicles and other fuel combustion processes. NO is colorless and odorless and is oxidized in the atmosphere to form NO_2. NO_2 is an odorous, brown, acidic, highly corrosive gas that can affect human health and the environment. NO_x are critical components of photochemical smog; NO_2 produces the yellowish-brown color of the smog.

Sulfur dioxide belongs to the family of sulfur oxide gases (SO_x). These gases are formed when fuel containing sulfur (mainly coal and oil) is burned, and during metal smelting and other industrial processes. The major health concerns associated with exposure to high concentrations of SO_2 include effects on breathing, respiratory illness, alterations in pulmonary defenses, and aggravation of existing cardiovascular disease. Major subgroups of the population that are most sensitive to SO_2 include asthmatics and individuals with cardiovascular disease or chronic lung diseases (such as bronchitis or Emphysema) as well as children and the elderly. Together, SO_2 and NO_x are the major precursors of acid rain, which is associated with the acidification of lakes and streams, accelerated corrosion of buildings and monuments, and reduced visibility.

Carbon monoxide is colorless, odorless, and poisonous gas formed when carbon in fuels is not burned completely. It is a byproduct of motor vehicle exhaust, which contributes more than two-thirds of all CO emissions nationwide.

Carbon monoxide enters the bloodstream and reduces oxygen delivery to the body's organs and tissues. The health threat from CO is most serious for those who suffer from cardiovascular disease. Healthy individuals are also affected, but only at higher levels of exposure to elevated CO levels which is associated with visual impairment, reduced work capacity, and reduced manual dexterity, poor learning ability, and difficulty in performing complex tasks.

A brief environmental assessment & monitoring was conducted in the Project area. The ambient air quality was monitored for the priority pollutants such as carbon monoxide, Sulphur dioxide, nitrogen oxide, volatile organic compound, nitrogen dioxide, suspended matter and particulate matter (PM10 and PM2.5). The study identified that all pollutants except some were found in the permissible limits of NEQS. Results are pasted at **Annexure-C.**

4.4.3. Noise Level Monitoring

Noise is a significant environmental problem and originates from many sources such as vehicular traffic (termed as roadway noise), airplanes, heavy machinery employed in construction work, etc. Elevated noise levels significantly affect psychological health which includes hearing loss, annoyance, hypertension, aggression, and high stress levels depending upon the magnitude of noise and duration of exposure.

According to the Pakistan National Environmental Quality Standards (NEQS) for Ambient Noise (2010), educational institutions fall under the category of Silence Zone, where the permissible ambient noise limits are 50 dB(A) Leq during daytime and 45 dB(A) Leq during nighttime, measured at sensitive receptor locations such as classrooms, administrative buildings, and campus boundaries. Noise level monitoring was conducted at the project site to establish baseline conditions, and the results indicate that existing noise levels are within the permissible NEQS limits. The detailed noise monitoring report is provided in **Annexure-D.**

4.5. Ecological Environment

This section provides an overview of the baseline environmental conditions related to the biological environment, incorporating insights from both primary and secondary

data sources. The process began with an initial assessment of the project area, allowing for a preliminary evaluation. This was followed by a comprehensive biological survey conducted by ecological experts, who gathered detailed information on the flora and fauna, as well as the overall ecological health of the area. This approach ensures a thorough understanding of the biological aspects that may be impacted by the project.

4.5.1. Field Survey and Data Collection

1. Primary data

Primary data on flora and fauna was obtained through systematic field observations and sample collection from strategically selected locations within the project area. These locations were chosen to maximize the representation of various vegetation types and wildlife habitats, ensuring comprehensive coverage of the region's biodiversity. The sampling process involved direct observation, species identification, and habitat assessment, with particular attention to identifying both common and rare species. Field notes were meticulously recorded to capture the ecological characteristics and the presence of any sensitive or protected species.

2. Secondary data

Secondary data was gathered from a variety of reputable sources to complement and validate the primary data. These included studies conducted by the Forest Department, World Wildlife Fund (WWF), and Capital Development Authority (CDA). These sources provided valuable insights into the historical and current state of the biological environment in the project area.

Additionally, other relevant studies and environmental assessments from the surrounding regions were reviewed, offering a broader context and aiding in the understanding of species distribution, ecological trends, and potential environmental impacts. The integration of these secondary sources enriched the overall assessment, enabling a more informed and holistic evaluation of the project's environmental baseline.

4.5.2. Flora in the Project Area

The vegetation of Islamabad predominantly represents the Dry Subtropical Scrub Forest, characterized by species such as Acacia modesta (Phulai), Ziziphus mauritiana (Ber), and Ziziphus nummularia (Mullah). Other commonly found species include Prosopis cineraria (Jand), Melia azadirachta (Dharek), Morus Alba (Mulberry-Shah-toot), Dalbergia sissoo (Tahli-Shisham), and Acacia nilotica (Kiker). The undergrowth features

species like Cannabis sativa (Bhang), Calotropis procera (Desi Ak), Parthenium hysterophorus (Gandi Booti), and Ocimum basilicum (Niazbo). The project site has minimal vegetation, predominantly consisting of weeds and shrubs. During the construction of campuses, no trees will be removed; only the weeds will be cleared from the site. Below are images of the common flora species found at the site, accompanied by detailed descriptions of each:

Table 3: Common Flora Species Found at Site

Sr.No	Scientific Name	Common Names	Description
	 *Tamarix dioica*	Farash and sometimes called Jhau	Native to South Asia and commonly found in riverbeds, it is a shrub or small tree. It can grow up to 2 to 10 meters in height and is multi-stemmed when young. It is used for windbreaks and also helps control soil erosion
	 *Eucalyptus camaldulensis*	Safeda	Safeda (Eucalyptus) is native to Australia and is widely planted across Pakistan. It is a fast-growing, tall tree that can reach heights of 30 to 50 meters, with a straight trunk and narrow leaves. It is commonly used for timber, fuelwood, windbreaks, and

			roadside plantations due to its rapid growth.
	 *Sesbania bispinosa*	Jantar	Jantar is native to South Asia and commonly grown in tropical and subtropical regions. It is a fast-growing shrub or small tree that can reach up to 2 to 6 meters in height. It is widely used as green manure, fodder for livestock, and for improving soil fertility due to its nitrogen-fixing properties.
	 *Panicum radicosum* J.Presl	Timorese crabgrass	This grass is characterized by its spreading growth habit, with stems that can root at the nodes, allowing it to cover ground quickly and effectively. The leaves are typically flat, narrow, and tapering, with a bright green color that contributes to its lush appearance. Panicum radicosum thrives in warm, humid climates and is often found in open fields, disturbed areas, and along roadsides. Its adaptability to different soil types and resilience in less-than-ideal growing

			conditions make it a common and persistent species in its native range. The grass is also noted for its potential use in erosion control due to its dense root system, which helps stabilize the soil.
	 *Lantana camara L.*	Lantana	**Lantana camara L.** is a flowering plant species belonging to the Verbenaceae family. Originally native to the tropical regions of Central and South America, it has spread globally and is now found in many tropical, subtropical, and warm temperate regions. Lantana camara is a highly variable and adaptable species, often recognized by its clusters of small, brightly colored flowers that can range from pink, red, orange, yellow, and white, sometimes even changing color as they mature.

	 *Chrozophora tinctoria*	Commonly known as dyer's croton, or dyer's litmus plant	It is an annual, typically found in nutrient-poor ground. It develops a large taproot. The plant is erect and covered with wool-like hairs. The ash-green leaves are alternate. The tiny monecious flowers are grouped in a raceme. The lower, female flowers lack petals and the upper male flowers have five small yellow petals. Pollination is by ants.
	 Cynodon dactylon Synonyms: Bahamagrass, Common stargrass, Couch grass, Dhubgrass, Devilgrass	Bermuda grass	This grass has a fine texture with a bright green color, growing low to the ground with stems that can spread quickly through stolons (above-ground runners) and rhizomes (underground stems). Its leaves are narrow and pointed, forming a dense mat that can crowd out weeds.

	 Parthenium	Congress grass	Congress grass feverfew plant on jungle. People also take feverfew by mouth for fever, irregular menstrual periods, arthritis, a skin disorder called psoriasis, allergies, asthma, ringing in the ears
	 Ceratocarpus arenarius L		A bushy herbaceous plant, no more than 30 cm tall (or wide), it is a valuable fodder for sheep, goats and horses, and it grows well in degraded and trampled soils
	 *Tectona grandis L.f.*	Teak	Tectona grandis L.f., also known as teak, is a large deciduous tree that can grow up to 50 meters tall and 2.5 meters in diameter.

	 Ambrosia Confertiflora	Weak leaf bur ragweed.	An erect, leafy somewhat bushy herb which can form large colonies. Its Leaf blades are lanceolate to ovate and irregularly 2 to 4 pinnately lobed. Involucres (whorled bracts) of staminate (stamens without pistels) heads are 1/16 to 1/8 + inches in diameter.
	 Ammophila Arenaria	Marram grass and European beachgrass.	Marram grass is a perennial grass that's native to the coastlines of Europe and North Africa. It's a member of the Poaceae family and can grow to be 0.5–1.2 meters tall. It's characterized by its dense, fibrous roots, coarse, spiky leaves, and golden flower spikes.

4.5.3. Fauna in the Project Area

Margalla Hills is home to a diverse range of wildlife, including exotic birds, monkeys, grey goral, barking deer, jungle cats, porcupines, cape hares, Himalayan palm civets, red foxes, Asiatic jackals, white-crested kalij pheasants, golden orioles, paradise flycatchers, grey shrikes, spotted doves, and other species.

No wild mammalian species were observed within the university premises.

4.6. Socio-Economic and Cultural Environment

The socio-economic environment of the Project Area has been studied with respect to human and economic development in the vicinity of the Mouza Sihala, Zone-V, Islamabad project site. The assessment focuses on population and communities, infrastructure availability, transportation network, prevailing land use, economic activities, institutions, and social conditions in the area.

To ensure representation of public opinion and social context, consultations were held with stakeholders in the study area. Both primary (field surveys, interviews, stakeholder meetings) and secondary sources (official records, census data, published reports) were used for data collection and analysis.

4.6.1. Administrative and Political Structure of Project

The Project Area is located within the Islamabad Capital Territory (ICT), a federally administered territory under the jurisdiction of the Federal Government of Pakistan. ICT covers an area of approximately 906 square kilometers and is regulated by the Capital Development Authority (CDA) under the Islamabad Master Plan. The territory is divided into five planning zones (Zone I–V), each designated for specific land use categories. The proposed project falls within Zone-V, which primarily consists of rural settlements, agricultural land, farmhouses, and low-density residential development. However, in accordance with applicable planning regulations, the Capital Development Authority (CDA) has granted approval for the establishment of an educational institution at the project site in Mouza Sihala.

Mouza Sihala is a recognized revenue village within the rural administrative framework of ICT and forms part of the local Union Council system. The area is located along Kahuta Road and lies in close proximity to the Islamabad Expressway, providing connectivity to Islamabad and Rawalpindi. Due to its strategic location along these transportation corridors, the area has experienced gradual peri-urban growth, including institutional and residential development in recent years.

4.6.2. Human and Economic Development

(a) Human Development

i. Population Composition & Demographics

The Islamabad Capital Territory has a diverse population with a total exceeding 2.3 million residents, including both urban and rural communities. ICT has one of the highest literacy rates in Pakistan, with over 93 % of the population being literate.

In contrast, Mouza Sihala itself, as a town, maintains a smaller but growing population of approximately 25,000+, comprising a mix of long-term residents and recent settlers attracted by proximity to Islamabad and associated economic opportunities.

ii. Rural-Urban Distribution

The ICT's population is roughly split between urban and rural areas, with significant rural settlements in zones like Zone-V where Sihala is located. While urban sectors host high-density development, rural localities such as Sihala still retain agricultural and semi-urban characteristics.

iii. Religion & Cultural Structure

The population of the Project area and ICT at large is predominantly Muslim, with minorities including Christians and other smaller groups, reflecting national religious composition patterns in Pakistan.

iv. Ethnicity & Languages

Islamabad's rural localities, including Sihala, comprise ethnic communities common to the Pothohar Plateau region, such as Rajputs, Gujar, Awan, Syed, and other tribes. The linguistic profile reflects multiple languages, with Punjabi, Urdu, and Pashto widely spoken alongside other regional mother tongues.

v. Migration & Population Growth

The capital region, including rural areas near Sihala, attracts people from other provinces seeking employment and services due to its strategic economic position, contributing to population growth beyond core city limits.

(b) Economic Development

i. Employment & Livelihoods

Residents in and around Sihala engage in varied economic activities. While agricultural livelihoods and local trade remain significant, many residents are employed in government jobs, transport services, education, retail, and construction linked to the broader Islamabad and Rawalpindi economies.

ii. Business & Services

The Project Area benefits from commercial development along the Islamabad Expressway and Kahuta Road, with small to medium enterprises providing employment and services to local communities.

4.6.3. Industrial and Commercial Development

Although the Project Area is not a major industrial hub, the vicinity includes logistics facilities, small scale commercial services, workshops, and institutional offices (e.g., training centres, fuel depots) which support local economic activity.

4.6.4 Infrastructure

(a) Roads and Transport

Mouza Sihala is well connected through the **Islamabad Expressway and Kahuta Road**, offering direct access to Islamabad, Rawalpindi and neighboring regions. Public transport services including buses, taxis and vans operate regularly, enhancing mobility for residents.

(b) Railways

Sihala hosts a railway station, linking the area to the national rail network and facilitating both passenger and freight movement.

(c) Utilities

Basic utilities such as electricity, water supply and sanitation services are provided, although quality and reliability of services vary by settlement and infrastructure expansion in the rural zone continues to improve with ongoing development efforts.

4.6.5 Institutions

Educational and health services in and around Sihala include schools, clinics and vocational facilities, both public and private, serving local residents and those commuting from nearby settlements. Proximity to major urban centres further enhances access to higher education and specialized medical facilities.

4.6.6 Quality of Life Values

Communities in the Project area generally share South Asian rural-urban cultural norms, with traditional family structures and local languages forming an integral part of daily life. Access to services like clean water, healthcare, nutrition, and sanitation remains a priority for local development, as in other parts of Islamabad Capital Territory.

4.6.7 Major Landmarks/Facilities Near Project Area

Important facilities near Sihala include:

- Police Training College Sihala
- Railway Station
- Animal Slaughterhouse
- Pakistan State Oil (PSO) Depot
- Capital University of Science & Technology (CUST)

4.6.8. Growth Trend Analysis of Islamabad (2013-2023)

The Project Area is located within the Islamabad Capital Territory (ICT), a federally administered territory under the jurisdiction of the Federal Government of Pakistan and regulated by the Capital Development Authority (CDA). ICT covers approximately 906 square kilometers and is divided into five planning zones (Zone I–V) under the Islamabad Master Plan. The proposed project falls within Zone-V, which primarily comprises rural settlements, agricultural land, and low-density residential development. However, the Capital Development Authority (CDA) has granted approval for the establishment of an educational institution at the project site in Mouza Sihala. Due to its location along Kahuta Road and in close proximity to the Islamabad Expressway, the area is gradually experiencing peri-urban development.

In this context, the overall urban growth pattern of Islamabad provides important insight into land use changes in peripheral zones, including Zone-V. Growth Trend Analysis of Islamabad (2013–2023) indicates that built-up areas of Islamabad increased from 150 sq. km to 281 sq. km, while other land uses such as water bodies, barren land, forest, and agricultural areas have decreased from 2013 to 2023 as shown in following figure:

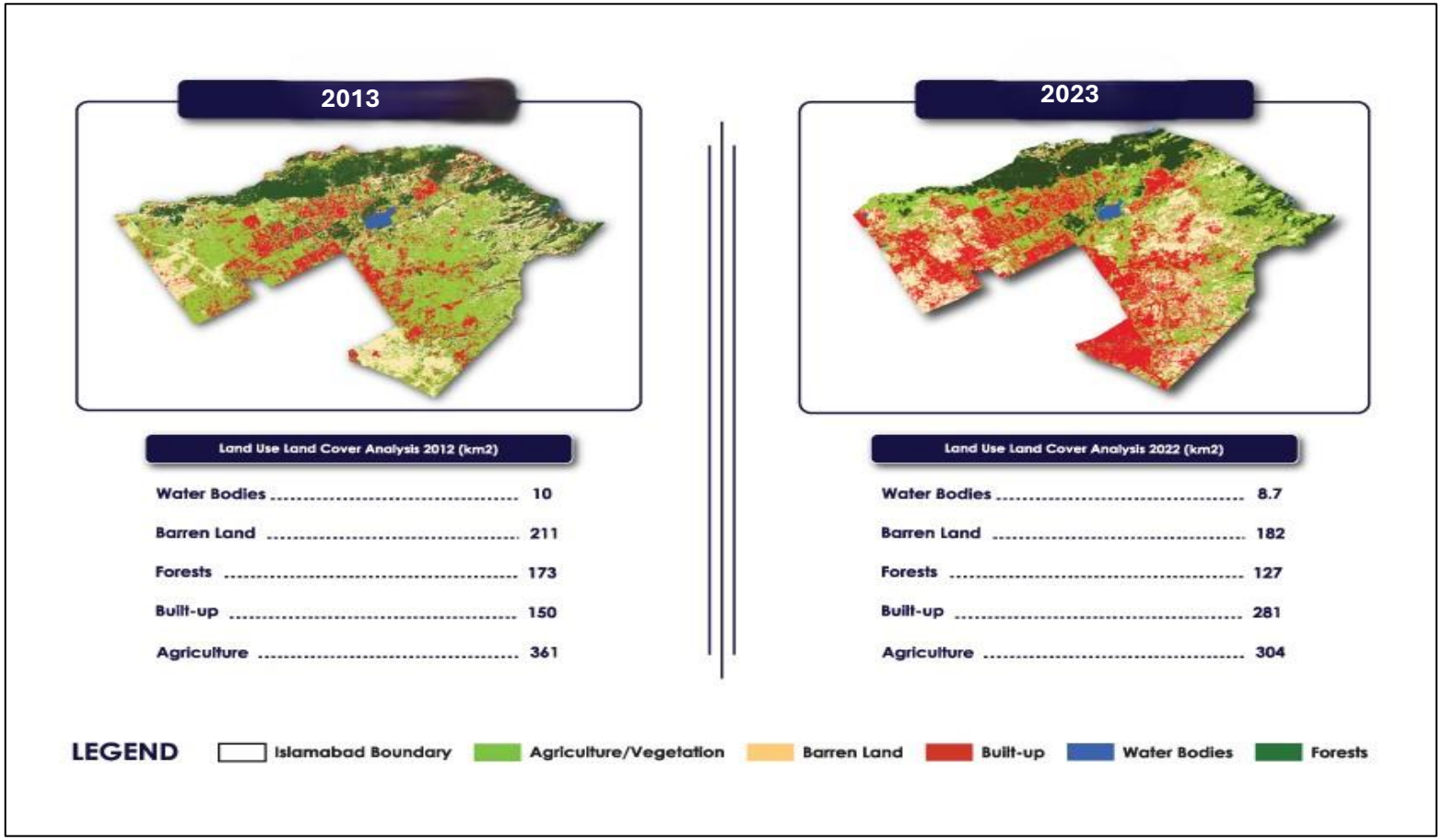


Figure 5 Growth Pattern of Islamabad

CHAPTER 5. INVOLVEMENT OF STAKEHOLDERS/PUBLIC CONSULTATION

5.1. General

This section describes the regulatory policy, planning and current practices of project proponent pertaining to the stakeholder engagements and outcomes of stakeholder consultation process initially done as part of the EIA report. The feedback from communities and other stakeholders directly or indirectly affected by the project is collected so that it may be used to adjust and improve the project's design, planning, implementation. The feedback helps in implementation structure by ensuring that the project is both environmentally and socially sound. The consultation process was carried out in accordance with the requirements of the Pakistan Environmental Protection Act and Guidelines for public consultation.

Public consultation and participation process provide an opportunity for those directly and indirectly affected by the project to express their concerns before the feasibility of the project is ascertained. It is meant to ensure that the EIA process is open, transparent, and robust, characterized by defensible analysis to attain sustainability in the design, implementation, operation & management of development proposals.

One common view of the level of public consultation and involvement is summarized below.

Informing → **Consulting** → **Participation**

Table 4: Stakeholders Categories on the Basis of Guidelines for Public Consultation for Project Area

Sr. No	Stakeholders Categories on the basis of Guidelines for public consultation Project Area
i.	The proponent of the proposed project & local people in the vicinity
ii.	Other affected communities, Govt. Agencies & NGOs, etc.
iii.	Discussion and consulting with Academia & Environmental Experts
iv.	Discussion with students of the university

The key objectives of Public Involvement are:

- Informing the stakeholders about the proposed activities and project
- Obtaining local and traditional knowledge before decision-making
- Share information with the stakeholders/public about the proposed project
- Inform the stakeholders of the project features and relevant details and the environmental issues likely to emerge while the project is in the pre-construction, construction, and operation stages
- To gather information on relevant issues so that the feedback received could be used to address these issues at an early stage of the project
- To determine the extent of the negative impacts of different project activities and suggest appropriate mitigation measures
- Developed a proposal which is truly sustainable and acceptable

5.2. Methods of Public Consultation

Public Consultation was carried out in order to establish stakeholder's opinion and their suggestions regarding project implementation.

The following methods were used for public consultation with project stakeholders:

- Scoping Sessions
- Household survey
- Individual Interview
- Formal Meetings & Informal Meetings with locals
- Focus Group Discussions and data collection through questionnaire

5.2.1 Environmental Protection Agency (EPA) Officials

A meeting was held with Pak-EPA officials for discussion on the project components. They recommended to conduct EIA for the proposed project. They have also hinted a few important issues that need special attention during the project execution. The important issues are:

- A solid waste management plan for the construction and operation period must be prepared.
- The project description, exact location, and site area should be clearly mentioned in the report.
- The exact location of the labour camp site must be determined to ensure proper accommodation and management of the workforce.

- Water supply source during construction and operational phase & treatment of wastewater from camp site.
- A Traffic Management Plan (TMP) must be developed to address and mitigate potential traffic disruptions during the project's execution, ensuring smooth and safe transportation for all road users.
- A comprehensive grievance redressal mechanism must be established to address and resolve any concerns or complaints from stakeholders promptly and in an efficient manner.
- Effective control measures for dust emission must be put in place to minimize air pollution and ensure the health and safety of the local community and workers.
- Consultations with local and major stakeholders must be conducted to gather input, address concerns, and ensure transparency and community involvement in the project.
- An accurate count of trees located on project sites must be undertaken to assess potential impacts on local vegetation.

Table 5: Primary Issues Discussed During Meeting with Public and Stakeholders

Primary Issues Discussed during meetings with public and stakeholders	
i.	All the activities related with construction of academic blocks & their possible impacts on Environment, Social status, Economic and culture
ii.	The project detail description, exact location and site area
iii.	Possible impact and their mitigations measure
iv.	Consulted, informed, recorded project relevant impacts and their suggestive mitigation measures
v.	Discussed all factors that contribute in local economy

Major Stakeholders Interviewed and their Apprehensions were Recorded and Incorporated.

Among all stakeholders, some major stakeholders were identified in the proposed Project Area. The pictorial view of Interviews and consultation meetings held with the stakeholders, list of major stakeholders and their apprehensions are mentioned below:

Table 6: Major Stakeholders and their Apprehensions

Major Stakeholders and their Apprehensions				
Sr. No	**Date**	**Name and Designation**	**Location**	**Suggestion/ Apprehension/Concern**
1	January 5, 2026	Mr. Shareef Hussain, Director JV and Public	CDA, Islamabad	• During stakeholder consultations, the Director, CDA, expressed concern regarding sustainable water

		Private Partnership, CDA		consumption and potential stress on groundwater resources associated with the proposed university campus. • Concerns were highlighted about stormwater management and the possibility of obstruction to natural drainage, which could result in localized flooding. • The Director noted potential environmental impacts arising from improper handling and disposal of construction and municipal solid waste. • Air quality deterioration due to dust emissions and increased noise levels during construction activities was identified as a key concern. • The need to preserve existing vegetation and ensure provision of adequate green areas in accordance with CDA regulations was emphasized.
2	January 2, 2026	Mr. Faisal Naeem, Hydrologist	Global Axis Technology consultants (Pvt) Ltd.,	• Mr. Naeem expressed concern regarding flood inundation of the project site due to the proximity of the Soan River, particularly during extreme monsoon rainfall events and high river discharge conditions.

				• He Highlighted the risk of river backflow and overtopping, noting that peak flows may exceed the carrying capacity of the river channel and affect adjacent low-lying areas of the proposed project. • Conduct detailed hydrology study to determine design flood levels and flow characteristics. • Maintain adequate setback distance from the river in accordance with regulatory requirements • Design an efficient stormwater drainage system with controlled discharge into the river. • Implement riverbank protection and erosion control measures where required.
3	January 6, 2026	Mr. Kashif, Director Environment, CDA	CDA, Islamabad	• Proper solid waste management and strategies to minimize environmental impact. • Air quality and water pollution monitoring must be conducted during construction and operation to ensure compliance with standards.

				• Promotion of renewable energy, such as solar power, should be included to reduce the project's environmental footprint. • Adequate green spaces and landscaping should be provided, ensuring that no invasive plant species are introduced. • Wastewater must be treated before discharge.
4	January 4, 2026	Mr. Ghulam Mustafa-Site Engineer	CUST-Islamabad	• Ensure safety of workers and visitors on the construction site through proper safety measures and use of PPE. • Maintain quality control of construction materials and workmanship to meet design specifications. • Monitor construction progress and schedules to avoid delays and coordinate activities efficiently. • Ensure environmental compliance, including dust, noise, and solid waste management on-site. • Manage site logistics, including safe storage of materials and movement of heavy equipment.

				• Monitor ground and soil conditions, addressing stability, erosion, and foundation safety. • Coordinate with architects, structural engineers, and environmental consultants to ensure accurate implementation of designs. • Oversee stormwater management and drainage on-site to prevent flooding and waterlogging during construction.
5.	January 5, 2026	Mr. Arsalan Abbas- Assistant Director Planning	CDA, Islamabad	• Ensure compliance with zoning regulations for the proposed project. • Verify adherence to ground coverage, open space, and layout requirements in line with CDA guidelines. • Assess integration with local infrastructure, including roads, utilities, and public services. • Ensure provision of green spaces and landscaped areas while maintaining environmental and aesthetic standards. • Check that stormwater drainage and natural water flow are not obstructed by the development.

				• Ensure coordination with other regulatory authorities such as Pak-EPA for approvals and compliance.
6.	January 6 & 7, 2026	Students, Faculty and resident's suggestions	At site	• Students and nearby residents expressed concerns about increased traffic and road safety due to construction and campus operations. • Noise and dust pollution from construction activities were highlighted as potential health and comfort issues • They were of the opinion to engage the local community and gather their feedback on the project. • Provide employment opportunities for local residents, particularly unskilled laborers and workers. • Construction activities must be planned considering peak hours of the university. • Solid waste should be managed properly. • Environmental monitoring must be carried out during construction as well as operation phase of the project.

Pictorial Evidence of Consultation with Academia, Environmental Expert Management

Consultation with CDA Officials

Consultation with Students and University Management

5.3. Future Stakeholder Consultation

Stakeholder consultation and engagement for the proposed CUST university project will be a continuous, structured, and adaptive process, carried out throughout the construction, operation, and maintenance phases. Consultations will be conducted on a needs basis and will involve a wide range of stakeholders, including relevant government departments, local administration, community representatives, and individuals potentially affected by the project. This approach ensures that all voices are heard and incorporated into project planning and decision-making.

The primary objective of this engagement is to facilitate effective project design and implementation, reduce potential conflicts or opposition, and increase the project's acceptability among local communities and authorities. Community members will be compensated where applicable and actively encouraged to participate in project-related activities, including awareness sessions, environmental management programs, and feedback consultations.

Consultations will be conducted regularly, with each community engaged at least twice annually, or more frequently if new concerns emerge. The process will also focus on providing updates on project progress, particularly the implementation of environmental and social management measures identified in the IEE. Stakeholders will have opportunities to provide feedback on the effectiveness of these measures, ensuring the project remains responsive to community needs.

Key ongoing engagement activities include:

- Periodic reporting on the progress of environmental and social management measures and recording stakeholder observations.
- Informing communities and other stakeholders about major project developments and collecting suggestions for improvement.
- Maintaining a grievance redress mechanism to promptly address concerns, ensure transparency, and strengthen trust with local communities.

- Facilitating local-level participation, including involving community members in environmental initiatives and awareness programs during construction and operation phases.

CHAPTER 6. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1. General

This chapter identifies and assesses both the beneficial and potentially significant adverse environmental and social impacts associated with the proposed project during its design/pre-construction, construction, and operation phases. The assessment covers impacts on the physical, ecological, and socio-economic components of the environment. Appropriate mitigation and remedial measures have been proposed to address identified impacts. A project impact evaluation matrix has also been developed to systematically analyze and rate the potential impacts of the project. A concise qualitative description of each environmental aspect and the corresponding environment affected within the Study Area is provided in the following sections.

6.1.1 Objectives

The objectives of screening all potential impacts and proposing appropriate mitigation measures are as follows:

- To ensure early identification of environmental and social issues associated with the proposed project.
- To support informed decision-making through systematic assessment of potential project impacts.
- To explore feasible alternatives and improved approaches for implementation of project activities.
- To enhance the environmental and social benefits associated with the proposed development.
- To avoid, minimize, and remediate potential adverse environmental and social impacts.
- To ensure that any residual adverse impacts are maintained within acceptable and manageable limits.

In addition, a systematic review of all project stages was undertaken as an analytical tool to support comprehensive identification and evaluation of potential impacts.

6.1.2. Impact Assessment Methodology

The methodology adopted for conducting the impact assessment of the proposed project of the Capital University of Science and Technology (CUST) involved a combination of systematic tools and approaches to ensure comprehensive evaluation of all project components. The assessment was designed to effectively address potential environmental and social concerns associated with the proposed development. Environmental aspects of the project were identified with reference to existing land use conditions, potential impacts on vegetation, air quality due to dust emissions, local hydrology, traffic movement, and other site-specific issues likely to arise during construction and operation phases.

The overall assessment process was structured to provide a thorough and balanced evaluation of potential impacts on the surrounding environment. The methodology primarily focused on identification and analysis of risks and hazards associated with project activities through the following steps:

- Review of relevant national legislation, environmental guidelines, and use of impact assessment checklists and matrices.
- Identification of potential environmental and social impacts through site visits, field surveys, and expert assessments.
- Collection and analysis of baseline information related to the physical, ecological, and socio-economic environment of the Project Area.
- Incorporation of stakeholder consultations to understand local concerns and expectations.
- Application of professional judgment and expert opinions to evaluate the magnitude, duration, and significance of potential impacts.
- Development of appropriate mitigation and management measures to minimize identified adverse impacts.

- Prediction and evaluation of residual impacts, including short-term, long-term, direct, indirect, beneficial, and adverse effects.

The National Environmental Quality Standards (NEQS) were used as reference criteria for determining permissible limits of environmental parameters during project construction and operation. Relevant national and international guidelines were also reviewed to ensure compliance with requirements related to ecological protection, including flora, fauna, natural habitats, and any culturally or historically significant features within the Area of Influence (AOI).

Based on the above approach, a structured impact assessment strategy was developed for the CUST project, which is summarized in the following sections.

***Table 7:* Impact Assessment Strategy for Proposed Project**

Step	Description	Importance	Next Steps	Outcome
Predict	What could happen because of doing what is proposed	It is important to understand potential impacts	Evaluate the predicted impacts in detail	Identify the potential impacts of the project
Evaluate	Is there still a significant impact	Determine the significance of the impact	Assess if mitigation measures can reduce the impact	Help prioritize which impacts need mitigation
Mitigate/Enhance	What can be done about it	Implement measures to reduce negative impacts or	Develop and apply mitigation or enhancement strategies	Reduces adverse impacts or enhances positive outcomes

		enhance positive ones		
Residual Impact	The project is currently planned, and mitigation already incorporated	Final assessment after mitigation	Evaluate if the residual impacts are acceptable	Ensures the project is environmentally friendly and sustainable
Stakeholder Interaction	Stakeholders can help decide this	Engage with stakeholders for input	Consult with stakeholders to gather feedback and incorporate their insights into the project	Develop a more inclusive and acceptable project plan
Solution Development	Interact with the stakeholders and project to develop solutions	Collaborate to find effective solutions	Work together with stakeholders to refine and improve mitigation measures	Leads to more effective and comprehensive mitigation strategies
Repetition of Sequence	For some impacts, the sequences may need to be repeated	Ensures thorough impact management	Continuously monitor and re-evaluate the impacts and mitigation	Maintains the project's environmental and social responsibility

			measures as necessary	throughout its lifecycle.

6.1.3. Approach Adopted for Impact Identification

The proposed project of the Capital University of Science and Technology (CUST) has been planned to accommodate the increasing academic population and evolving educational requirements, while ensuring compatibility with the existing campus layout and functions. The project is intended to strengthen the university's infrastructure through the development of additional academic blocks, laboratories, administrative facilities, and student support amenities.

In order to identify and assess the potential environmental and social impacts of the proposed project, detailed impact assessment checklists were developed by subject experts for the physical, ecological, and socio-cultural components of the environment. These checklists were prepared considering the nature of the proposed facilities and the prevailing conditions of the Project Area. Furthermore, a systematic review of all project stages, including design, construction, and operation, was undertaken as an additional analytical tool to ensure comprehensive identification of potential impacts.

Table 8: Checklist Provides the Screening of Potential Environmental Impacts

Screening Questions	Yes	No	Remarks
Project Siting			
Is the project area densely populated?	✓		The project site is located in zone-v and is densely populated. However, population density is expected to increase further following project completion.
Is the area characterized by heavy development activities?		✓	The surrounding area consists mainly of educational and residential developments with no major ongoing industrial activities.
Is the site adjacent to any		✓	No socio-cultural or community

socio-cultural or community sensitive location?			sensitive sites are located in the immediate vicinity of the project area.
Is the project near any cultural heritage or archaeological site?		✓	No notified heritage or archaeological sites are present within or near the project boundary.
Is the project located in an estuarine, wetland, or environmentally sensitive area?		✓	Not applicable. The project is situated in an inland institutional setting.
Potential Environmental Impacts			
Will construction activities temporarily deteriorate environmental conditions at the site?	✓		Minor deterioration such as dust, noise, and traffic disturbance may occur during construction if mitigation measures are not implemented.
Will the project cause degradation of land or local ecosystems?	✓		Temporary disturbance to soil and surface conditions is expected during earthworks; however, no significant natural vegetation exists on-site.
Will the project require involuntary resettlement or displacement of people?		✓	The project site is owned by the proponent and free of any human settlements.
Will the project affect any cultural property or tourism resources?		✓	No cultural or tourism resources exist within the Area of Influence (AOI).
Will the project create water resource problems (depletion or quality degradation)?	✓		Water demand will increase; however, conservation measures, wastewater treatment, and rainwater harvesting are planned to manage impacts.
Will the project cause air pollution due to dust and emissions?	✓		Dust generation is expected during construction; control measures under the EMMP will be implemented to maintain

			compliance with NEQS.
Will the project create social conflicts between local and non-local workers?		✓	Local labor will be prioritized; no significant social conflicts are anticipated.
Will construction activities block roads or disturb traffic?	✓		Temporary traffic disturbances may occur; a Traffic Management Plan will be prepared and implemented.
Will there be increased noise levels due to construction activities?	✓		Noise impacts are expected to be minor and short-term; mitigation measures will be applied.
Will there be risk of silt runoff from the site?	✓		Minor risk during monsoon; sediment control measures will be implemented.
Will there be depletion or degradation of water quality?	✓		Potential minor impacts during construction; proper drainage and wastewater management will mitigate risks.
Will improper waste disposal cause contamination of surface or groundwater?	✓		Waste management plans will be implemented to prevent contamination.
Will the project adversely affect flora and fauna?		✓	The site is largely developed land with minimal natural vegetation; no significant ecological impacts are expected.
Will there be adverse impacts on the local community?	✓		Minor temporary impacts such as noise and traffic; mitigation measures will be enforced through the EMMP.

6.1.4. Project Location

The proposed project titled "Extension of Capital University of Science and Technology (CUST), Zone-V, Islamabad" covers a total area of 182.05 kanals, comprising an originally approved area of 80 kanals and an additional 107 kanals proposed for the project. The project site is located in Mouza Sihala, adjacent to the Islamabad Expressway in Zone-V, Islamabad. At present, the site consists of partially developed institutional land with

limited vegetation mainly along the periphery. There is no involvement of displacement of local communities, resettlement, loss of property, or impact on existing business activities as the land is owned by the project proponent. The proposed development includes construction of additional academic blocks, laboratories, administrative offices, hostels, auditoriums, parking areas, playgrounds, internal roads, and supporting infrastructure such as a sewage treatment plant, solid waste management system, and rainwater harvesting facilities. These components are planned to accommodate future academic growth while ensuring efficient campus operations. The project will be implemented in compliance with applicable CDA planning standards and environmental regulations, with necessary mitigation measures adopted to ensure environmentally sustainable development and operation of the university campus.

6.1.5. Environmental Impact Matrices for "Capital University of Science and Technology, Islamabad".

Environmental and social impact matrices have been developed for the proposed project of the Capital University of Science and Technology (CUST) to systematically evaluate the magnitude and significance of impacts arising from various project activities on the physical, ecological, and socio-economic components of the environment during both construction and operational phases. These matrices provide a structured framework for assessing potential impacts associated with the university expansion, prioritizing key areas of concern, and identifying appropriate mitigation and management measures. The approach ensures that all relevant environmental and social considerations are comprehensively addressed to support informed decision-making and environmentally responsible project implementation.

Table 9: Impact Evaluation Matrix of the Project- CUST

Project Impact Matrix																														
Environmental Component	**Physical Environment**						**Ecological Environment**							**Socio Economic Environment**																
Project Component	Soil (Erosion/Stability/ Contamination)	Air Quality	Noise Level	Surface & Ground Water Quality	Indoor Air Quality	Solid Waste Generation	Aquatic Ecosystem	Terrestrial Ecosystem	Endangered Species	Migratory birds	Beneficial Plants	Loss of trees	Loss of Crops/Orchards	Conflict over Resources	Mobility of Locals	Public Infrastructure	Accessibility	Housing Infrastructure	Cultural Properties (Mosque, Shrine, Graveyard	Community Stability	Tourism And Recreation	Grazing Area	Gender Issues	Cultural & Social Issues	Health & Safety	Aesthetic	Security Situation	Living Standards	Employment Opportunities	Restoration of Livelihood	Economic Upset
A. Planning & Design Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Topographic Survey	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Geotechnical Investigations	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0
Temporary Acquisition of Land	0	0	2	2	0	0	0	2	0	0	0	4	0	3	0	0	2	0	0	3	0	0	2	3	0	2	2	0	0	0	0
B. Construction Phase																															
Clearing and Excavation	9	9	9	8	0	8	2	4	0	0	0	0	0	0	6	4	3	0	0	2	0	0	0	6	9	4	4	0	6	0	4
Establishment of Construction Camps & Workshop	2	2	4	0	0	0	0	4	0	0	0	4	0	8	0	0	0	0	4	4	0	0	4	4	8	4	0	0	6	6	6
Transportation & Storage of Construction Materials	4	6	6	2	0	4	0	2	0	0	0	0	4	0	4	0	0	0	0	4	0	0	0	4	6	4	0	0	4	0	0
Use of Construction Material and Heavy Machinery	3	8	9	0	0	4	2	4	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	2	8	0	4	0	4	0	0
Solid Waste (Construction and Municipal)	3	3	0	6	0	6	2	6	0	0	0	4	6	0	0	0	0	0	0	2	0	0	0	4	4	6	0	0	0	0	0
Structural & Civil Work	8	8	8	7	0	7	2	6	0	0	0	0	0	2	2	0	0	0	0	2	0	0	4	6	9	4	4	0	8	0	8
Drainage Work	6	6	6	7	0	6	4	6	0	0	0	0	0	2	0	2	0	0	0	2	0	0	4	4	9	4	4	0	8	0	8
Miscellaneous Work (Road Ancillaries, water supply, sewerage system, and Signals etc.)	0	4	6	4	0	4	2	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	6	0	0	0	6	0	6
Landscaping	2	2	2	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	8	0	6	6	4	6
Finishing and Comissioning	0	2	4	0	0	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0	4
C. Operational Phase																															
Operation of CUST University	0	2	2	0	0	0	0	4	0	0	0	6	0	0	6	4	8	0	0	6	4	0	0	8	6	8	4	8	6	6	6
Inspection & Monitoring of campuses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	2	4	0	4	0	4	0	0
CUST University Waste Handling	6	4	4	4	0	9	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	6	0	0	4	0	0
Building Maintenance	0	4	4	2	0	0	0	2	0	0	0	0	4	0	4	4	4	0	0	0	0	0	0	0	6	2	0	0	4	0	0
Miscellaneous Work	0	0	2	0	0		0	0	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	4	0	0	0	4	0	4

Significance of Impacts	Score of Beneficial Impacts	Score of negative Impacts
Negligible	0	0
Low	2 to 4	2 to 4
Medium	5 to 8	5 to 8
High	9 to 12	9 to 12
Very High	> 12	> 12

6.2. Positive Impacts of the proposed project

The proposed project of CUST is fundamentally a developmental and socially beneficial project. It is expected to generate numerous positive impacts at local and regional levels.

Educational and Social Benefits

- Expansion of higher education infrastructure in Islamabad
- Increase in student enrollment capacity from approximately **7,000 to 14,000 students**
- Provision of modern academic facilities including laboratories, libraries, and classrooms
- Improved hostel and residential facilities for students
- Enhanced sports, recreational, and cultural opportunities
- Contribution to human resource development in Pakistan

Economic Benefits

- Direct employment opportunities during construction phase
- Long-term employment for teaching and administrative staff
- Growth of local businesses and services
- Increase in demand for transport, food, and accommodation services
- Enhancement of property values in surrounding areas

Environmental and Sustainability Benefits

The project incorporates several environmentally responsible components such as:

- Establishment of an on-site Sewage Treatment Plant (STP)
- Integration of rainwater harvesting system
- Organized three-tier solid waste management system
- Development of extensive green areas and playgrounds (36.33% of total area)
- Improved landscaping and urban aesthetics

These features will enhance the environmental performance of the campus and contribute toward sustainable development goals.

6.3. Screening of Potential Environmental Impacts and Mitigation Measures

This section of the EIA report presents the results of the screening and impact assessment process and evaluates the potential environmental impacts associated with the design, construction, and operational phases of the proposed project. It identifies the nature and significance of any adverse environmental impacts and proposes appropriate mitigation and management measures to avoid, minimize, or compensate for negative effects. The assessment ensures that all relevant environmental considerations are comprehensively addressed to support environmentally sustainable project implementation.

6.3.1. Phases of the Project

The phase of the project covered in the impact assessment includes:

- Planning & Design Phase
- Construction Phase
- Operation Phase

6.3.1.1 Impacts Associated with Design Phase

Impacts arising during the design and planning phase are indirect in nature but have significant long-term implications. Proper planning at this stage can minimize environmental issues during construction and operation.

The following sections discuss the potential impacts associated with design decisions and corresponding mitigation measures.

6.3.1.2 Impacts on Physical Environment

Topography

Potential Impacts

The proposed project will involve construction of new academic blocks, hostels, auditoriums, parking areas, and internal roads. These activities may result in:

- Minor alteration of existing landform
- Modification of natural slopes
- Disturbance to existing surface drainage patterns

However, as the project site is already part of an established university campus, large-scale topographic changes are not anticipated.

Mitigation Measures

- Limit earthworks to designated construction footprints
- Avoid unnecessary cutting and filling
- Preserve existing natural drainage routes
- Rehabilitate disturbed areas through landscaping
- Implement erosion control measures where required

6.3.1.3. Technical Design and Layout Planning

Potential Impacts

Incompatible layout planning and inadequate engineering design of the CUST project can undermine the overall aesthetic quality and functional environment of the university campus. Poor utilization of available spaces and designing structures without considering future academic growth and evolving institutional needs may result in facilities with low operational efficiency, social acceptability, and long-term functionality. Other possible impacts associated with design deficiencies are as follows:

- Drinking water contamination may occur due to improper design of the internal water supply network of the proposed campus buildings. If pipelines and overhead water storage tanks are not properly designed for regular cleaning and maintenance, they may lead to bacteriological contamination of potable water, which can cause infectious diseases and health problems for students, faculty, and staff.
- The quality of surface water may be adversely affected due to disposal of untreated wastewater generated from hostels, laboratories, and other campus facilities into nearby drains or channels. Inadequate drainage design or extreme rainfall events may result in ponding on impervious surfaces such as building roofs, internal roads, and parking areas, which can damage infrastructure and create conditions for vector breeding.
- An inefficient firefighting system and inadequate storage of fire water may pose a serious threat to human safety and to university buildings and assets.

- Lightening strikes can damage campus buildings and may cause failure of electrical and electronic equipment, which can sometimes result in fire hazards, leading to potential human and financial losses.
- Air quality within the Project Area may be affected due to increased movement of vehicles inside the campus and unnecessary idling of diesel and petrol-powered engines.

Overall, these potential impacts are considered moderately adverse in nature.

Mitigation Measures

- All structural, architectural, and engineering designs of the Project will be carried out in strict compliance with applicable national and international standards, including CDA by-laws and the Building Code of Pakistan.
- A properly designed water filtration and treatment system of adequate capacity will be incorporated in the campus design to ensure safe and potable drinking water supply.
- The location of water storage tanks will be carefully planned. Drinking water tanks will not be placed directly beneath sanitary plumbing or any pipes conveying non-potable water.
- All water storage tanks will be properly covered and protected to prevent entry of dust, surface runoff, insects, birds, or animals.
- Provision of water dispensers at strategic locations within academic blocks and hostels may also be considered.
- An on-site Sewage Treatment Plant (STP) will be incorporated in the design for proper treatment of wastewater prior to its reuse or safe disposal within the campus area.
- Introduction of dual-flush systems and water-efficient fixtures will be planned to reduce unnecessary water consumption.
- The design of storm water drainage systems will conform to current CDA and national/international design criteria to ensure efficient management of surface runoff.
- Proper paving will be provided around buildings and external structures to prevent ingress of surface water and to protect foundations and internal roads.

- Rainwater harvesting systems will be incorporated to promote sustainable water use and groundwater recharge.
- A dedicated firefighting pump system will be included in the design to maintain the required pressure within the firefighting network.
- All university buildings will be provided with adequately spaced emergency exits and staircases for safe evacuation of occupants during emergencies in accordance with the Building Code of Pakistan – Fire Safety Provisions.

In addition to the above provisions incorporated by the Design Consultant for Fire Safety, the following additional measures will also be considered during the design phase:

- The Islamabad Fire Prevention and Life Safety Regulations 2010 will be fully considered while designing the firefighting system for the campus.
- A separate and dedicated water storage tank will be provided exclusively for firefighting purposes.
- Fire hose cabinets connected to pressurized water lines will be installed at appropriate locations in all major buildings.
- The firefighting system will be pressurized through an automatic booster system consisting of duty pumps and a jockey pump.
- A comprehensive fire alarm and detection system will be designed and installed for all academic and hostel buildings.

Furthermore, the following fire safety provisions will be ensured in the proposed Project during the design phase:

- Assignment of dedicated emergency contact numbers to inform the campus emergency response team in case of fire; and
- Installation of adequate numbers of fire extinguishers at appropriate and accessible locations throughout the campus.

6.3.1.4. Seismicity

The CUST project site is located within Seismic Zone 2B, where Zone 2B (moderate damage) represents peak horizontal ground acceleration ranging from 0.16g to 0.24g. In this seismic zone, the design of all structural components is required to be

based on the appropriate Peak Ground Acceleration (PGA) values. A low to moderate intensity earthquake affecting the Project Area could potentially cause structural and functional damage to campus buildings and infrastructure. This factor necessitates careful consideration by the design consultants, particularly in view of the major earthquake of October 08, 2005, as well as the frequent earthquake tremors experienced in the region in recent years. The potential impact associated with seismic activity is therefore considered a local and moderate adverse impact.

Mitigation Measures

- The proposed academic, hostel, and administrative structures will be designed and constructed to withstand anticipated seismic loads in accordance with applicable standards. Updated structural, geotechnical, hydrological, and seismic studies will be undertaken to ensure safe and resilient design of the campus facilities; and
- To effectively address seismic risks, the Seismic Building Code of Pakistan 2007 (SBC-07) will be strictly adopted in the design and construction of all buildings and infrastructure. This code specifies minimum requirements for seismic safety of structures and will be applied by qualified engineers in conjunction with sound structural, geotechnical, and earthquake engineering practices.

6.3.1.5. Building Illumination and lighting

Proper design of illumination systems is essential for the CUST project to ensure a safe, comfortable, and energy-efficient campus environment. Inadequate or poorly planned lighting can adversely affect the performance and safety of students, faculty, and staff, while also increasing electricity consumption and operational carbon footprint. Excessive or improperly directed exterior lighting can create glare, disturb the nighttime environment, and result in light pollution or obtrusive light. Such impacts may also affect local biodiversity, including potential habitats in and around the campus. These impacts are considered moderate adverse in nature. Effective lighting design, integrated with energy efficiency measures, will therefore play an important role in reducing operational energy demand and associated greenhouse gas emissions from the university.

Mitigation Measures

- Illumination systems for academic blocks, hostels, and administrative buildings will be designed to maximize the use of natural daylight through appropriate building orientation, window placement, and architectural design.
- Energy-efficient lighting technologies such as LED fixtures, motion sensors, timers, and daylight sensors will be incorporated to minimize electricity consumption and reduce the campus carbon footprint.
- External lighting will be designed to minimize light pollution and glare. To achieve this, downward-directed and fully shielded luminaires will be installed to prevent unnecessary light spill into surrounding areas and ensure illumination is limited to required locations and time periods.
- Lighting design will comply with relevant national and international standards for energy efficiency and environmental protection; and
- Care will be taken to ensure that outdoor lighting does not adversely affect nearby wildlife habitats, particularly any potential habitat activity in landscaped and green areas.

6.3.1.6. Resource Conservation

Use of non-renewable construction materials, high water consumption, and fuel use during construction may exert pressure on natural resources and increase emissions.
Nature: Moderate Adverse

Mitigations Measures

- Ensure efficient and sustainable use of construction materials
- Promote reuse and recycling of construction waste
- Implement water conservation measures at construction site
- Optimize fuel efficiency through proper maintenance of machinery
- Prepare an effective site management plan to minimize resource use
- Plan for solar energy integration during operational phase
- Incorporate rainwater harvesting for non-potable uses

6.4. Impact during Construction / Development Phase

The construction phase of the proposed CUST University project will involve site preparation, excavation, building construction, installation of utilities, road works, and

landscaping. These activities are temporary in nature but may cause various environmental disturbances if not properly managed.

This section identifies the potential impacts during construction and proposes mitigation measures to minimize their adverse effects.

6.4.1. Physical Environment

6.4.1.1 Soil Erosion, Contamination and Structural Risks from Excavation

Construction activities for the CUST project may lead to soil erosion and localized soil contamination. Erosion can occur due to excavation, grading, and cut-and-fill operations, while contamination may result from accidental spills of fuel, lubricants, paints, and concrete wash water at material storage areas and equipment yards.

Deep excavations and vibration from construction machinery may also affect nearby infrastructure such as internal roads, boundary walls, and utility lines if not properly managed. These impacts are considered moderate adverse in nature.

Mitigation Measures

- Excavation bases will be properly compacted and inspected before concreting.
- Excavated soil will be covered, stored safely and reused where possible. Construction vehicle movement will be restricted to designated routes. Vehicles will be kept away from soft or unstable ground.
- Adequate shoring and trench protection will be provided for deep excavations.
- Topsoil will be preserved and reused for landscaping.
- Oil and chemical storage will be in designated, protected areas. Temporary sanitation facilities will be provided to avoid soil pollution.
- Major earthworks will be planned considering monsoon periods. Erosion control measures such as jute mats will be used where required.

6.4.1.2 Temporary Visual and Landscape Disturbance

Stockpiling of construction materials, debris, and temporary site facilities may temporarily affect the visual quality of the campus surroundings. This impact is moderate and short-term.

Mitigation Measures

- Stockpiles will be minimized, covered, and removed promptly.
- Disturbed areas will be regraded and landscaped after works. Good housekeeping practices will be maintained to limit visual clutter.

6.4.1.3 Construction Phase Air Quality Impacts

Air quality may be affected by dust generation and exhaust emissions from construction machinery, vehicles, excavation works, and material handling. In dry and windy conditions of Islamabad, airborne dust can become a nuisance if not controlled. Major sources include:

- Earthworks and excavation
- Transport of materials
- Concrete mixing and cutting operations
- Vehicle and equipment exhaust
- Improper fuel use at temporary camps

These impacts are considered moderately adverse.

Mitigation Measures

- All machinery and generators will be properly maintained to reduce emissions.
- Open burning of waste will be strictly prohibited.
- Use of low-Sulphur fuel will be encouraged.
- Unnecessary vehicle idling will be controlled.
- Workers will be provided with PPE such as masks and goggles.
- Compliance with NEQS (2010) for emissions will be ensured.

Dust Control Measures

- Regular water sprinkling on site and access roads

- Covering of sand and soil stockpiles
- Use of temporary barriers around active work areas
- Covering vehicles carrying fine materials
- Restricting vehicle speeds within the site
- Wheel washing before vehicles exit the site
- Scheduling high-dust activities during favorable weather
- Implementing an air quality monitoring program as per EMP

6.4.1.3. Noise and Vibration from Construction Activities

Construction of the CUST project will generate noise and vibration due to operation of heavy machinery and equipment. Typical sources include excavators, compactors, concrete mixers, generators, cutting tools, and movement of construction vehicles within the campus. These activities may temporarily elevate background noise levels in nearby academic and residential areas.

Increased noise can cause disturbance to students, faculty, and staff, particularly in classrooms, offices, and hostels. Prolonged exposure may result in annoyance, reduced concentration, and general discomfort for sensitive receptors.

Mitigation Measures

The following measures will be implemented to minimize construction noise and vibration:

Engineering Controls

- Use modern, well-maintained, and low-noise equipment wherever feasible
- Install silencers and mufflers on generators and machinery
- Position noisy equipment away from classrooms, hostels, and offices
- Use temporary acoustic barriers or screens around major noise sources
- Prefer electric-powered tools over diesel-powered equipment where possible

Administrative Controls

- Schedule high-noise activities during daytime and outside peak academic hours
- Limit duration of noisy operations and switch off idle equipment
- Avoid night-time construction works without prior approval

- Notify campus administration in advance of major noise-generating activities
- Rotate work tasks to reduce individual worker exposure

Operational Measures

- Enforce regular maintenance of all machinery to reduce excess noise
- Prohibit unnecessary use of vehicle horns within the campus
- Control vehicle speeds on internal roads
- Sensitize drivers and operators to minimize avoidable noise
- Provide hearing protection to workers where required

Environmental Measures

- Develop green buffer zones and plantation belts around the site
- Use earth mounds or temporary walls to contain vibration where necessary
- Ensure compliance with NEQS (2010) noise standards at all times

6.4.1.4. Water Quality

Impact Description

Construction activities of the CUST University project may affect local water resources and water quality if not properly managed. Potential impacts can arise from site runoff, accidental spillage of fuels and chemicals, and improper disposal of wastewater generated from construction operations.

Major potential sources of water quality impacts include:

- Runoff from exposed soil surfaces and excavated areas
- Concrete and cement wash water
- Dust suppression wash water carrying sediments
- Accidental spillage of diesel, oils, paints, and solvents
- Improper storage and disposal of construction debris
- Domestic wastewater from construction labor camps

The estimated water requirement during the construction phase is 9,900 gallons per day of which 80% is wastewater. Wastewater generated from construction activities and labor facilities may cause localized soil and groundwater contamination if discharged untreated.

Mitigation Measures

To minimize impacts on water resources and quality, the following measures will be implemented:

- Water will be used efficiently to avoid unnecessary waste during construction
- Construction materials such as cement, sand, and aggregates will be stored in covered areas
- Fuel, oil, and chemicals will be stored in designated bunded locations
- Vehicle maintenance and refueling will be carried out only on paved and controlled surfaces
- Temporary silt traps and sediment control measures will be installed at site drainage points
- Earthworks will be scheduled to avoid peak monsoon periods where possible
- Open washing of machinery and vehicles will be strictly prohibited
- Controlled washing bays with wastewater collection systems will be provided
- Temporary septic tanks will be installed for labor camp sanitation
- No untreated wastewater will be discharged into nearby land or drains
- Regular inspection and maintenance of drainage channels will be ensured
- Periodic water quality monitoring will be carried out in accordance with NEQS.

6.4.1.5 Management of Construction and Municipal Solid Waste

Impact Description

Construction activities of the CUST University project will generate different types of solid waste including construction debris, packaging materials, scrap metal, wood, plastics, and municipal waste from labor camps.

Improper handling and disposal of solid waste may lead to:

- Soil and land contamination
- Blockage of drainage channels
- Generation of foul odor
- Breeding of disease vectors
- Health and safety risks to workers and nearby communities

Typical wastes expected from the project include:

- Concrete debris, bricks, and rubble, wood
- Scrap steel and reinforcement bars
- Packaging materials such as plastic and paper
- Empty containers of paints and chemicals
- Food waste from Labor Camps

Mitigation Measures

The following waste management measures will be adopted:

- All waste generated from the construction site will be disposed of at approved MCI/CDA designated sites
- Open burning of any type of waste will be strictly prohibited
- Waste will be segregated at source into recyclable and non-recyclable categories
- Separate labeled containers will be provided for different waste types
- Hazardous waste such as oil, lubricants, and chemical containers will be stored in designated areas
- Residual and hazardous waste will be disposed of through licensed contractors
- Construction workers will be trained in waste minimization and segregation practices
- Recyclable materials such as metal, wood, and plastics will be reused wherever possible
- Waste piles will be properly covered to prevent scattering by wind
- Waste disposal arrangements will be reviewed regularly considering site conditions and weather
- Transportation of waste will be carried out in covered vehicles to avoid littering

Waste Segregation System at Site

Color-coded bins will be provided at the construction site for proper segregation:

- **Grey – Inert Waste:** concrete, rubble, bricks
- **Blue – Metal Waste:** scrap steel and reinforcement
- **Green – Wood Waste:** clean timber and wood products

- **Brown – Packaging Waste:** paper and cardboard
- **Black – General Waste:** mixed non-recyclable waste
- **Red – Hazardous Waste:** paints, oils, chemical containers

The contractor will ensure implementation of a site-specific Waste Management Plan throughout the construction phase.

6.4.1.6. Resource Conservation

Construction of the proposed Capital University of Science and Technology (CUST) project will require the use of various construction materials including coarse aggregates, fine aggregates, steel, cement, asphalt, reinforcement, and water. Most of these materials are non-renewable in nature; therefore, their efficient and judicious use is essential to ensure resource conservation and long-term sustainability.

Fuel will also be required to operate construction machinery, generators, and transportation vehicles. Efficient use of fuel and energy resources is important not only for conservation purposes but also for minimizing associated air emissions. The magnitude of this impact is considered moderate and negative, as resource consumption will be temporary and limited to the construction phase.

Mitigation Measures

To promote resource conservation during construction, the following measures will be implemented:

- Low-sulfur diesel and fuel-efficient machinery will be used to minimize fuel consumption and emissions.
- Only well-maintained and efficient equipment will be deployed on site.
- Machinery and vehicles will be switched off when not in use to prevent unnecessary fuel wastage.
- Regular inspection and maintenance will be conducted to prevent fuel and lubricant leakages.
- Water conservation practices will be adopted through worker awareness and controlled usage during construction activities.
- Reuse and recycling of construction waste materials will be encouraged wherever feasible.

- Efficient site planning and construction camp design will be adopted to minimize water demand and reduce wastewater and solid waste generation.
- Temporary site offices and construction camps will utilize solar-powered lighting and equipment where feasible, consistent with the project's sustainability approach

6.4.1.7. Visual Impacts & Aesthetics

During the construction phase of the proposed project of Capital University of Science and Technology (CUST), temporary visual impacts may arise due to site preparation activities, movement of construction machinery, storage of construction materials, accumulation of debris, and establishment of temporary construction facilities. Fugitive dust generated from excavation, earthworks, and material handling may also affect the visual quality and aesthetic character of the project area and its immediate surroundings.

These impacts will be short-term and limited to the construction period. Considering the temporary nature and localized extent of construction activities, the impact is assessed as moderate and adverse.

Mitigation Measures

- The project site will be clearly demarcated and fenced, and all construction activities will be confined within designated boundaries.
- Access roads and work areas will be regularly cleaned and sprinkled with water to control dust and maintain visual neatness.
- Construction materials will be properly stacked and covered to prevent scattering and visual clutter.
- Construction debris and waste will be removed promptly and disposed of at approved locations.
- Temporary structures, labor camps, and storage areas will be dismantled and the site restored to its planned condition upon completion of construction works.
- Good housekeeping practices will be maintained to ensure orderly site conditions and minimize visual disturbance.

6.4.1.8. Construction Traffic Impacts on Existing Road Network

Movement of heavy vehicles during the construction phase of the proposed Capital University of Science and Technology (CUST project may exert pressure on the surrounding road network. Transportation of construction materials, machinery, and workforce may contribute to temporary traffic congestion, increased noise levels, dust emissions, and potential deterioration of road surfaces.

The project site is accessible through Islamabad Expressway, Zone-V, which experience traffic flow variations during peak hours. Additional construction-related traffic may temporarily aggravate congestion and affect road safety during peak hours.

Considering the frequency of material transport and the duration of construction activities, the impact is assessed as high and adverse during peak construction periods; however, it will be temporary and confined to the construction phase.

Mitigation Measures

To minimize traffic-related impacts, the following measures will be implemented:

- Vehicles transporting fine materials (sand, soil, aggregates) will be fitted with proper side and tailboards and covered with tarpaulin sheets to prevent dust dispersion.
- Overloading vehicles will be strictly prohibited.
- All construction vehicles will comply with applicable noise and emission standards.
- Transportation of construction materials will be scheduled during off-peak traffic hours to minimize congestion.
- Speed limits will be enforced near the project site and sensitive receptors, and drivers will be instructed accordingly.
- Warning signs, reflectors, and traffic control signage will be installed at appropriate locations around the site.
- Access roads will be kept clear of mud and debris to maintain safe traffic flow.
- Public information boards displaying project details and complaint contact information will be installed at the site.

- The contractor will prepare and implement a comprehensive Traffic Management Plan (TMP) in coordination with the Capital Development Authority (CDA). The TMP will include:
    - Identification of roads likely to be affected by construction traffic.
    - Phasing and sequencing of construction activities.
    - Propose schedule and duration of transport activities.
    - Designate haul routes and working hours; and
    - Measures to maintain uninterrupted access for emergency services.

Implementation of the above measures will help reduce traffic disruption and enhance road safety during the construction phase.

6.4.2. Impacts on Ecological Aspects of the Project

6.4.2.1. Flora and Vegetation

Based on the site assessment conducted for the proposed Capital University of Science and Technology (CUST) project, no mature trees are required to be cut for implementation of the proposed development. The project layout has been designed in a manner that avoids removal of existing trees within the site boundary.

However, minor clearing of grasses and small shrubs may be required within the construction footprint for site preparation and infrastructure development. Temporary impacts on surrounding vegetation may occur due to construction activities such as dust generation, movement of machinery, and establishment of temporary facilities.

Potential indirect impacts may include:

- Dust deposition on nearby vegetation, potentially affecting photosynthesis.
- Emissions from construction machinery that may temporarily affect plant vigor; and
- Accidental damage to ornamental plants due to movement of equipment and workforce.

Since no tree cutting is involved and impacts will be temporary and localized, the overall impact on flora is assessed as minor to moderate in nature.

Mitigation Measures

- The project design will continue to ensure protection of existing trees within and around the site.
- Construction activities will be confined strictly to demarcated areas to avoid unnecessary disturbance of vegetation.
- Regular water sprinkling will be undertaken to control dust deposition on nearby plants.
- Contractor's staff will be instructed not to damage trees, shrubs, or ornamental plants.
- Construction vehicles and machinery will operate only within designated movement corridors.
- Open burning of vegetation or waste will be strictly prohibited.
- Landscaping and plantation of native, non-invasive species will be incorporated as part of campus development to enhance the green character of the university.
- The detailed plantation plan for the project is mentioned in chapter 7 of this EIA report.

6.4.2.2. Impacts on Fauna (Mammals, Reptiles and Birds)

The proposed project of the Capital University of Science and Technology (CUST) campus will be constructed within and adjacent to an already developed university environment. Based on field observations and the existing disturbed habitat conditions, no mammals were recorded within the project footprint. The site mainly consists of managed land with limited natural habitat, which does not support significant wildlife populations.

Construction activities such as excavation, operation of machinery, movement of vehicles, and presence of workforce may cause temporary disturbance to common faunal species, particularly birds and small reptiles, if present in surrounding areas. Noise and human activity may cause birds to temporarily relocate to nearby undisturbed areas. However, since no tree cutting is involved and the area is already influenced by human activities, no significant loss of habitat or nesting sites is anticipated. Reptiles are rarely observed within the project site due to limited suitable

habitat, and the likelihood of direct impact is minimal. Any impact on fauna will be temporary, localized, and reversible upon completion of construction activities.

Considering the existing developed conditions and absence of sensitive wildlife species, the impact is assessed as minor in nature.

Mitigation Measures

- Construction activities will be confined within designated project boundaries to minimize disturbance to surrounding habitats.
- Hunting, poaching, or harming of birds and reptiles by construction workers will be strictly prohibited.
- Construction camps and material storage areas will be properly managed to avoid attracting animals.
- Waste generated at the site will be regularly collected and disposed of at approved locations.
- Noise-generating construction activities will be restricted to daytime hours to minimize disturbance to birds.
- Construction vehicles will operate at controlled speeds within the project area.
- Existing vegetation will be preserved to the maximum extent possible to maintain ecological value.
- Landscaping and plantation of native species will be incorporated into campus development to enhance habitat conditions.
- In case any wild species is encountered during construction, work will be halted in that area, and appropriate measures will be taken in coordination with relevant authorities.

6.4.3. Impact on Socioeconomic Environment

6.4.3.1. Employment Opportunities

The construction phase of the proposed project of the Capital University of Science and Technology (CUST), Islamabad, is expected to generate direct and indirect employment opportunities for the local population. Construction activities will require a workforce comprising skilled, semi-skilled, and unskilled labor for activities such as excavation, civil works, electrical installation, plumbing, equipment handling, and site

management. It is anticipated that a significant proportion of the unskilled and semi-skilled labor will be recruited from nearby communities, thereby contributing to local income generation and economic uplift.

In addition to direct employment, the project will stimulate secondary economic activities within the surrounding area. Local vendors, food service providers, small retail shops, equipment suppliers, transport operators, and construction material vendors may experience increased demand due to the presence of construction personnel and project-related activities. These economic linkages will enhance commercial activity and provide temporary income-earning opportunities for local residents.

The project will therefore contribute positively to local economic development during the construction period. However, these benefits will primarily be short-term and associated with the construction phase. The overall impact on employment and local economic activity is assessed as positive and beneficial in nature.

6.4.3.2. Chance Discovery of Archaeological or Cultural Resources

Based on available records and site reconnaissance, no designated archaeological sites, historical structures, or protected cultural heritage resources have been identified within the proposed project area or its immediate surroundings. The project site is located within a zone where Educational projects are allowed to develop or construct, which reduces the likelihood of encountering buried heritage remains.

Nevertheless, excavation activities for foundations, utilities, and infrastructure development may present a remote possibility of uncovering subsurface artifacts, antiquities, or historically significant materials. Such findings, although unlikely, must be treated with due caution in accordance with national heritage protection regulations.

In the event that any archaeological remains, artifacts, or culturally significant materials are encountered during construction, all activities in the immediate vicinity will be halted immediately. The Project Proponent will notify the Department of Archaeology and Museums, Government of Pakistan, through appropriate channels. Further actions will be taken in accordance with the prescribed Chance Find

Procedure to ensure proper documentation, preservation, and protection of the discovered materials.

Implementation of this procedure will ensure that any potential cultural heritage resources are protected, and therefore the impact is considered minor and manageable with proper mitigation measures.

6.4.3.3. Social and Cultural Interactions

Construction of the proposed project will involve deployment of construction personnel, some of whom may originate from areas outside the immediate project vicinity. Interaction between construction workers and the local community, including nearby residents and existing university population, may result in minor social disturbances or cultural sensitivities due to differences in social norms, behavior, or cultural practices.

Increased demand for locally available goods and services, such as food, transportation, and utilities, may also temporarily place additional pressure on local infrastructure and resources. However, since the project is located within the boundary of an existing university campus with controlled access, institutional management, and security systems, the potential for significant social conflict is limited.

Any impacts related to social and cultural interactions will be temporary and confined to the construction period. With appropriate management and adherence to professional conduct standards, these impacts can be effectively minimized. The impact is therefore assessed as moderate and adverse without mitigation but manageable with appropriate control measures.

Mitigation Measures

- Preference will be given to recruitment of labor from nearby communities to minimize labor influx and enhance local economic participation.
- All construction workers will be required to comply with a formally established Code of Conduct, outlining acceptable workplace behavior and respect for local cultural values.

- Workers will be provided with orientation and awareness training regarding local customs, traditions, and social sensitivity.
- Continuous coordination will be maintained between the contractor, project management, and local stakeholders to address concerns.
- A structured Grievance Redress Mechanism (GRM) will be established to receive and resolve complaints in a timely and transparent manner.

6.4.3.4 Health Impacts (Communicable Diseases)

The presence of construction workers, particularly those recruited from different regions, may introduce the risk of communicable diseases within the construction workforce and potentially the surrounding community. Common communicable diseases associated with construction environments include respiratory infections, skin infections, gastrointestinal illnesses, and viral diseases such as COVID-19.

Poor sanitation, inadequate hygiene practices, overcrowded working conditions, and insufficient medical screening may increase the likelihood of disease transmission. However, since the construction workforce is expected to be moderate in number and appropriate health management measures will be implemented, the risk remains controllable.

The impact is therefore assessed as **moderate and adverse in nature**.

Mitigation Measures

- Pre-employment medical screening of workers will be conducted.
- Adequate sanitation facilities and clean drinking water will be provided at the construction site.
- Workers will be trained in personal hygiene and disease prevention practices.
- Proper waste management and site sanitation will be maintained.
- Measures will be taken to prevent stagnant water accumulation.

6.4.3.5 Labor Influx

Construction activities will require temporary workforce deployment. However, due to availability of local labor and the controlled university environment, large-scale labor influx is not expected.

Potential impacts include increased demand for local services and minor social interaction issues.

The impact is assessed as moderate and adverse.

Mitigation Measures

- Local labor will be prioritized.
- Labor accommodation will be properly managed.
- Code of Conduct will be enforced.
- Grievance Redress Mechanism will be implemented.

6.4.3.6 Gender-Based Violence and Child Labor

Gender-Based Violence (GBV)

Construction activities associated with the proposed project of the Capital University of Science and Technology (CUST) will involve engagement of a workforce primarily comprising male laborers, including skilled, semi-skilled, and unskilled workers. In some cases, workers may be recruited from outside the immediate project vicinity and may reside temporarily at or near the construction site. Separation from family and established social environments, combined with workplace stress and temporary living arrangements, may increase the risk of inappropriate or unlawful conduct if proper controls are not implemented.

Gender-Based Violence (GBV) encompasses a range of harmful behaviors directed at individuals based on their gender, including sexual harassment, intimidation, exploitation, verbal abuse, and other forms of misconduct. Such risks may potentially affect female students, staff, visitors, and women residing in nearby communities, particularly if interactions between construction workers and the surrounding population are not adequately managed. In extreme cases, labor influx associated with construction activities may contribute to increased vulnerability of women and girls to exploitation or unsafe social conditions.

However, it is important to note that the proposed project is located within an existing university campus environment, which is characterized by controlled access, institutional oversight, and security presence. These factors significantly reduce the likelihood of such incidents. Nevertheless, given the seriousness and sensitivity of GBV

risks, preventive measures must be implemented to ensure a safe and respectful environment. Without appropriate mitigation, this impact is assessed as moderate and adverse in nature.

Child Labor

Child labor refers to the employment of individuals below the legally permissible age, particularly in hazardous occupations such as construction. Economic conditions in certain communities may encourage children to participate in income-generating activities, which can negatively affect their education, health, and overall development. Increased economic activity associated with construction projects may indirectly create demand for low-cost labor in ancillary services, which may increase the risk of child labor if proper safeguards are not in place.

International frameworks such as the International Labor Organization (ILO) Minimum Age Convention, 1973 (Convention No. 138) establish minimum age limits for employment and emphasize the elimination of child labor. The convention specifies minimum age requirements for general employment and higher age thresholds for hazardous work, including construction activities. Similarly, national labor laws of Pakistan strictly prohibit employment of children in hazardous occupations, including construction, and prescribe penalties for violations.

Although the proposed CUST project will require engagement of construction workers, the Project Proponent and contractor will comply fully with national labor laws and international best practices. Strict procedures will be implemented to ensure that no child labor is employed directly or indirectly during any stage of construction.

Without proper enforcement, the potential impact related to child labor is assessed as moderate and adverse, but it can be effectively prevented through strict compliance with legal and contractual requirements.

Mitigation Measures

To prevent and control risks related to Gender-Based Violence and Child Labor, the following measures will be implemented:

- The contractor will appoint qualified personnel responsible for implementation and monitoring of environmental and social safeguards, including prevention of GBV and child labor risks.
- Contractual agreements and bidding documents will include explicit provisions requiring compliance with labor laws, ethical standards, and social protection requirements, including prohibition of child labor and prevention of workplace harassment.
- A comprehensive **Code of Conduct (CoC)** will be developed and enforced, clearly defining acceptable workplace behavior and prohibiting any form of harassment, exploitation, abuse, or discrimination. All workers, supervisors, and contractor staff will be required to sign and comply with this Code of Conduct.
- Contractors and project personnel will be required to adopt and implement workplace policies addressing sexual harassment, abuse, and exploitation, in accordance with applicable national laws and international standards.
- Mandatory awareness and training programs will be conducted for workers to promote respectful behavior, gender sensitivity, workplace ethics, and compliance with the Code of Conduct.
- Age verification procedures will be strictly implemented prior to employment of workers to ensure compliance with minimum age requirements.
- Regular monitoring and inspections will be conducted to ensure that child labor is not employed at the construction site or associated activities.
- Preference will be given to hiring local labor to minimize labor influx and reduce associated social risks.
- A confidential and accessible Grievance Redress Mechanism (GRM) will be established to enable workers, students, staff, and community members to report any inappropriate behavior or labor violations safely.
- Contract provisions may include performance-based requirements to ensure compliance with environmental and social safeguards, including implementation of awareness programs and worker training.
- Implementation of these mitigation measures will ensure compliance with national labor regulations and international labor standards and will minimize risks associated with Gender-Based Violence and Child Labor during the construction phase of the project.

6.4.3.7 Health and Safety

A. Occupational Health and Safety

Construction workers may be exposed to occupational hazards such as equipment-related accidents, falls, and injuries during excavation, and exposure to dust and noise. Improper safety practices and inadequate supervision may increase the risk of injury.

This impact is assessed as high and adverse in nature without mitigation.

Mitigation Measures

- A dedicated Safety Officer will be appointed to supervise all construction activities.
- Workers will be provided with appropriate Personal Protective Equipment (PPE).
- Safety training programs will be conducted regularly.
- First aid facilities and emergency response arrangements will be available on site.
- Excavation areas will be properly barricaded and secured.
- Safety signage and warning notices will be installed.

B. Community Health and Safety

Construction activities and movement of heavy vehicles may pose temporary risks to students, staff, and visitors of the existing university campus. Accidental spills of fuel or oil may also present localized environmental risks.

The impact is assessed as moderate and adverse in nature.

Mitigation Measures

- Construction areas will be fenced and access controlled.
- Traffic management measures will be implemented.
- Warning signs will be installed.
- Spill prevention and emergency response measures will be enforced.

C. Natural and Man-Made Disaster Risks

Construction workers may face risks associated with accidental incidents or natural hazards such as earthquakes.

Mitigation Measures

- Emergency Response Plan will be developed and implemented.
- Workers will receive emergency preparedness training.
- Emergency contact information will be displayed.

6.5. Screening of Potential Impacts in Operational Phase

6.5.1. Topography and Landscape

The operational phase of the proposed project of the Capital University of Science and Technology (CUST) will result in permanent but planned modification of the project site's surface characteristics. Site grading and construction of academic infrastructure will alter the immediate land profile; however, these changes are consistent with institutional land use and approved campus planning standards.

Following completion of construction activities, the project will incorporate landscaping measures including plantation of native tree species, ornamental vegetation, and development of green areas within open spaces and along internal circulation routes. These measures will improve the visual quality of the campus, enhance microclimatic conditions, and contribute to dust suppression and ecological value. The presence of additional vegetation will also support environmental sustainability by improving carbon sequestration and enhancing the overall campus environment.

Considering the introduction of planned landscaping and green infrastructure, the operational phase of the project is expected to produce a major positive impact on landscape quality and environmental aesthetics.

6.5.2. Ambient Air Quality

During the operational phase, potential emissions to the atmosphere may arise primarily from standby power generators and vehicular movement within the campus. Standby generators, which operate on diesel fuel, may emit pollutants including carbon monoxide (CO), nitrogen oxides (NOx), sulfur oxides (SOx), particulate matter (PM_{10}), and carbon dioxide (CO_2), particularly during power interruptions. Vehicular emissions associated with transportation of students, faculty, staff, and visitors may also contribute to localized air pollutant concentrations.

However, it is important to note that the proposed project is designed to operate with a substantial contribution from solar energy systems, which significantly reduces reliance on fossil fuel-based power sources. Standby generators will be used only intermittently during electricity outages, and therefore continuous emissions are not anticipated.

Overall, the operational activities may result in minor localized deterioration of air quality if not properly managed. Therefore, the impact is categorized as moderate adverse without mitigation but is expected to remain within acceptable environmental limits with implementation of appropriate control measures.

Mitigation Measures

To ensure protection of ambient air quality, the following measures will be implemented during the operational phase:

- Standby generators will be used strictly for emergency purposes and will not operate continuously.
- Low sulfur diesel fuel will be utilized in generator units to minimize pollutant emissions.
- Generator installation will be planned at appropriate locations, maintaining safe distances from academic and occupied areas.
- Generator exhaust stacks will be designed in accordance with regulatory standards to ensure effective dispersion of emissions.
- Routine inspection and preventive maintenance of generators will be carried out to maintain optimal performance and minimize emissions.
- The university will continue utilizing solar energy systems to reduce dependence on conventional fuel-based electricity generation.
- Plantation of trees and development of landscaped areas will be undertaken to improve air quality and enhance environmental conditions.
- Unnecessary idling of vehicles within campus premises will be discouraged through administrative controls and awareness.
- Heating, ventilation, and air conditioning (HVAC) systems will be maintained regularly to ensure efficient operation and prevent unnecessary emissions.
- Ambient air quality monitoring will be conducted periodically in accordance with applicable environmental standards to ensure compliance and environmental protection.

6.5.3. Indoor Air Quality (IAQ)

Maintaining acceptable indoor air quality (IAQ) is essential for ensuring a safe, healthy, and comfortable learning and working environment within the proposed project of the Capital University of Science and Technology (CUST). Good IAQ contributes significantly to the well-being, productivity, and overall performance of students, faculty, and administrative staff occupying academic buildings, laboratories, offices, and other enclosed facilities.

Sources Affecting Indoor Air Quality

Indoor air quality within university buildings may be influenced by multiple factors related to building design, operation, maintenance practices, and occupant activities. Potential sources affecting IAQ in the proposed university facilities include ventilation system performance, occupant density, indoor activities, building materials, and external environmental conditions.

Poor IAQ may result from inadequate ventilation, improper maintenance of heating, ventilation, and air conditioning (HVAC) systems, or ingress of outdoor air pollutants. Structural issues such as leakage through roofs, walls, windows, or foundations may allow moisture accumulation, which can create favorable conditions for microbial growth. Furthermore, indoor activities such as laboratory work, cleaning operations, use of electrical equipment, and occupancy-related emissions may also influence indoor air quality if not properly managed.

Environmental conditions such as temperature and relative humidity also play an important role in maintaining indoor air quality. Improper regulation of temperature and humidity may result in occupant discomfort and may promote growth of microorganisms such as bacteria and fungi.

Health Effects Associated with Poor Indoor Air Quality

Exposure to indoor air contaminants may result in a range of health effects depending on the type of pollutant, its concentration, and the duration of exposure. Poor indoor air quality may cause discomfort and health issues among building occupants, particularly in environments with high occupancy such as classrooms, laboratories, and administrative offices.

Common symptoms associated with poor IAQ may include irritation of the eyes, nose, and throat, headaches, fatigue, dizziness, and respiratory discomfort. Prolonged

exposure to poor indoor air quality may aggravate existing respiratory conditions such as asthma and allergies.

Moisture intrusion and damp conditions within buildings may encourage growth of mold and other microorganisms, which can adversely affect indoor air quality. Exposure to mold spores and microbial contaminants may cause respiratory symptoms such as coughing, wheezing, nasal congestion, and allergic reactions. Therefore, effective building design, maintenance, and ventilation management are essential to ensure protection of occupant health.

Mitigation Measures

To ensure good indoor air quality during the operational phase of the CUST project, the following measures will be implemented:

- An Indoor Air Quality Management Plan will be developed and implemented as part of the university's facility management system to monitor and maintain acceptable indoor environmental conditions.
- The structural integrity of buildings, including roofs, walls, windows, and foundations, will be regularly inspected to identify and rectify any water leakage, dampness, or structural defects that may affect indoor air quality.
- Heating, ventilation, and air conditioning (HVAC) systems will be properly designed, operated, and maintained to ensure adequate air circulation and ventilation in accordance with international and national standards.
- Routine inspection, cleaning, and replacement of HVAC filters, ducts, and associated components will be carried out to ensure efficient operation and prevent accumulation of dust and contaminants.
- Indoor environmental parameters such as temperature, humidity, carbon dioxide (CO_2), and other relevant indicators will be monitored periodically to ensure compliance with acceptable comfort and health standards.
- Proper housekeeping practices will be implemented throughout the campus buildings to prevent accumulation of dust, debris, and other potential indoor pollutants.
- Moisture control measures will be implemented, and any damp or wet building materials will be promptly dried or replaced to prevent microbial growth.

- Preventive maintenance programs will be established to ensure proper functioning of building systems and early identification of any issues affecting indoor air quality.
- Adequate natural and mechanical ventilation will be ensured to maintain fresh air exchange within occupied spaces.

Implementation of these measures will ensure that indoor air quality remains within acceptable limits and will provide a safe, comfortable, and healthy indoor environment for students, faculty, and staff during the operational phase of the project.

6.5.4. Noise and Vibration

During the operational phase of the proposed project of the Capital University of Science and Technology (CUST), potential sources of noise will primarily include operation of standby power generators and vehicular movement associated with students, faculty, staff, and visitors within the campus premises. These activities may result in localized increases in ambient noise levels, particularly near generator locations, access roads, parking areas, and building entrances.

Standby generators, although used intermittently during electricity outages, may produce mechanical and exhaust-related noise during operation. Similarly, vehicle movement, engine operation, and occasional honking may contribute to short-term noise increases within the campus environment. However, these noise sources will be intermittent and limited in duration.

The project site is located within an institutional zone where noise-sensitive receptors such as classrooms, laboratories, and administrative offices are present. Therefore, proper noise management is necessary to maintain a conducive academic environment. No significant vibration impacts are anticipated during the operational phase, as the installed equipment and operational activities do not involve high-vibration machinery.

In the absence of mitigation measures, the operational phase may result in a moderate adverse impact on the noise environment. However, with implementation of appropriate noise control measures, the impact can be effectively minimized and maintained within acceptable limits.

Mitigation Measures

The following mitigation measures will be implemented to minimize noise impacts during the operational phase:

- Standby generators will be installed at appropriate locations away from classrooms, offices, and other sensitive areas to reduce noise exposure.
- Acoustic enclosures or soundproof housing will be provided for generator units to reduce noise emission at the source.
- Preventive maintenance of generators and mechanical equipment will be conducted regularly to ensure smooth operation and prevent excessive noise from worn or loose components.
- Vehicle movement within the campus will be properly regulated, and unnecessary use of horns will be strictly discouraged.
- Speed limits will be established and enforced within the campus premises to minimize traffic-related noise.
- Trees and vegetation will be planted along campus boundaries and open areas, which will act as natural noise buffers and contribute to noise attenuation.
- Proper building design measures, including use of sound-insulating construction materials, will be incorporated to reduce transmission of external noise into indoor spaces.
- The university administration will ensure compliance with National Environmental Quality Standards (NEQS) for noise, and the campus will be maintained as a low-noise institutional zone consistent with its educational function.
- Periodic monitoring of noise levels may be conducted, if required, to ensure that operational noise remains within acceptable limits.

Implementation of these measures will ensure that noise levels remain controlled and will help maintain a quiet and comfortable academic environment for students, faculty, and staff.

6.5.5. Drinking Water Contamination

During the operational phase of the proposed project of the Capital University of Science and Technology (CUST), provision of safe and potable water for students, faculty, staff, and visitors will be an essential component of campus operations.

Drinking water will be supplied through the internal water distribution network and stored in overhead and underground storage tanks prior to use.

Potential contamination of drinking water may occur if proper operation and maintenance of the water supply infrastructure is not ensured. Poorly maintained storage tanks, pipelines, or distribution systems may allow the growth of harmful microorganisms, leading to bacteriological contamination. Such contamination may pose health risks, including gastrointestinal infections and other waterborne diseases, if consumed without adequate treatment or quality control.

In addition, improper management of wastewater disposal systems, including soakage pits or septic systems, may result in infiltration of contaminants into the subsurface environment. While natural soil filtration processes may reduce bacterial contamination over time, chemical pollutants, particularly nitrogen compounds such as nitrates, may persist longer in groundwater and pose risks to human health if present in elevated concentrations.

However, considering that the university operates within a regulated institutional environment with managed water supply and sanitation systems, the likelihood of significant contamination is low if appropriate preventive and monitoring measures are implemented. In the absence of mitigation measures, the potential impact is assessed as moderate and adverse in nature.

Mitigation Measures

To ensure protection of drinking water quality during the operational phase, the following mitigation measures will be implemented:

- All water storage tanks, including overhead and underground reservoirs, will be inspected, cleaned, and disinfected at regular intervals to prevent microbial growth and contamination.
- The internal water distribution network will be regularly inspected to identify and repair leaks, damaged pipelines, or faulty fittings that may compromise water quality.
- Plumbing fixtures, including taps, valves, and pumps, will be maintained in good working condition to prevent leakage and contamination.
- Proper operation and maintenance of wastewater disposal systems will be ensured to prevent infiltration of contaminants into soil and groundwater.

- Where appropriate, safe drinking water will be provided through properly maintained filtration systems or water dispensers to ensure water quality suitable for human consumption.
- Water conservation practices and efficient water management systems will be implemented to reduce unnecessary wastage and maintain system integrity.
- University facility management staff will be trained in proper water system maintenance, hygiene practices, and contamination prevention measures.
- Periodic testing of drinking water quality will be carried out in accordance with National Environmental Quality Standards (NEQS) for drinking water to ensure compliance with regulatory requirements.
- Records of water quality monitoring and maintenance activities will be maintained for compliance verification and continuous improvement.

Implementation of these measures will ensure safe and reliable drinking water supply within the campus and will minimize risks to the health and well-being of building occupants.

6.5.6. Solid Waste Generation and Management

During the operational phase of the proposed project of the Capital University of Science and Technology (CUST), municipal solid waste will be generated from academic buildings, administrative offices, cafeterias, student areas, and other campus facilities. The waste stream will primarily consist of paper, cardboard, food waste, plastic containers, packaging materials, bottles, and other non-hazardous domestic refuse.

Based on the projected campus population of approximately 15,056 individuals (including 14,000 students and 1,056 faculty and staff) and adopting a waste generation rate of 0.5 kg/person/day for educational institutions in developing countries, the total estimated solid waste generation is approximately **7,528 kg/day (equivalent to about 7.53 tons/day)**.

If not properly managed, improper storage, handling, or disposal of solid waste may lead to environmental degradation, including contamination of soil and water resources, blockage of drainage systems, deterioration of campus aesthetics, and potential health risks to students, staff, and waste handlers. However, given the institutional framework and planned waste management measures, these impacts

are manageable. Therefore, the operational phase impact related to solid waste is assessed as minor to moderate adverse without mitigation, but minor with implementation of proper waste management practices.

To ensure environmentally sound management, the university will implement a structured and systematic waste management system consisting of waste segregation, internal collection, temporary storage, and final disposal through authorized municipal waste services.

Mitigation Measures

The following measures will be implemented to ensure effective solid waste management within the campus:

- Adequate waste collection bins will be installed at strategic locations throughout the campus, including academic buildings, offices, cafeterias, corridors, and outdoor areas to facilitate proper waste collection.
- Color-coded waste bins will be provided to promote segregation of waste at source into categories such as recyclable, organic, and general waste, in accordance with recognized environmental management practices.
- Recyclable materials including paper, plastics, metals, and glass will be separated and collected for recycling through authorized recycling vendors, thereby reducing the volume of waste requiring disposal.
- An organized internal waste collection system will be established, whereby designated sanitary staff will collect waste regularly and transport it to a designated temporary waste storage area within the campus.
- The temporary waste storage area will be properly designed and maintained to prevent littering, odor generation, pest infestation, and environmental contamination.
- Waste collected at the temporary storage site will be transferred through covered vehicles and disposed of at authorized municipal waste disposal facilities through coordination with local waste management authorities or licensed contractors.
- Proper housekeeping practices will be implemented to maintain cleanliness and prevent accumulation of waste in unauthorized areas.
- Waste storage containers and collection areas will be cleaned and disinfected regularly to maintain hygiene and prevent nuisance conditions.

- Awareness programs will be conducted for students, staff, and facility management personnel to promote waste reduction, segregation, recycling, and responsible waste disposal practices.
- A comprehensive Solid Waste Management Plan will be developed and implemented by the university administration to ensure sustainable waste handling, compliance with environmental regulations, and continuous improvement of waste management practices.

Implementation of these measures will ensure environmentally responsible management of solid waste generated during the operational phase and will minimize potential impacts on environmental quality, public health, and campus aesthetics.

6.5.7. Fire and Explosion Hazards

During the operational phase of the proposed project of the Capital University of Science and Technology (CUST), there is a potential risk of fire incidents associated with electrical systems, standby diesel generators, fuel storage, laboratory equipment (if applicable), and improper storage or handling of combustible materials. Electrical faults such as short circuits, overloading, or malfunctioning wiring systems may act as ignition sources if preventive maintenance is not properly carried out.

Similarly, diesel fuel used for standby generators, if improperly stored or handled, may pose a fire hazard in the presence of ignition sources. Leakage or accidental spillage of fuel or lubricants may increase the risk of fire if combustible materials accumulate near generator installations or electrical equipment. Improper use of electrical appliances, overheating of equipment, or lack of safety awareness may further increase the likelihood of fire-related incidents.

Although the university buildings will be designed in accordance with applicable building safety standards and fire safety regulations, the potential for fire incidents cannot be completely eliminated. Therefore, without appropriate preventive and control measures, the impact is assessed as moderate and adverse in nature.

Mitigation Measures

To minimize fire and explosion risks during the operational phase, the following preventive and protective measures will be implemented:

- All electrical installations will be designed, installed, and maintained in accordance with approved engineering standards to ensure safe operation.
- Standby generators and associated fuel storage areas will be regularly inspected to ensure absence of fuel leaks, accumulation of combustible materials, or unsafe conditions.
- Appropriate fire detection and fire suppression systems, including smoke detectors, fire alarms, fire extinguishers, hydrants, and hose reels, will be installed at designated locations throughout the buildings.
- Fire extinguishing equipment will be inspected and maintained periodically to ensure operational readiness at all times.
- Emergency evacuation routes, exits, and assembly points will be clearly marked and kept unobstructed.
- Fire safety awareness programs and training sessions will be conducted for university staff and facility management personnel.
- Periodic emergency response and evacuation drills will be conducted to ensure preparedness in case of fire emergencies.
- Smoking will be strictly prohibited in designated areas, and warning signs will be displayed where necessary.
- A comprehensive Fire Safety and Emergency Response Plan will be developed and implemented as part of campus operational management.

6.5.8. Traffic Management

During the operational phase of the proposed CUST project, the number of students, faculty members, administrative staff, and visitors accessing the campus is expected to increase. This increase in campus population will lead to a corresponding rise in vehicular movement within and around the university premises, particularly during peak academic hours.

Increased traffic flow may result in temporary congestion at campus entry and exit points, internal circulation roads, and nearby public road networks. Additionally,

improper parking or unmanaged vehicle movement may create safety concerns for pedestrians and affect overall traffic efficiency within the campus environment.

However, since the project is located within an existing institutional area with planned access routes and designated parking areas, traffic impacts can be effectively managed through proper planning and administrative controls. Without mitigation measures, the impact is assessed as moderate and adverse in nature.

Mitigation Measures

To ensure smooth traffic flow and minimize congestion during the operational phase, the following measures will be implemented:

- A comprehensive Traffic Management Plan will be developed and implemented by the university administration to regulate vehicular movement within the campus.
- Designated parking areas will be provided within the campus to prevent unauthorized roadside parking and traffic obstruction.
- Clearly marked entry and exit points will be maintained to facilitate orderly vehicle movement.
- Traffic signage, directional signs, and speed limit indicators will be installed at appropriate locations to guide drivers.
- Internal campus speed limits will be strictly enforced to ensure safety of pedestrians and cyclists.
- Coordination will be maintained with local traffic authorities to ensure effective management of traffic conditions in surrounding areas.
- Pedestrian walkways and crossings will be properly designed and maintained to ensure safe movement of students and staff.
- Awareness measures will be implemented to encourage carpooling, use of university transport services, and reduction of unnecessary vehicle use.

6.5.9. Impacts on Ecological Aspects (Flora and Fauna)

The operational phase of the proposed project of the Capital University of Science and Technology (CUST) is expected to have an overall positive influence on the ecological environment within the campus. The project site is located within an

existing institutional setting, and the development plan has been prepared in a manner that avoids removal of existing mature trees. No trees are required to be cut for the implementation of the proposed project. Existing vegetation present within and around the project area will be retained and integrated into the landscape design.

As part of the campus planning, designated areas have been specifically reserved for development of green spaces, including landscaped lawns, plantation zones, and vegetated areas along internal roads and open spaces. These reserved green areas will be developed through plantation of native trees, shrubs, and ornamental plants, thereby enhancing vegetation cover and improving ecological conditions within the campus.

The establishment and proper maintenance of these green areas will provide several ecological and environmental benefits, including:

- Enhancement of the overall landscape quality and visual environment of the campus.
- Provision of suitable habitat and resting areas for common bird species.
- Improvement of ambient air quality through natural filtration and absorption of dust and pollutants.
- Reduction of soil erosion and improvement of soil stability.
- Moderation of local temperature through shading and reduction of heat buildup; and
- Contribution toward carbon sequestration and environmental sustainability.

Since no tree removal is involved and additional plantation will be carried out in reserved green areas, the operational phase is expected to result in an overall ecological improvement. However, improper maintenance of landscaped areas, excessive irrigation, or uncontrolled use of fertilizers may result in minor localized impacts such as soil degradation or water stagnation. Therefore, without proper management, the impact may be considered minor adverse, but with implementation of appropriate measures, the overall ecological effect will remain positive.

Mitigation and Ecological Enhancement Measures

To ensure protection and enhancement of ecological conditions during the operational phase, the following measures will be implemented:

- Existing trees and vegetation within the project area will be preserved and protected.
- Reserved green areas identified in the campus layout will be developed and maintained through plantation of native and locally suitable species.
- Landscaping and plantation activities will be carried out in open spaces, along internal roads, and around academic buildings to strengthen ecological conditions.
- Newly planted saplings will be regularly irrigated, monitored, and maintained to ensure proper growth and survival.
- Proper drainage management will be implemented to prevent waterlogging and protect plant health.
- Use of chemical fertilizers and pesticides will be controlled, and environmentally friendly alternatives will be preferred.
- Regular maintenance activities, including pruning, cleaning, and removal of weeds, will be carried out to maintain healthy vegetation.
- Campus management will ensure long-term protection and maintenance of green areas as part of sustainable campus management practices.

6.5.10 Impact on Socioeconomic Environment

6.5.10.1. Employment

The operational phase of the proposed project of the Capital University of Science and Technology (CUST) will generate long-term employment opportunities through recruitment of additional academic, administrative, technical, and support staff required for operation and maintenance of the new campus facilities. These employment opportunities will include positions for teaching faculty, laboratory staff, administrative personnel, security staff, facility management personnel, and sanitation workers.

The creation of these employment opportunities will contribute positively to the local economy by providing stable income sources and improving the socioeconomic conditions of individuals and their families. In addition, indirect employment

opportunities may also be generated through ancillary services such as maintenance, transportation, food services, and campus support operations.

Preference will be given to qualified candidates from nearby areas where feasible, thereby contributing to local employment generation and economic development. Overall, the operational phase of the project will have a positive and beneficial impact on employment and socioeconomic conditions.

6.5.10.2 Occupational Health and Safety (OHS) Considerations

During the operational phase of the proposed CUST project, occupational health and safety risks may arise for staff involved in building operation, maintenance, and facility management activities. These may include electrical maintenance personnel, HVAC technicians, laboratory staff, housekeeping staff, and solid waste management personnel.

Potential risks may include electrical hazards such as electric shock, arc flash, or equipment malfunction; physical injuries resulting from slips, trips, or falls during maintenance activities; exposure to hazardous substances such as cleaning agents or laboratory chemicals; and risks associated with waste handling and equipment maintenance.

Without appropriate safety procedures and controls, these occupational hazards may pose risks to the health and safety of staff. Therefore, in the absence of mitigation measures, the impact is assessed as moderate and adverse in nature.

Mitigation Measures

To ensure a safe working environment and minimize occupational risks, the following measures will be implemented:

- Operation and maintenance of electrical and mechanical systems will be carried out only by trained and qualified personnel.
- Appropriate Personal Protective Equipment (PPE), including safety gloves, helmets, protective footwear, masks, and ear protection, will be provided to all relevant staff and its use will be strictly enforced.
- Proper safety training programs will be conducted regularly to educate staff on occupational hazards, safe work procedures, and emergency response measures.

- Safe handling, storage, and labeling of chemicals, cleaning agents, and maintenance materials will be ensured in accordance with safety standards.
- Material Safety Data Sheets (MSDS) will be made available and accessible to staff handling hazardous substances.
- Fire detection and fire suppression systems, including fire extinguishers and alarms, will be installed and maintained throughout the buildings.
- Emergency response procedures, including evacuation plans and emergency contact information, will be established and communicated to all staff.
- Preventive maintenance of electrical systems, HVAC systems, and building infrastructure will be carried out regularly to prevent equipment failure and associated hazards.
- Fall protection measures will be implemented for maintenance personnel working at heights, particularly during maintenance of rooftop equipment.
- Clear warning signs and safety instructions will be displayed in areas where hazards may exist.
- Solid waste handling staff will be trained in safe waste management practices to avoid injury and exposure.
- Regular health checkups and medical support will be provided for staff involved in operational and maintenance activities.
- All electrical maintenance work will be carried out in accordance with applicable national safety standards, including Pakistan Electrical and Telecommunication Safety Codes.

- Applicable public health and safety guidelines issued by relevant authorities will be followed to ensure overall workplace safety.

6.5.11. Carbon Emissions from Operational Phase

During the operational phase of the proposed project of the Capital University of Science and Technology (CUST), greenhouse gas (GHG) emissions will mainly result from electricity consumption, vehicular movement within the campus, and occasional operation of standby diesel generators. These emissions primarily consist of carbon dioxide (CO_2), which contributes to global climate change.

Electricity consumption is the primary source of operational carbon emissions in institutional facilities. The total annual electricity demand of the university is estimated to be approximately **1,147,968 kWh**. However, the university has adopted a sustainable energy approach by utilizing on-site solar energy systems as the main source of electricity. Approximately **1,112,288 kWh per year (about 97%)** of the electricity demand will be met through solar energy, while only **35,680 kWh per year** will be obtained from the national electricity grid.

Since solar power does not produce greenhouse gas emissions during operation, carbon emissions are associated only with the portion of electricity supplied through the grid. As a result of this renewable energy integration, the university avoids approximately **527 tonnes of CO_2 emissions annually**, significantly reducing its operational carbon footprint.

In addition to electricity consumption, vehicular movement associated with students, faculty, staff, and visitors contributes to operational carbon emissions. Based on the projected campus population, approximately 900 vehicles, including 880 cars and 20 buses, are expected to access the campus on a daily basis. Using standard emission factors and average travel distances, the total vehicular carbon emissions are estimated to be approximately 1,354 tonnes of CO_2 per year. These emissions are primarily associated with fuel combustion in vehicle engines and represent one of the major operational emission sources.

Operation of standby diesel generators during electricity outages may also contribute to minor emissions. However, generator usage will be limited to emergency situations, and therefore associated emissions will be relatively low.

Despite these emission sources, the extensive use of solar energy significantly reduces the overall operational carbon footprint of the project. The reliance on renewable energy, combined with efficient campus planning and green infrastructure development, demonstrates the project's commitment to environmental sustainability and climate change mitigation.

Overall, while vehicular movement and grid electricity contribute to carbon emissions during the operational phase, the integration of solar power substantially offsets these emissions. Therefore, the operational phase carbon impact of the proposed project is considered moderate but environmentally sustainable due to significant reliance on renewable energy sources.

CHAPTER 7. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

7.1. General

This section presents the Environmental Management and Monitoring Plan (EMMP) for the proposed project of the Capital University of Science and Technology (CUST), Islamabad. The EMMP has been developed to ensure that potential environmental and social impacts identified during the Environmental Impact Assessment are effectively managed through appropriate mitigation and monitoring measures during both construction and operational phases of the project. It provides a systematic approach to minimize adverse impacts on air quality, water resources, noise environment, waste management, and surrounding communities.

The EMMP also defines the institutional arrangements required for implementation of environmental protection measures, including the roles and responsibilities of the university administration, contractors, and supervisory personnel. It establishes monitoring procedures, reporting mechanisms, and resource requirements necessary to ensure compliance with national environmental regulations and Pak-EPA guidelines. A budget estimate has also been included to support environmental mitigation, monitoring, and capacity-building activities throughout the project lifecycle.

7.2. Objectives

The main objectives of the Environmental Management and Monitoring Plan are to:

- Identify potential environmental and social impacts associated with the construction and operational phases of the CUST project and propose appropriate mitigation measures.
- Ensure effective implementation of mitigation measures to minimize or eliminate adverse environmental impacts.
- Define the roles and responsibilities of the Capital University of Science and Technology administration, contractors, and supervisory consultants in environmental management.
- Establish a monitoring mechanism, including monitoring parameters and reporting frequency, to ensure compliance with environmental requirements.

- Provide a framework for timely corrective actions in case of any unforeseen environmental impacts.
- Identify the resources, institutional arrangements, and budget required for implementation of environmental management and monitoring measures.

7.2. Institutional Framework for EMP Management and Execution

The following personnel will play key roles in the implementation of the Environmental Management Plan (EMP):

- **Project Director of CUST/Environmental Compliance Manager:** Responsible for overall oversight and ensuring compliance with environmental regulations and standards.
- **Environmental Engineer (EE) of the Supervision Consultant (SC):** Tasked with monitoring and verifying the implementation of EMP measures by the contractor and providing technical support where needed.
- **Environmental Engineer (EE) of the Contractor:** Responsible for the on-ground implementation of the EMP, ensuring that all mitigation measures are properly executed during the project's lifecycle.

The contractor will be contractually obligated to implement the mitigation measures outlined in the EMP. To ensure compliance, the entire EMP will be incorporated as a binding clause within the contract documents. Furthermore, regular reporting and auditing mechanisms will be established to ensure that the EMP is followed meticulously throughout the project's duration. This will include periodic reviews and updates to address any emerging environmental concerns or changes in project scope.

7.2.1. Roles and Responsibilities of Key Personnel in EMP Implementation

The M/s Educational Excellence Pvt. Ltd., being the Project Proponent, will be the responsible authority for implementation of the proposed project during the construction and operational phases. Therefore, M/s Educational Excellence Pvt. Ltd. will establish an Environmental Committee (EC) to ensure effective implementation, management, and supervision of the Environmental Management and Monitoring Plan (EMMP) during the design, construction, and operational phases of the project. The following staff will be part of the Environmental Committee for implementation of the EMMP:

- Project Director designated by M/s Educational Excellence Pvt. Ltd., who will also appoint an Environmental Specialist for monitoring and ensuring compliance with the EMMP.
- Environmental Engineer (EE) of the Supervisory Consultant (SC);
- And Environmental and Social Officer (ESO) of the Contractor.

2. Environmental Compliance Officer of CUST

The Environmental Compliance Manager is responsible for ensuring compliance with the EMP. This role encompasses the following duties:

- **Staff Training:** Ensure that all relevant staff receive the necessary environmental training.
- **Site Inspections:** Conduct visits to construction sites to evaluate the environmental performance of contractors.
- **Activity Monitoring:** Oversee the progress of environment-related activities.
- **Measure Implementation:** Ensure that the construction contractor implements additional measures recommended by the Supervision Consultant in monthly environmental monitoring reports.

3. Supervision Consultant- Environmental Engineer

The Environmental Engineer from the Supervision Consultant (SC) will monitor the contractor's performance through periodic inspections to ensure compliance with the EMP. This role also involves providing guidance and support to the Contractor's staff for effective EMP implementation.

4. Construction Contractor- Site Environmental Engineer

The Site Environmental Engineer of the Construction Contractor (CC) will be responsible for implementing the mitigation measures on-site. The Construction Contractor is required, under contract documents, to appoint a Site Environmental Engineer with the appropriate educational background and relevant experience.

7.2.2. Reporting Mechanism

The contractor's Environmental Engineer will be responsible for the implementation of mitigation measures and maintaining corresponding records. The Environmental Engineer from the supervision consultant will evaluate whether these mitigation measures are effectively in place and determine if any corrective actions are required.

The supervision consultant's Environmental Engineer will also oversee progress reporting related to environmental activities and will be responsible for submitting quarterly Environmental Management Plan (EMP) compliance reports to the Environmental Compliance Manager/Project Director of CUST and Pak EPA.

After the project's construction phase, a comprehensive report will be prepared and submitted to the Project Director of CUST and Pak EPA. Additionally, a report will be submitted to Pak EPA during the operational phase of the project.

7.2.3. Non-Compliance with EMP

The successful implementation of the Environmental Management Plan (EMP) requires the coordinated efforts of various stakeholders as previously discussed. The CUST contractor holds primary responsibility for ensuring the implementation of the mitigation measures outlined in the EMP, which will be incorporated into the contract documents.

The costs associated with environmental mitigation will be included in the total project budget, with payments to the contractor made based on the submission of periodic environmental compliance reports. However, should the contractor fail to comply with the EMP implementation or fail to submit the required periodic compliance reports, deductions will be made from the payments under the environmental components of the contract.

7.3. Environmental Management Plan

The Environmental Management Plan (EMP) outlines the framework for implementing mitigation measures, as well as for environmental management and monitoring throughout the design, construction, and operation phases of the proposed project. Details of the potential impacts, targets, mitigation strategies, and the organizations responsible for implementing these measures during each phase of the project are presented below in **Table 10.**

Table 10: Environmental Management Plan

Sr. No.	Environmental Aspect	Potential Impact	Mitigation Measures	Monitoring Method	Responsibility
Pre-Construction/Design Phase					
1	Site Topography and Landform Modification	The proposed project of CUST will require excavation, leveling, and grading activities, which may alter the existing land profile. Improper planning may cause unnecessary disturbance, erosion risk, and aesthetic degradation of the site environment.	• Site design will minimize unnecessary cutting and filling activities. • Excavation will be restricted strictly to areas defined in approved engineering drawings. • Landscaping and plantation will be incorporated into the project design to restore disturbed areas. • Proper drainage planning will be included to prevent erosion and land degradation.	Review of approved layout plans, engineering drawings, and landscaping design.	**Implementation:** Design Consultant **Monitoring:** M/s Educational Excellence Pvt. Ltd.

2	Structural Design and Seismic Safety	The project site lies in Seismic Zone 2B, which indicates moderate seismic vulnerability. Improper structural design may increase risk of damage to buildings and safety hazards during earthquake events.	• All academic, administrative, and supporting structures will be designed according to Seismic Building Code of Pakistan (SBC-2007). • Detailed geotechnical investigations will be conducted before finalizing foundation design. • Structural designs will incorporate appropriate load-bearing capacity and safety factors. • Qualified structural engineers will review and approve all structural plans.	Verification of structural design reports and compliance with seismic standards.	**Implementation:** Design Consultant **Monitoring**: Project Proponent
3	Engineering Design and Campus Layout Planning	Poor planning and incompatible layout may result in inefficient use of space, poor accessibility, and environmental degradation.	• The campus layout will comply with CDA regulations and approved planning standards. • Functional zoning will be adopted to ensure efficient use of space and proper circulation.	Review and approval of engineering drawings and planning layouts.	**Implementation:** Design Consultant **Monitoring:** Project Proponent

			• Open areas and green spaces will be integrated into the campus layout. • Sustainable planning principles will be incorporated in infrastructure design.		
4	Energy Efficiency and Resource Optimization	Inefficient building design may lead to excessive consumption of electricity and other energy resources during operation phase.	• Building design will maximize use of natural daylight and ventilation. • Solar energy systems will be incorporated to reduce dependence on grid electricity. • Energy-efficient electrical systems and equipment will be selected. • Sustainable building design principles will be adopted wherever feasible.	Review of electrical design and sustainability provisions.	**Implementation:** Design Consultant **Monitoring:** Project Proponent
5	Water Resource Management	Poor planning may result in excessive water consumption and inefficient water use during operation.	• Efficient plumbing systems will be designed to minimize water losses. • Provision of water-	Review of water supply design and plumbing layout.	**Implementation:** Design Consultant **Monitoring:** Project Proponent

			efficient fixtures will be included in design. • Rainwater harvesting and reuse options will be considered. • Sustainable water management practices will be incorporated.		
6	Vegetation and Landscape Conservation	Site development may require removal of vegetation, affecting environmental quality and ecological balance.	• Site layout will be optimized to avoid unnecessary removal of trees. • Compensatory plantation will be carried out where removal is unavoidable. • Landscaping plan will include native plant species. • Green areas will be incorporated to improve environmental conditions.	Review of landscaping plans and plantation provisions.	**Implementation:** Design Consultant **Monitoring:** Project Proponent
7	Wildlife and Ecological Considerations	Construction planning may disturb local fauna due to habitat alteration and human activity.	• Project design will incorporate green areas to support ecological balance.	Review of project layout and environmental planning documents.	**Implementation:** Design Consultant **Monitoring:** Project Proponent

			• Construction footprint will be limited to minimize ecological disturbance. • Habitat disturbance will be avoided wherever possible.		
8	Lighting and Illumination Design	Poor lighting design may increase energy consumption and cause light pollution affecting surrounding environment.	• Lighting systems will be designed to maximize natural daylight utilization. • Energy-efficient lighting fixtures will be used. • Outdoor lighting will be designed to minimize environmental disturbance.	Review of electrical and lighting system design.	**Implementation:** Design Consultant **Monitoring:** Project Proponent
9	Utility Planning and Infrastructure Coordination	Construction activities may disrupt existing utility services if not properly planned.	• Utility surveys will be conducted before finalizing design. • Utility relocation plans will be developed where required. • Coordination with relevant utility agencies will be ensured.	Verification of utility plans and coordination records.	**Implementation:** Design Consultant **Monitoring:** Project Proponent

10	Traffic Planning and Access Management	Increased future student and staff population may increase traffic load on surrounding road network.	• Adequate parking facilities will be included in campus design. • Proper internal circulation system will be designed.	Review of traffic management and campus access design.	**Implementation:** Design Consultant **Monitoring:** Project Proponent

Construction Phase					
Sr. No.	**Impacts**	**Mitigation Measure**	**Performance Monitoring Methods**	**Responsibility (Implementation)**	**Responsibility (Monitoring)**
1	**Deterioration of Ambient Air Quality.** Construction activities such as excavation, earthmoving, grading, transportation of materials, and operation of diesel-powered machinery will generate fugitive dust and exhaust emissions. These emissions include particulate matter, carbon monoxide, nitrogen oxides, and sulfur oxides, which may degrade ambient air quality and affect the	Dust suppression will be ensured through regular sprinkling of water on exposed surfaces, haul roads, and stockpile areas, especially during dry and windy conditions. All vehicles transporting loose materials such as sand and soil will be covered with tarpaulins. Construction machinery and generators will be maintained in proper working conditions and tuned regularly to minimize exhaust emissions. Idling of	Visual observation and photographic record; inspection of dust suppression measures; vehicle and machinery maintenance records; periodic air quality monitoring where required; audit and checks.	Construction Contractor	M/s Educational Excellence Pvt. Ltd. / Supervisory Consultant

	health and comfort of construction workers and nearby receptors.	engines will be discouraged and burning of waste will be strictly prohibited at the construction site.			
2	**Water Quality Contamination.** Construction activities may result in contamination of surface and groundwater due to runoff carrying sediments, construction debris, oil, fuel, and chemicals. Improper sanitation arrangements for workers may further degrade water quality.	Temporary drainage systems, sediment traps, and barriers will be installed to prevent uncontrolled runoff. Fuel, lubricants, and chemicals will be stored in designated areas with proper containment measures. Construction wastewater will be managed through appropriate sanitation facilities. Washing of equipment will be restricted to designated areas.	Visual inspection and photographic record; inspection of drainage systems; sanitation facility inspection records; water quality monitoring reports where required; audit and checks.	Construction Contractor	Project Proponent
3	**Noise and Vibration Impacts.** Operation of construction machinery and equipment will generate noise and vibration, which may disturb workers and nearby receptors.	Construction activities generating excessive noise will be restricted to daytime hours. Machinery will be maintained regularly and fitted with silencers. Workers exposed to elevated noise	Noise level monitoring; inspection of equipment maintenance records; audit and checks.	Construction Contractor	Project Proponent

	Prolonged exposure may cause hearing impairment and discomfort.	levels will be provided with hearing protection devices.			
4	**Soil Erosion and Contamination.** Excavation and earthworks may destabilize soil and increase erosion risk. Accidental spills of fuel and lubricants may contaminate soil.	Excavation will be carried out as per approved engineering plans. Excavated material will be reused where feasible. Fuel and chemicals will be stored in designated areas with spill prevention measures.	Site inspection records; spill incident logs; photographic record; audit and checks.	Construction Contractor	Project Proponent
5	**Solid Waste Generation.** Construction activities will generate municipal and construction waste. Improper disposal may result in soil and water contamination.	Waste will be segregated at source and stored in designated containers. Recyclable materials will be reused where feasible. Waste will be disposed of at approved disposal sites.	Waste management records; inspection reports; audit and checks.	Construction Contractor	Project Proponent
6	**Traffic and Road Safety Impacts.** Movement of construction vehicles may increase traffic congestion and accident risks.	Traffic management plan will be implemented. Warning signs will be installed. Drivers will be trained in safe driving practices.	Traffic inspection reports; incident records; audit and checks.	Construction Contractor	Project Proponent

7	**Resource Consumption.** Construction will require water, fuel, and construction materials, contributing to resource depletion.	Efficient use of materials and water will be ensured. Machinery will be turned off when not in use. Waste minimization practices will be implemented.	Resource usage records; inspection reports; audit and checks.	Construction Contractor	Project Proponent
8	**Greenhouse Gas Emissions.** Construction machinery and vehicles will emit greenhouse gases contributing to climate change.	Fuel-efficient machinery will be used. Idling will be minimized. Tree plantation will be implemented.	Equipment maintenance records; fuel consumption logs; audit and checks.	Construction Contractor	Project Proponent
9	**Biodiversity Impacts (Flora and Fauna).** Construction activities may disturb vegetation and wildlife. Dust and noise may also affect ecological conditions.	Vegetation removal will be minimized. Compensatory plantation will be implemented. Workers will be instructed not to harm wildlife.	Plantation records; inspection reports; audit and checks.	Construction Contractor	Project Proponent
10	**Occupational Health and Safety Risks.** Construction activities involve excavation, handling of heavy materials, and operation of machinery, working at heights, and	The Contractor will implement a comprehensive Occupational Health and Safety (OHS) Plan in accordance with national labor laws and international best practices. All workers will	Inspection of PPE usage; safety training attendance records; accident and incident reports; visual inspection of site safety conditions;	Construction Contractor	Project Proponent

	exposure to dust, noise, and electrical systems. These activities may expose workers to risks such as falling objects, slips and falls, electrocution, respiratory irritation due to dust, and injuries caused by improper handling of equipment. Lack of proper safety practices may result in serious injuries, disability, or fatal accidents.	be provided with appropriate Personal Protective Equipment (PPE), including helmets, safety boots, gloves, masks, and reflective jackets, and will be trained in their proper use. Hazardous areas will be clearly marked, and access will be restricted. Only trained and authorized personnel will be allowed to operate machinery and electrical equipment. First aid kits, emergency medical assistance, and firefighting equipment will be available at site. Regular safety training sessions and toolbox talks will be conducted to promote awareness of workplace hazards and safe work practices	audit and compliance checks.		
11	**Community Health and Safety Risks.** Construction activities may pose risks to nearby communities,	The construction site will be properly fenced and secured to prevent unauthorized access.	Visual inspection of site fencing and warning signs; traffic monitoring records; complaint and	Construction Contractor	Project Proponent

	students, and visitors due to movement of heavy vehicles, open excavations, dust emissions, and noise. Unauthorized access to construction areas may result in accidents or injuries. Improper site management may create inconvenience and safety hazards for surrounding population.	Warning signs, barricades, and lighting will be installed around hazardous areas such as excavation zones. Movement of construction vehicles will be controlled, and drivers will be instructed to follow speed limits and safe driving practices. Dust suppression measures and noise control practices will be implemented to minimize impacts on nearby receptors. A grievance redress mechanism will be established to allow community members to report concerns, and appropriate corrective actions will be taken promptly.	grievance register; audit and checks.		
12	**Public Health and Disease Risks.** Labor camps and workforce concentration may increase risk of	Adequate sanitation facilities including toilets, washing areas, and clean drinking water will be provided at construction sites and labor camps. Proper waste	Inspection of sanitation facilities; health and hygiene inspection records; training	Construction Contractor	Project Proponent

	communicable diseases due to inadequate sanitation, poor hygiene, and improper waste management. Workers may also suffer from respiratory illnesses due to dust exposure and other occupational hazards.	management practices will be implemented to maintain hygienic conditions. Workers will be provided awareness training on hygiene, sanitation, and disease prevention. Stagnant water will be avoided to prevent breeding of disease vectors such as mosquitoes. Regular health monitoring and medical assistance will be provided as required.	attendance records; audit and checks.		
13	**Chance Find of Archaeological and Cultural Resources.** During excavation activities, there is a possibility of discovering archaeological artifacts, historical objects, or cultural remains. Improper handling of such findings may result in permanent loss of valuable cultural	In the event of discovery of any archaeological or cultural artifact, construction activities in the immediate area will be stopped immediately. The area will be secured to prevent damage or unauthorized access. Relevant government authorities will be informed promptly, and further actions will be taken in accordance with applicable laws and regulations. Construction	Incident reports; communication records with authorities; site inspection reports; audit and checks	Construction Contractor	Project Proponent

	heritage and violation of national regulations.	activities will only resume after receiving clearance from the competent authority.			
14	**Labor Influx and Social Impacts.** Construction activities may require hiring workers from outside the project area, which may increase pressure on local resources, infrastructure, and social systems. Improper management of labor camps may result in conflicts with local communities and environmental degradation.	Preference will be given to hiring local labor wherever possible to reduce labor influx. Labor camps will be established in designated areas with proper sanitation, waste management, and security arrangements. Workers will be trained to respect local customs and cultural practices. A grievance redress mechanism will be established to address complaints from local communities.	Employment records; Code of Conduct compliance records; training records; grievance register; audit and checks.	Construction Contractor	Project Proponent
15	**Gender-Based Violence, Harassment, and Child Labor Risks.** Presence of construction workers may increase risk of inappropriate behavior,	The Contractor will implement a strict Code of Conduct prohibiting harassment, gender-based violence, and child labor. Age verification will be	Labor records; audit and checks.	Construction Contractor	Project Proponent

	harassment, or exploitation. Employment of underage workers may also occur if proper verification procedures are not followed.	conducted prior to hiring workers. Awareness and training programs will be conducted to educate workers on acceptable behavior and legal requirements. Violations will result in disciplinary action, including termination of employment.			
16	**Natural Disasters and Emergency Risks.** The project site is located in a seismically active region, and near Soan River, and construction activities may be affected by natural disasters such as earthquakes and flooding. In addition, fire incidents, fuel spills, structural failures, and accidents may occur during construction, posing risks to workers,	The Contractor will prepare and implement an Emergency Response Plan (ERP) addressing potential natural disasters and emergency situations. And apart from that the proponent will conduct the hydrology study of the area to assess the possible impacts from Soan River at times of high rainfall and prepare appropriate plan. Fire extinguishers, emergency exits, and firefighting equipment will be installed at appropriate	Emergency drill records; inspection of emergency equipment; incident reports; audit and checks.	Construction Contractor	Project Proponent

	infrastructure, and environment.	locations. Workers will be trained in emergency response procedures, evacuation plans, and fire safety measures. Emergency contact information will be displayed prominently at the site. Regular emergency drills will be conducted to ensure preparedness.			
17	**Social Conflicts and Community Disturbance.** Interaction between workers and local communities may result in social conflicts due to cultural differences, competition for resources, and disturbance caused by construction activities.	Workers will be trained to respect local customs, traditions, and social norms. Community consultation and engagement will be maintained throughout the construction phase. A grievance redress mechanism will be established to address community concerns. Construction activities will be managed to minimize disturbance to nearby communities.	Community consultation records; grievance register; inspection reports; audit and checks.	Construction Contractor	Project Proponent

Operational Phase					
Sr. No.	**Impacts**	**Mitigation Measure**	**Performance Monitoring Methods**	**Responsibility (Implementation)**	**Responsibility (Monitoring)**
1	**Change in Topography and Landscape Enhancement.** During the operational phase, the project site will remain permanently developed with academic buildings, roads, parking areas, and landscaped green spaces. The establishment of plantation, green belts, and maintained open spaces will improve aesthetic quality, reduce soil erosion, improve microclimatic conditions, and enhance environmental sustainability. However, improper maintenance of landscape and green areas may lead to degradation of environmental quality and loss of ecological benefits.	A comprehensive landscape management plan will be implemented, including plantation of native tree species, ornamental plants, and grass in open areas and along internal roads. Regular irrigation, pruning, fertilization, and replacement of damaged plants will be carried out to maintain vegetation health. Use of treated wastewater for irrigation will reduce freshwater demand. Landscaping will be maintained throughout the operational phase to ensure environmental sustainability.	Visual inspection and photographic record; plantation and maintenance records; audit and checks.	Facility Management / CUST Administration	M/s Educational Excellence Pvt. Ltd.

2	**Ambient Air Quality Deterioration.** During operational phase, emissions from standby generators and vehicular traffic (approximately 900 vehicles per day) will release pollutants such as particulate matter, nitrogen oxides, sulfur oxides, carbon monoxide, and carbon dioxide. These emissions may affect ambient air quality and health of students, staff, and visitors.	Solar energy will be used as the primary electricity source to minimize reliance on diesel generators. Generators will be properly maintained and operated only during emergencies. Adequate stack height will be provided to ensure proper dispersion of emissions. Plantation of trees within campus will improve air quality. Vehicle idling will be discouraged, and traffic movement will be managed efficiently.	Air quality monitoring reports; generator maintenance records; vehicle inspection records; audit and checks.	Facility Management	Project Proponent
3	**Indoor Air Quality Deterioration.** During the operational phase of the university, indoor air quality may be affected due to inadequate ventilation, accumulation of dust, use of air conditioning systems, laboratory activities, and high occupancy of classrooms and offices. Poor maintenance of HVAC systems, clogged	Proper design and maintenance of ventilation and HVAC systems will be ensured to provide adequate fresh air circulation in classrooms, laboratories, offices, and other enclosed areas. Air filters will be cleaned and replaced regularly according to manufacturer recommendations. Regular housekeeping practices will be implemented to minimize	Inspection of HVAC systems and ventilation facilities; maintenance and filter replacement records; indoor air quality inspection reports; visual observation and audit and checks.	Facility Management / CUST Administration	M/s Educational Excellence Pvt. Ltd.

	air filters, moisture buildup, and improper housekeeping may result in increased concentrations of indoor pollutants such as particulate matter, carbon dioxide, and biological contaminants, which may affect the health, comfort, and productivity of students, faculty, and staff.	dust accumulation. Periodic inspection of buildings will be conducted to identify moisture, mold, or ventilation problems. Use of low-emission building materials, furniture, and cleaning products will be encouraged to reduce indoor air pollution.			
4	**Noise Generation.** Noise may be generated from generators, maintenance equipment, and vehicle movement within campus, which may cause disturbance to campus occupants.	Generators will be installed with acoustic enclosures to minimize noise levels. Trees and vegetation will be planted to act as natural noise barriers. Vehicle movement will be regulated, and unnecessary horn use will be prohibited. Equipment will be maintained regularly to reduce noise emissions.	Noise monitoring reports; inspection records; audit and checks.	Facility Management	Project Proponent
5	**Water Demand, Drinking Water Contamination, and Wastewater Generation.** During the operational phase, the total water demand of the university	A comprehensive water management plan will be implemented to ensure efficient and sustainable use of water resources. Water storage tanks will be	Water quality monitoring reports in accordance with NEQS drinking water standards; inspection of water storage tanks and plumbing systems;	Facility Management / CUST Administration	Project Proponent

	is estimated to be approximately **123,200 gallons per day**, which will be used for drinking, sanitation, laboratory activities, and landscaping. Improper storage, handling, and distribution of water may result in contamination and health risks to students and staff. In addition, approximately **80%** of total water demand **(98,560 gallons per day)** will be generated as wastewater. Excessive reliance on freshwater sources may contribute to depletion of local water resources if conservation measures are not implemented.	regularly cleaned and disinfected to prevent contamination. Plumbing systems will be inspected periodically to prevent leakage and water loss. **Rainwater harvesting** systems will be installed to collect and store rainwater from rooftop and paved surfaces, which will be used for landscaping, irrigation, and other non-potable uses, thereby reducing dependence on freshwater sources. Water-efficient fixtures such as low-flow taps and dual-flush toilets will be installed. Wastewater generated from the campus will be treated through an on-site Sewage Treatment Plant (STP), and treated wastewater will be reused for landscaping and irrigation purposes wherever feasible. Regular monitoring and maintenance of the water supply and wastewater treatment systems will be	monitoring of rainwater harvesting system operation; wastewater quality monitoring reports; STP maintenance records; audit and checks.		

		carried out to ensure compliance with environmental standards.			
6	**Solid Waste Generation (7,528 kg/day).** During operational phase, approximately **7,528 kg/day of solid waste** will be generated from academic, administrative, and residential activities. Improper waste handling may cause environmental pollution, health risks, and aesthetic degradation.	A comprehensive Solid Waste Management Plan will be implemented. Waste segregation will be practiced at source using color-coded bins. Recyclable waste will be separated and sent for recycling. Organic waste may be composted where feasible. Waste will be collected regularly and disposed of through authorized waste management services.	Waste management records; inspection reports; audit and checks.	Facility Management	Project Proponent
7	**Traffic Congestion and Safety Risks.** Increased number of vehicles entering and exiting campus may create traffic congestion and safety risks.	Traffic Management Plan will be implemented. Designated parking areas will be provided. Traffic signs and speed limits will be enforced to ensure safety.	Traffic inspection records; audit and checks.	Campus Administration	Project Proponent
8	**Energy Consumption and GHG Emissions.** Electricity consumption and generator use may contribute to greenhouse	Solar energy will be used to reduce dependence on grid electricity. Energy-efficient lighting and equipment will be installed. Energy	Energy consumption records; inspection reports; audit and checks.	Facility Management	Project Proponent

	gas emissions and climate change.	consumption will be monitored regularly.			
9	**Occupational Health and Safety Risks.** Maintenance staff may face risks such as electrical hazards, equipment-related injuries, and exposure to hazardous materials.	Maintenance staff will be trained in safety procedures. PPE will be provided and used. Emergency response procedures will be implemented.	Safety inspection reports; incident records; audit and checks.	Facility Management	Project Proponent
10	**Fire and Emergency Risks.** Fire hazards may arise from electrical faults and equipment malfunction.	Fire detection systems, alarms, and firefighting equipment will be installed and maintained. Emergency drills will be conducted regularly.	Fire safety inspection reports; drill records; audit and checks.	Facility Management	Project Proponent
11	**Environmental Compliance and Sustainability.** Improper environmental management may lead to environmental degradation and regulatory non-compliance.	Environmental monitoring and management measures will be implemented. Environmental records will be maintained, and regular audits will be conducted.	Environmental monitoring reports; audit records.	Facility Management	Project Proponent

7.4. Environmental Monitoring

Environmental monitoring will be conducted during the operational phase to ensure the effectiveness of the proposed mitigation measures. Environmental monitoring will be conducted daily, weekly, monthly, quarterly, or annually, in accordance with Pak EPA guidelines and instructions. The parameters to be analyzed and the responsibilities for monitoring and reporting are detailed below. The tentative environmental monitoring plan for operational phase is given in **Table 11.**

7.4.1. Operational phase

1. Air quality

Air quality monitoring will be conducted annually during the operational phase of the project at representative locations. All the parameters mentioned in the NEQs will be monitored.

2. Noise monitoring

Noise level monitoring will be carried out at representative locations in the project area annually.

3. Groundwater quality

Groundwater quality monitoring will be carried out annually during the operational phase at representative locations. The parameters that are mentioned in the NEQs for assessing the quality of groundwater will be monitored.

Table 11: Tentative Environmental Monitoring Plan for Operational Phase

Sr. No.	Receptor	Monitoring Parameters / Performance Indicator	Locations	Monitoring Mechanism	Monitoring and Reporting Frequency
1	**Water Resources / Water Quality**	Compliance with NEQS drinking water standards and wastewater discharge standards. Monitoring of potable water quality, treated wastewater quality from STP, and performance of rainwater harvesting system.	Proposed CUST Campus including tube wells, water storage tanks, sewage treatment plant (STP), rainwater harvesting tanks, and water supply distribution points.	Visual inspection of water supply and treatment systems. Discrete grab sampling and laboratory analysis of potable water and treated wastewater by Pak-EPA approved laboratory. Inspection of rainwater harvesting and reuse system.	Once before start of operation. Quarterly monitoring during first year of operation. Bi-annual monitoring thereafter during operational phase.
2	**Soil Quality / Land Resources**	Soil contamination due to improper solid waste disposal, wastewater leakage, fuel and lubricant spills, and improper waste handling practices.	Solid waste collection areas, waste storage areas, STP location, generator areas, parking areas, and fuel storage locations within campus.	Visual inspection of waste handling areas. Soil sampling and laboratory analysis where contamination is suspected. Inspection of waste management practices.	Quarterly monitoring during first year. Bi-annually during operational phase.
3	**Ambient Air Quality**	Compliance with NEQS standards for PM2.5, PM10, CO, NOx, SO_2, and	Campus premises including academic blocks, parking areas,	Ambient air quality monitoring using portable air quality monitoring equipment	Quarterly monitoring during first year.

		vehicular emissions from campus traffic and standby generators.	generator areas, and sensitive receptors such as classrooms and administrative buildings.	and laboratory analysis by Pak-EPA approved laboratory. Visual inspection of vehicular emissions.	Bi-annually during operational phase.
4	**Noise Pollution**	Compliance with NEQS noise level standards (dBA Leq). Noise from generators, vehicular movement, and mechanical equipment.	Generator areas, parking areas, academic buildings, and sensitive receptors such as classrooms and administrative offices.	Monitoring noise levels using sound level meter. Visual inspection of equipment and traffic management practices.	Quarterly monitoring during first year. Bi-annually thereafter.
5	**Wastewater Management**	Monitoring of treated wastewater quality and compliance with NEQS. Monitoring of wastewater generation estimated at **98,560 gallons/day** and STP efficiency.	Sewage Treatment Plant (STP), wastewater discharge points, irrigation reuse locations.	Laboratory analysis of treated wastewater samples. Inspection of STP operation and maintenance records.	Quarterly monitoring during first year. Bi-annually thereafter.
6	**Solid Waste Management**	Monitoring of proper collection, segregation, recycling, and disposal of solid waste estimated at **7,528 kg/day**. Prevention of uncontrolled dumping.	Waste collection points, waste storage areas, recycling areas, and disposal collection points.	Visual inspection of waste handling practices. Review of waste collection and disposal records.	Monthly monitoring during initial operation. Quarterly thereafter.
7	**Vehicular Emissions and Traffic Management**	Monitoring vehicular emissions, traffic congestion, and compliance with emission standards within campus premises.	Parking areas, campus entrances, and internal roads.	Visual inspection of vehicle emissions. Traffic monitoring and record keeping.	Quarterly monitoring during operational phase.

8	**Ecological Resources and Plantation**	Monitoring plantation survival rate, green belt maintenance, and protection of campus vegetation.	Green areas, plantation zones, landscaped areas, and campus boundaries.	Visual inspection of plantation and landscaping. Monitoring plantation survival rate.	Quarterly monitoring during first year. Bi-annually thereafter.
9	**Indoor Air Quality**	Monitoring indoor air quality including ventilation, dust levels, HVAC performance, and occupant comfort.	Classrooms, laboratories, administrative offices, libraries, and indoor occupied spaces.	Inspection of HVAC systems, ventilation systems, and indoor air quality monitoring.	Quarterly monitoring during operational phase.
10	**Occupational Health and Safety**	Monitoring workplace safety, PPE usage, accident prevention, and emergency preparedness.	Maintenance areas, STP area, generator area, and facility management areas.	Visual inspection, safety audits, and incident record review.	Quarterly monitoring and reporting.
11	**Energy Consumption and Sustainability**	Monitoring electricity consumption, solar energy generation, and generator usage.	Solar power system, generator areas, and campus energy distribution system.	Review of energy consumption records and solar generation data.	Quarterly monitoring and reporting.

CHAPTER 8. GRIEVANCE REDRESSAL MECHANISM (GRM)

A grievance redressal mechanism (GRM) is designed to allow local communities, employees, out growers, and other affected stakeholders to voice their concerns and seek resolution if they perceive negative impacts arising from the project's activities. This mechanism is crucial for mitigating, managing, and resolving any potential or realized negative effects, adhering to international human rights standards, and fostering positive relations with the community and employees.

The outlined grievance procedure emphasizes interaction, consultation, targeted information, and timely resolution of legitimate grievances from nearby land users and business operators, who are key stakeholders. This approach aims to establish a reputation for responsiveness and responsibility, thereby securing and maintaining community support for the project's construction and operation.

The proponent and its contractors are committed to working closely with the local community and addressing grievances proactively. The grievance management system will be flexible and integrated into the Community Grievance Procedure. Additionally, all contractor teams will receive training on these procedures.

In practice, the contractor(s) will:

- Record all grievances.
- Assess and recommend resolutions within the required time frame.

All grievances will be investigated, and responses provided by the proponent or contractors within 30 days of receipt. If additional time is needed, the person who raised the grievance will be kept informed.

While contractors may initiate grievance resolution processes, any corrective actions must be coordinated with the proponent. The details of the community grievance procedure will be disseminated through community meetings, posters, and other communication methods to ensure that all local residents are aware of how to lodge and follow up on grievances.

Furthermore, the proponent and contractors will ensure that local populations are informed about how to contact and initiate grievances through various outreach programs, including meetings and pamphlets.

CHAPTER 9. CONCLUSIONS AND RECOMMENDATIONS

9.1. General

This section presents the overall conclusions of the Environmental Impact Assessment (EIA) study conducted for the proposed project of the Capital University of Science and Technology (CUST), Islamabad. The primary objective of this EIA was to evaluate the potential environmental and social impacts associated with the construction and operational phases of the proposed project and to identify appropriate mitigation and management measures to minimize adverse effects and ensure environmentally sustainable development.

The environmental assessment has demonstrated that the proposed project will provide substantial educational, social, and economic benefits while contributing to sustainable urban development. The development of additional academic facilities, administrative infrastructure, and associated amenities will strengthen the university's capacity to accommodate growing student enrollment and enhance the overall quality of higher education in the region.

Positive Impacts of the Project

The implementation of the proposed CUST project is expected to result in several positive environmental, social, and economic impacts, including:

Educational and Institutional Benefits:

The project will significantly enhance the university's academic capacity by providing modern educational facilities, laboratories, and improved infrastructure. This will improve access to quality higher education and support academic excellence, research development, and technological advancement.

Economic Benefits:

The project will generate employment opportunities during both the construction and operational phases. These opportunities will benefit local communities through direct and indirect employment, including construction workers, administrative staff, maintenance personnel, and service providers. The project will also support local businesses, suppliers, and service sectors.

Infrastructure Development:

The proposed project will improve existing infrastructure, including internal roads,

utilities, drainage systems, and campus facilities. These improvements will enhance operational efficiency, accessibility, and overall campus functionality.

Environmental and Sustainability Benefits:

The project incorporates sustainable design features, including solar energy utilization, rainwater harvesting systems, wastewater treatment and reuse, and plantation of trees and green belts. These measures will reduce dependence on natural resources, improve environmental quality, and contribute to climate change mitigation.

Community and Social Benefits:

The project will contribute positively to the surrounding community by enhancing educational opportunities, improving local infrastructure, and supporting social development. Improved campus facilities will also enhance the overall learning environment and quality of life for students and staff.

Potential Environmental Impacts

The environmental assessment identified certain potential adverse environmental impacts associated with the construction and operational phases of the project. However, these impacts are generally site-specific, temporary in nature during construction, and manageable through implementation of appropriate mitigation measures.

Air Quality:

Construction activities and vehicular movement may generate dust emissions, while operation of standby generators and campus traffic may contribute to localized air pollution.

Noise Pollution:

Construction machinery and operational activities such as generator operation and vehicular movement may result in increased noise levels within the campus.

Water Resources:

The project will require approximately **123,200 gallons per day of water**, and approximately **80% of this demand (98,560 gallons per day)** will be generated as wastewater. Improper management may pose risks to water resources if not properly controlled.

Solid Waste Management:

The project is expected to generate approximately **7,528 kg/day of solid waste**

during operational phase, which requires proper segregation, collection, recycling, and disposal.

Soil and Land Use:

Construction activities may result in soil disturbance and temporary changes in land use; however, landscaping and plantation will restore and enhance environmental conditions.

Public Health and Safety:

Construction and operational activities may pose occupational and community health and safety risks if proper safety measures are not implemented.

All identified impacts can be effectively mitigated through proper implementation of the Environmental Management and Monitoring Plan (EMMP).

9.4 Recommendations

Based on the findings of the Environmental Impact Assessment, the following recommendations are made to ensure environmentally sustainable implementation of the proposed project:

- The Environmental Management and Monitoring Plan (EMMP) must be fully implemented during both construction and operational phases to ensure effective mitigation of potential environmental impacts.
- The project proponent, M/s Educational Excellence Pvt. Ltd., and all contractors shall comply with all applicable environmental laws, regulations, and guidelines, including the Pakistan Environmental Protection Act, 1997, and National Environmental Quality Standards (NEQS).
- Regular environmental monitoring shall be conducted, and environmental compliance reports shall be submitted to the Pakistan Environmental Protection Agency (Pak-EPA) as required.
- Rainwater harvesting systems, wastewater treatment systems, and water conservation measures shall be properly implemented and maintained to ensure sustainable water resource management.
- A comprehensive solid waste management system shall be implemented to ensure proper segregation, recycling, and disposal of approximately **7,528 kg/day of solid waste** generated during operational phase.

- Tree plantation and landscaping activities shall be carried out and maintained throughout the project lifecycle to improve environmental quality, enhance biodiversity, and support carbon sequestration.
- Occupational health and safety measures shall be strictly implemented, and all staff and contractors shall receive appropriate environmental and safety training.
- The project should prioritize employment opportunities for residents to support the local economy and promote positive community engagement.

ANNEXURE-A

Tree Plantation/Landscaping Plan

Upon completion of the construction phase of the proposed project of the Capital University of Science and Technology (CUST), Islamabad, a comprehensive site restoration and landscaping program will be implemented. This program will include removal of temporary construction facilities, restoration of disturbed areas, and establishment of a structured tree plantation and landscaping system throughout the campus. It is important to note that no mature trees are proposed to be cut or removed as part of the project development, as the site primarily consists of open and previously disturbed land with limited vegetation cover. However, the plantation plan is being implemented proactively to enhance the environmental quality of the campus, improve ecological conditions, and strengthen the overall green infrastructure of the university.

The plantation and landscaping activities will significantly improve the visual aesthetics of the campus and contribute to environmental sustainability by providing green cover and acting as a natural buffer against dust, noise, and air pollution. These green areas will also help regulate microclimatic conditions by reducing ambient temperatures and improving air quality. The primary objective of the plantation program is environmental enhancement and ecological improvement rather than compensation for vegetation loss. Native and locally adapted plant species will be selected to ensure high survival rates, minimal water requirements, and resilience to local climatic conditions.

The plantation and landscaping plan will be implemented with the following key considerations:

- Maximum number of trees will be planted initially, along with shrubs, ornamental plants, and grass in designated landscaped areas, open spaces, parking areas, and along internal roads and campus boundaries.
- Native species such as Neem (Azadirachta indica), Amaltas (Cassia fistula), Kachnar (Bauhinia variegata), and other locally suitable species will be preferred due to their adaptability, low maintenance requirements, and ecological benefits.

- Plantation activities will be initiated during the early operational phase and will continue as part of routine campus maintenance and environmental management.
- Treated wastewater from the Sewage Treatment Plant (STP) and harvested rainwater will be used for irrigation to promote sustainable water use and reduce dependence on freshwater resources.
- Regular maintenance including watering, pruning, fertilization, and replacement of damaged plants will be carried out to ensure long-term survival and effectiveness of the plantation.

Tree plantation and landscaping will provide several environmental benefits, including improvement of air quality through absorption of pollutants and carbon dioxide, reduction of noise levels, control of dust emissions, enhancement of groundwater recharge, and improvement of campus microclimate. In addition, the plantation will contribute to climate change mitigation by acting as a carbon sink and supporting sustainable campus development.

Overall, although no trees are proposed to be removed for the project, the implementation of this plantation and landscaping plan reflects the project proponent's commitment to environmental sustainability and the development of a green and environmentally responsible university campus.

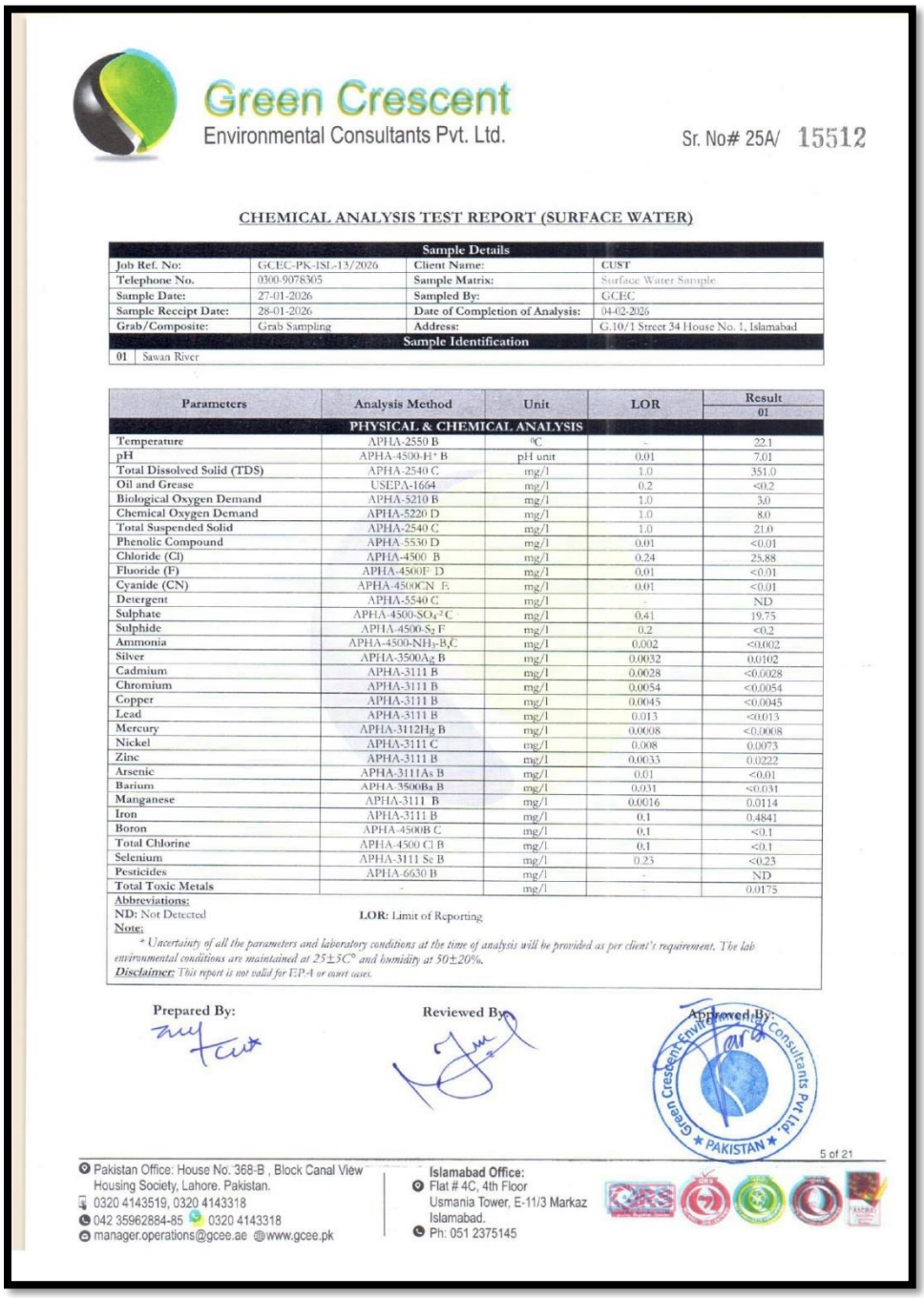
Table 12: Plantation Plan for the Project

Sr, No	Common Names	Botanical Names	Brief Features
1.	Dhak	Butea monosperma	Ornamental, Medicinal
2.	Beir	Ziziphus mauritima	Drought tolerant, shade, medicinal.
3.	Phulai	Acacia modesta	Drought tolerant, medicinal
4.	Kachnar	Bauhinia variegate	Ornamental, shade, medicinal
5.	Sukh chain	Pongamia pinnata	Ornamental, shade, medicinal
6.	Sanatta	Dodonaea viscosa	Drought tolerant, marginal hedge plant, medicinal
7.	Pipal	Ficus religiosa	Shade, fast growing

8.	Neem Tree	Azadirachta Indica	Neem tree is famous for its medicinal properties. The tree supports a rapid and dense
9.	Sukh Chain Tree	Pongamia Pinnata	tree's roots and seeds are used in a number of medicinal
10.	Amaltas	Cassia Fistula	Golden Shower Tree, herbal medicine

ANNEXURE-B

Chemical Analysis Test Report (Surface and Ground Water)



Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15512

CHEMICAL ANALYSIS TEST REPORT (SURFACE WATER)

Sample Details			
Job Ref. No:	GCEC-PK-ISL-13/2026	Client Name:	CUST
Telephone No.	0300-9078305	Sample Matrix:	Surface Water Sample
Sample Date:	27-01-2026	Sampled By:	GCEC
Sample Receipt Date:	28-01-2026	Date of Completion of Analysis:	04-02-2026
Grab/Composite:	Grab Sampling	Address:	G.10/1 Street 34 House No. 1, Islamabad
Sample Identification			
01	Sawan River		

Parameters	Analysis Method	Unit	LOR	Result 01
PHYSICAL & CHEMICAL ANALYSIS				
Temperature	APHA-2550 B	°C	-	22.1
pH	APHA-4500-H+ B	pH unit	0.01	7.01
Total Dissolved Solid (TDS)	APHA-2540 C	mg/l	1.0	351.0
Oil and Grease	USEPA-1664	mg/l	0.2	<0.2
Biological Oxygen Demand	APHA-5210 B	mg/l	1.0	3.0
Chemical Oxygen Demand	APHA-5220 D	mg/l	1.0	8.0
Total Suspended Solid	APHA-2540 C	mg/l	1.0	21.0
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01
Chloride (Cl)	APHA-4500 B	mg/l	0.24	25.88
Fluoride (F)	APHA-4500F D	mg/l	0.01	<0.01
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01
Detergent	APHA-5540 C	mg/l	-	ND
Sulphate	APHA-4500-SO_4^{-2} C	mg/l	0.41	19.75
Sulphide	APHA-4500-S_2 F	mg/l	0.2	<0.2
Ammonia	APHA-4500-NH_3-B,C	mg/l	0.002	<0.002
Silver	APHA-3500Ag B	mg/l	0.0032	0.0102
Cadmium	APHA-3111 B	mg/l	0.0028	<0.0028
Chromium	APHA-3111 B	mg/l	0.0054	<0.0054
Copper	APHA-3111 B	mg/l	0.0045	<0.0045
Lead	APHA-3111 B	mg/l	0.013	<0.013
Mercury	APHA-3112Hg B	mg/l	0.0008	<0.0008
Nickel	APHA-3111 C	mg/l	0.008	0.0073
Zinc	APHA-3111 B	mg/l	0.0033	0.0222
Arsenic	APHA-3111As B	mg/l	0.01	<0.01
Barium	APHA-3500Ba B	mg/l	0.031	<0.031
Manganese	APHA-3111 B	mg/l	0.0016	0.0114
Iron	APHA-3111 B	mg/l	0.1	0.4841
Boron	APHA-4500B C	mg/l	0.1	<0.1
Total Chlorine	APHA-4500 Cl B	mg/l	0.1	<0.1
Selenium	APHA-3111 Se B	mg/l	0.23	<0.23
Pesticides	APHA-6630 B	mg/l	-	ND
Total Toxic Metals	-	mg/l	-	0.0175

Abbreviations:
ND: Not Detected LOR: Limit of Reporting
Note:
* Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.
Disclaimer: This report is not valid for EPA or court cases.

Prepared By: Reviewed By: Approved By:

Green Crescent Environmental Consultants Pvt Ltd ★ PAKISTAN ★

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Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae @www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15511

CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Sample Details			
Job Ref. No:	GCEC-PK-ISL-13/2026	Client Name:	CUST
Telephone No.	0300-9078305	Sample Matrix:	Ground Water Sample
Sample Date:	27-01-2026	Sampled By:	GCEC
Sample Receipt Date:	28-01-2026	Date of Completion of Analysis	04-02-2026
Grab/Composite:	Grab Sampling	Address:	G.10/1 Street 34 House No. 1, Islamabad
02	Day care New Pump		

Parameters	Analysis Method	Unit	LOR	Result 01	NEQS
PHYSICAL & CHEMICAL ANALYSIS					
pH	APHA-4500H+ B	-	0.01	6.84	6.5-8.5
Odor	In-house	-	-	Odorless	Non-Objectionable
Taste	In-house	-	-	Sweet	Non-Objectionable
Color	APHA-2120 B/C	Pt/Co	1.0	<1.0	≤15 TCU
Turbidity	APHA-2130 B	NTU	0.1	<0.1	<5 NTU
Total Hardness	APHA-2340 B & C	mg/l	0.1	328.0	< 500 mg/l
Total Dissolved Solid (TDS)	APHA-2540 C	mg/l	1.0	541.0	< 1000
Ammonia	APHA-4500-NH_3-B	mg/l	0.002	<0.002	-
Chloride	APHA-4500Cl- B	mg/l	0.24	47.64	< 250
Cyanide (CN)	APHA-4500CN- E	mg/l	0.01	<0.01	≤ 0.05
Fluoride (F)	APHA-4500F- D	mg/l	0.01	<0.01	≤ 1.5
Nitrite	APHA-4500NO2 B	mg/l	0.01	<0.01	≤ 3 (P)
Nitrate	APHA-4500NO3 C	mg/l	0.1	1.8	≤ 50
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	-
Residual Chlorine	APHA-4500Cl G	mg/l	0.1	<0.1	0.2-0.5
Aluminum (Al)	APHA-3111Al B	mg/l	0.028	<0.028	≤ 0.2
Cadmium	APHA-3111Cd B	mg/l	0.0028	<0.0028	0.01
Copper	APHA-3111Cu B	mg/l	0.0045	<0.0045	2
Chromium	APHA-3111Cr B	mg/l	0.0054	<0.0054	≤ 0.05 (P)
Mercury	APHA-3112Hg B	mg/l	0.0008	ND	≤ 0.001
Antimony (Sb)	APHA-3111Sb B	mg/l	-	<0.008	≤ 0.005 (P)
Nickel	APHA-3111Ni C	mg/l	0.008	<0.0033	≤ 0.02
Zinc	APHA-3111Zn B	mg/l	0.0033	<0.031	5.0
Arsenic	APHA-3111As B	mg/l	0.01	<0.0016	≤ 0.05 (P)
Barium	APHA-3111Ba B	mg/l	0.031	<0.1	0.7
Manganese	APHA-3111Mn B	mg/l	0.0016	<0.1	≤ 0.5
Iron	APHA-3111Fe B	mg/l	0.1	<0.013	-
Boron	APHA-4500-B (C)	mg/l	0.1	ND	0.3
Lead	APHA-3111Pb B	mg/l	0.013	<1.0	≤ 0.05
Selenium	APHA-3111Se B	mg/l	-	<0.0008	0.01 (P)
MICROBIOLOGICAL ANALYSIS					
Total Coliforms	APHA:9222 B	CFU/100ml		Absent	0/100ml
Faecal Coliforms (Ecoli)	APHA:9222 D	CFU/100ml		Absent	0/100ml

Abbreviations:
ND: Not Detected **LOR:** Limit of Reporting **NEQS:** National Environmental Quality Standards

Note:
*Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%. **Disclaimer:** This report is not for legal or court purposes.*

Prepared By: Reviewed By: Approved By:

Green Crescent Environmental Consultants Pvt. Ltd. ★ PAKISTAN ★

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15510

CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Sample Details			
Job Ref. No:	GCEC-PK-ISL-13/2026	Client Name:	CUST
Telephone No.	0300-9078305	Sample Matrix:	Ground Water Sample
Sample Date:	27-01-2026	Sampled By:	GCEC
Sample Receipt Date:	28-01-2026	Date of Completion of Analysis	04-02-2026
Grab/Composite:	Grab Sampling	Address:	G.10/1 Street 34 House No. 1, Islamabad
01	Block B Old Pump		

Parameters	Analysis Method	Unit	LOR	Result 01	NEQS
PHYSICAL & CHEMICAL ANALYSIS					
pH	APHA-4500H+ B	-	0.01	6.84	6.5-8.5
Odor	In-house	-	-	Odorless	Non-Objectionable
Taste	In-house	-	-	Sweet	Non-Objectionable
Color	APHA-2120 B/C	Pt/Co	1.0	<1.0	≤15 TCU
Turbidity	APHA-2130 B	NTU	0.1	<0.1	<5 NTU
Total Hardness	APHA-2340 B & C	mg/l	0.1	328.0	< 500 mg/l
Total Dissolved Solid (TDS)	APHA-2540 C	mg/l	1.0	541.0	< 1000
Ammonia	APHA-4500-NH_3-B	mg/l	0.002	<0.002	-
Chloride	APHA-4500Cl- B	mg/l	0.24	47.64	< 250
Cyanide (CN)	APHA-4500CN- E	mg/l	0.01	<0.01	≤ 0.05
Fluoride (F)	APHA-4500F- D	mg/l	0.01	<0.01	≤ 1.5
Nitrite	APHA-4500NO2 B	mg/l	0.01	<0.01	≤ 3 (P)
Nitrate	APHA-4500NO3 C	mg/l	0.1	1.8	≤ 50
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	-
Residual Chlorine	APHA-4500Cl G	mg/l	0.1	<0.1	0.2-0.5
Aluminum (Al)	APHA-3111Al B	mg/l	0.028	<0.028	≤ 0.2
Cadmium	APHA-3111Cd B	mg/l	0.0028	<0.0028	0.01
Copper	APHA-3111Cu B	mg/l	0.0045	<0.0045	2
Chromium	APHA-3111Cr B	mg/l	0.0054	<0.0054	≤ 0.05 (P)
Mercury	APHA-3112Hg B	mg/l	0.0008	ND	≤ 0.001
Antimony (Sb)	APHA-3111Sb B	mg/l	-	<0.008	≤ 0.005 (P)
Nickel	APHA-3111Ni C	mg/l	0.008	<0.0033	≤ 0.02
Zinc	APHA-3111Zn B	mg/l	0.0033	<0.031	5.0
Arsenic	APHA-3111As B	mg/l	0.01	<0.0016	≤ 0.05 (P)
Barium	APHA-3111Ba B	mg/l	0.031	<0.1	0.7
Manganese	APHA-3111Mn B	mg/l	0.0016	<0.1	≤ 0.5
Iron	APHA-3111Fe B	mg/l	0.1	<0.013	-
Boron	APHA-4500-B (C)	mg/l	0.1	ND	0.3
Lead	APHA-3111Pb B	mg/l	0.013	<1.0	≤ 0.05
Selenium	APHA-3111Se B	mg/l	-	<0.0008	0.01 (P)
MICROBIOLOGICAL ANALYSIS					
Total Coliforms	APHA:9222 B	CFU/100ml		Absent	0/100ml
Faecal Coliforms (Ecoli)	APHA:9222 D	CFU/100ml		Absent	0/100ml

Abbreviations:
ND: Not Detected **LOR:** Limit of Reporting **NEQS:** National Environmental Quality Standards

Note:
*Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%. **Disclaimer:** This report is not for legal or court purposes.*

Prepared By: Reviewed By: Approved By:

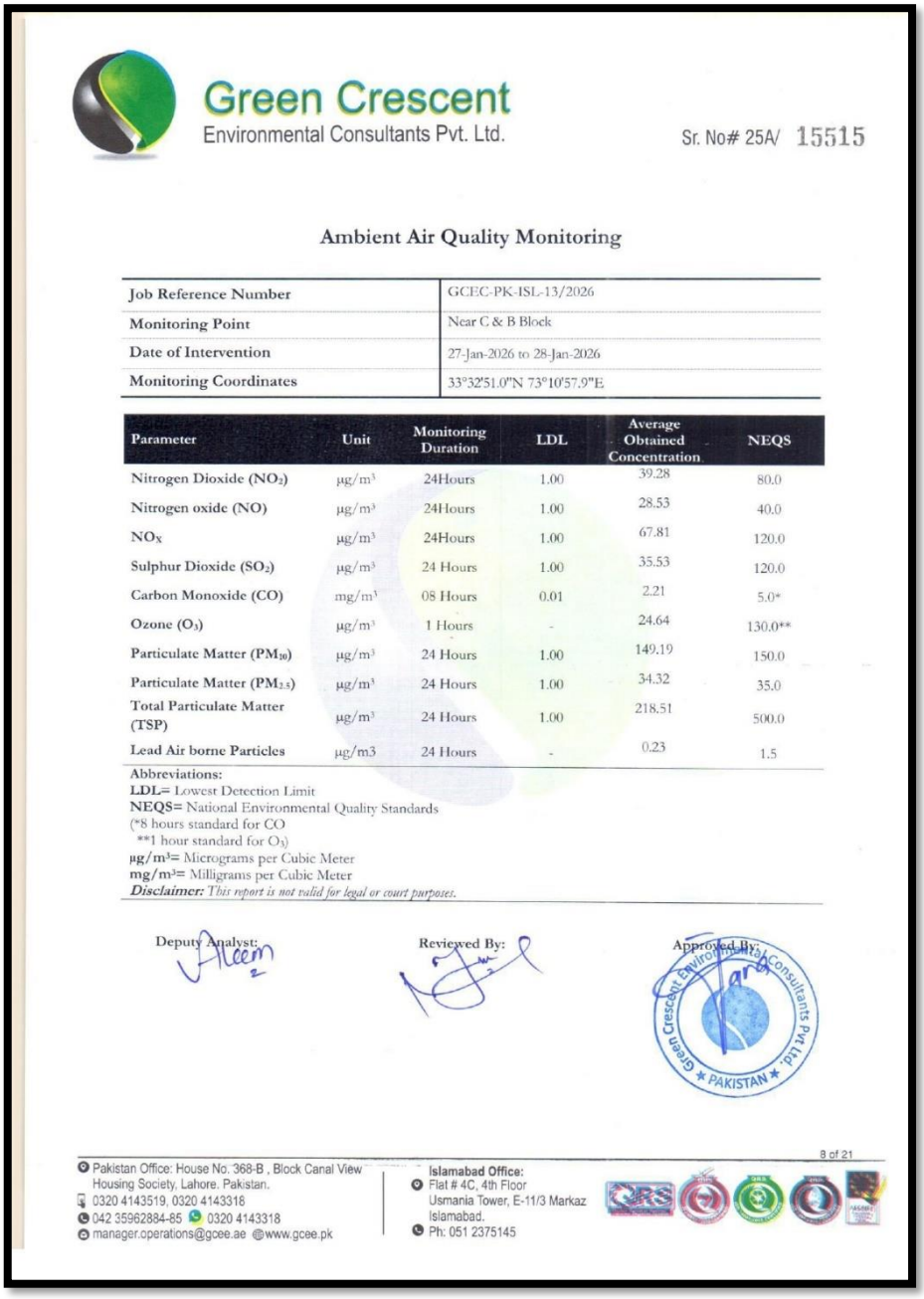
Green Crescent Environmental Consultants Pvt Ltd. ★ PAKISTAN ★

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

ANNEXURE-C

Ambient Air Monitoring Test Report



Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15515

Ambient Air Quality Monitoring

Job Reference Number	GCEC-PK-ISL-13/2026
Monitoring Point	Near C & B Block
Date of Intervention	27-Jan-2026 to 28-Jan-2026
Monitoring Coordinates	33°32'51.0"N 73°10'57.9"E

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	NEQS
Nitrogen Dioxide (NO_2)	µg/m³	24Hours	1.00	39.28	80.0
Nitrogen oxide (NO)	µg/m³	24Hours	1.00	28.53	40.0
NO_X	µg/m³	24Hours	1.00	67.81	120.0
Sulphur Dioxide (SO_2)	µg/m³	24 Hours	1.00	35.53	120.0
Carbon Monoxide (CO)	mg/m³	08 Hours	0.01	2.21	5.0*
Ozone (O_3)	µg/m³	1 Hours	-	24.64	130.0**
Particulate Matter (PM_{10})	µg/m³	24 Hours	1.00	149.19	150.0
Particulate Matter ($PM_{2.5}$)	µg/m³	24 Hours	1.00	34.32	35.0
Total Particulate Matter (TSP)	µg/m³	24 Hours	1.00	218.51	500.0
Lead Air borne Particles	µg/m3	24 Hours	-	0.23	1.5

Abbreviations:
LDL= Lowest Detection Limit
NEQS= National Environmental Quality Standards
(*8 hours standard for CO
**1 hour standard for O_3)
µg/m³= Micrograms per Cubic Meter
mg/m³= Milligrams per Cubic Meter
Disclaimer: This report is not valid for legal or court purposes.

Deputy Analyst: Reviewed By: Approved By:

Green Crescent Environmental Consultants Pvt Ltd. ★ PAKISTAN ★

8 of 21

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae @www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15514

Ambient Air Quality Monitoring

Job Reference Number	GCEC-PK-ISL-13/2026
Monitoring Point	Near C & B Block
Date of Intervention	27-Jan-2026 to 28-Jan-2026
Monitoring Coordinates	33°32'51.0"N 73°10'57.9"E

Sr. #	Time	CO (mg/m³)	NO (µg/m³)	NO_2 (µg/m³)	NO_x (µg/m³)	SO_2 (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)
1	13:10	2.17	27.82	41.92	69.74	35.64	40.28	151.61
2	14:10	2.21	28.65	40.91	69.56	32.67	43.82	162.72
3	15:10	2.16	28.84	41.27	70.11	34.63	46.27	154.16
4	16:10	2.16	27.29	40.97	68.25	37.62	42.60	155.05
5	17:10	2.19	28.97	38.64	67.60	36.65	25.63	162.72
6	18:10	2.25	27.33	43.10	70.42	32.70	38.94	142.83
7	19:10	2.17	27.62	41.70	69.33	31.63	27.10	134.94
8	20:10	2.26	29.22	39.95	69.16	38.71	32.71	139.61
9	21:10	2.13	28.46	38.39	66.84	37.60	31.49	146.94
10	22:10	2.20	29.34	38.87	68.21	36.66	32.83	148.94
11	23:10	2.13	28.68	36.97	65.65	34.60	23.56	139.18
12	00:10	2.14	27.35	39.49	66.84	36.61	24.41	141.27
13	01:10	2.10	28.36	40.93	69.29	37.58	21.85	142.33
14	02:10	2.21	29.23	39.28	68.51	38.67	25.63	145.73
15	03:10	2.27	28.39	35.08	63.48	34.72	31.74	135.37
16	04:10	2.20	30.02	31.49	61.52	35.66	30.76	132.93
17	05:10	2.25	30.23	33.23	63.46	37.70	29.05	131.71
18	06:10	2.17	29.63	36.87	66.51	31.64	26.73	159.79
19	07:10	2.24	27.95	41.43	69.38	32.69	46.27	167.97
20	08:10	2.36	28.05	42.77	70.82	33.79	41.38	172.49
21	09:10	2.17	27.88	39.97	67.85	33.64	43.46	161.02
22	10:10	2.27	29.22	38.31	67.53	37.71	41.63	156.25
23	11:10	2.30	27.43	40.21	67.64	36.74	42.60	151.13
24	12:10	2.22	28.01	43.74	71.76	36.68	38.94	146.36
Average Concentration		**2.21**	**28.53**	**39.28**	**67.81**	**35.53**	**34.32**	**149.19**

Disclaimer: *This report is not valid for legal or court purposes.*

Deputy Analyst: Aleem

Reviewed By:

Approved By:

Green Crescent Environmental Consultants Pvt Ltd. ★ PAKISTAN ★

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15516

Meteorological Data

Job Reference Number	GCEC-PK-ISL-13/2026
Monitoring Point	Near C & B Block
Date of Intervention	27-Jan-2026 to 28-Jan-2026
Monitoring Coordinates	33°32'51.0"N 73°10'57.9"E

Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
13:10	12	NW	1.6	88	726.2
14:10	14	S	1.5	71	725.2
15:10	14	SW	1.6	68	725.0
16:10	13	S	1.7	70	724.8
17:10	13	SE	1.7	71	725.2
18:10	11	SE	1.7	74	725.5
19:10	10	S	1.6	77	726.0
20:10	9	SW	1.6	82	726.7
21:10	9	SW	1.5	86	727.2
22:10	9	NW	1.6	87	727.9
23:10	8	NW	1.6	90	728.0
00:10	8	NW	1.8	92	728.2
01:10	7	NW	1.6	93	728.0
02:10	7	NW	1.6	93	728.0
03:10	6	NW	1.6	94	727.6
04:10	5	NW	1.6	94	727.7
05:10	4	S	1.5	94	727.7
06:10	4	SE	1.5	94	728.0
07:10	4	S	1.6	94	728.3
08:10	4	S	1.5	94	728.9
09:10	6	S	1.5	92	729.3
10:10	13	S	1.6	71	729.3
11:10	13	E	1.6	71	729.0
12:10	15	NE	1.6	65	728.1

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Deputy Analyst:

Reviewed By:

Approved By:

Green Crescent Environmental Consultants Pvt Ltd. PAKISTAN

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

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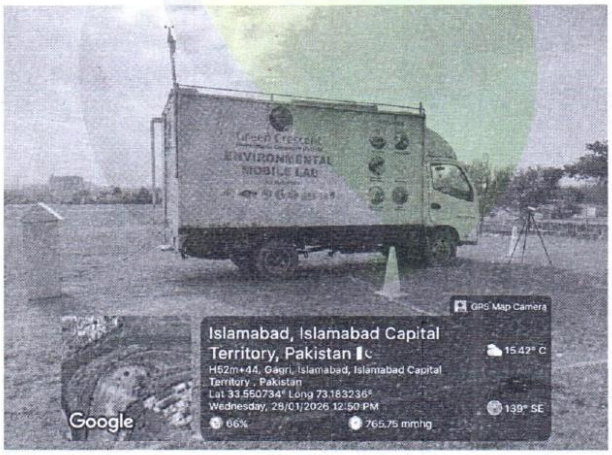
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15518

Ambient Air Monitoring Location#2

SPORTS ROOM/GROUND

(Islamabad)



Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15520

Ambient Air Quality Monitoring

Job Reference Number	GCEC-PK-ISL-13/2026
Monitoring Point	Sports Room/Ground
Date of Intervention	28-Jan-2026 to 29-Jan-2026
Monitoring Coordinates	33°33'02.6"N 73°10'59.7"E

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	NEQS
Nitrogen Dioxide (NO_2)	µg/m³	24Hours	1.00	36.93	80.0
Nitrogen oxide (NO)	µg/m³	24Hours	1.00	24.65	40.0
NO_X	µg/m³	24Hours	1.00	61.59	120.0
Sulphur Dioxide (SO_2)	µg/m³	24 Hours	1.00	31.59	120.0
Carbon Monoxide (CO)	mg/m³	08 Hours	0.01	1.77	5.0*
Ozone (O_3)	µg/m³	1 Hours	-	21.51	130.0**
Particulate Matter (PM_{10})	µg/m³	24 Hours	1.00	136.98	150.0
Particulate Matter ($PM_{2.5}$)	µg/m³	24 Hours	1.00	34.34	35.0
Total Particulate Matter (TSP)	µg/m³	24 Hours	1.00	206.32	500.0
Lead Air borne Particles	µg/m3	24 Hours	-	0.21	1.5

Abbreviations:
LDL= Lowest Detection Limit
NEQS= National Environmental Quality Standards
(*8 hours standard for CO
**1 hour standard for O_3)
µg/m³= Micrograms per Cubic Meter
mg/m³= Milligrams per Cubic Meter
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Deputy Analyst: Reviewed By: Approved By:

Green Crescent Environmental Consultants Pvt Ltd. * PAKISTAN *

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15519

Ambient Air Quality Monitoring

Job Reference Number	GCEC-PK-ISL-13/2026
Monitoring Point	Sports Room/Ground
Date of Intervention	28-Jan-2026 to 29-Jan-2026
Monitoring Coordinates	33°33'02.6"N 73°10'59.7"E

Sr. #	Time	CO (mg/m³)	NO (µg/m³)	NO_2 (µg/m³)	NO_x (µg/m³)	SO_2 (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)
1	12:40	1.79	22.76	39.78	62.54	33.57	38.90	131.84
2	13:40	1.74	24.53	37.66	62.19	33.50	40.24	150.15
3	14:40	1.78	25.50	36.48	61.99	27.55	43.79	150.36
4	15:40	1.73	20.72	36.90	57.62	32.49	46.23	126.59
5	16:40	1.72	23.92	38.87	62.79	25.48	42.56	153.94
6	17:40	1.75	20.87	37.33	58.20	28.52	25.59	151.36
7	18:40	1.81	23.97	39.02	62.99	33.60	38.90	140.51
8	19:40	1.73	24.31	37.41	61.72	33.49	27.06	131.84
9	20:40	1.82	26.16	35.37	61.53	33.61	32.67	128.18
10	21:40	1.70	25.28	33.56	58.84	32.45	31.45	131.84
11	22:40	1.76	23.30	34.12	57.42	33.54	32.80	141.73
12	23:40	1.70	25.53	36.56	62.10	29.44	23.52	128.18
13	00:40	1.71	24.00	38.32	62.32	33.46	24.37	138.80
14	01:40	1.67	25.16	36.51	61.67	30.41	21.81	127.81
15	02:40	1.78	26.18	34.59	60.77	33.55	25.59	111.20
16	03:40	1.83	25.20	37.85	63.05	28.63	31.70	120.85
17	04:40	1.76	24.10	37.17	61.26	33.54	30.72	118.41
18	05:40	1.81	27.34	38.02	65.35	33.60	29.01	117.19
19	06:40	1.74	26.64	39.92	66.57	28.50	26.69	145.27
20	07:40	1.81	24.69	37.09	61.78	30.59	46.23	153.45
21	08:40	1.93	24.80	38.64	63.45	33.75	41.34	157.97
22	09:40	1.74	24.61	35.39	60.00	29.50	43.42	146.49
23	10:40	1.83	26.16	36.96	63.11	33.62	41.59	141.73
24	11:40	1.87	24.08	35.67	59.76	33.67	42.56	136.60
Average Concentration		**1.77**	**24.65**	**36.93**	**61.59**	**31.59**	**34.34**	**136.98**

Disclaimer: *This report is not valid for legal or court purposes.*

Deputy Analyst: Reviewed By: Approved By:

Green Crescent Environmental Consultants Pvt. Ltd. PAKISTAN

12 of 21

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15525

Ambient Air Quality Monitoring

Job Reference Number	GCEC-PK-ISL-13/2026
Monitoring Point	Parking
Date of Intervention	29-Jan-2026 to 30-Jan-2026
Monitoring Coordinates	33°32'46.2"N 73°11'07.2"E

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	NEQS
Nitrogen Dioxide (NO_2)	µg/m³	24Hours	1.00	46.88	80.0
Nitrogen oxide (NO)	µg/m³	24Hours	1.00	31.18	40.0
NO_X	µg/m³	24Hours	1.00	78.06	120.0
Sulphur Dioxide (SO_2)	µg/m³	24 Hours	1.00	38.64	120.0
Carbon Monoxide (CO)	mg/m³	08 Hours	0.01	2.15	5.0*
Ozone (O_3)	µg/m³	1 Hours	-	27.09	130.0**
Particulate Matter (PM_{10})	µg/m³	24 Hours	1.00	150.14	150.0
Particulate Matter ($PM_{2.5}$)	µg/m³	24 Hours	1.00	32.54	35.0
Total Particulate Matter (TSP)	µg/m³	24 Hours	1.00	217.68	500.0
Lead Air borne Particles	µg/m3	24 Hours	-	0.19	1.5

Abbreviations:
LDL= Lowest Detection Limit
NEQS= National Environmental Quality Standards
(*8 hours standard for CO
**1 hour standard for O_3)
µg/m³= Micrograms per Cubic Meter
mg/m³= Milligrams per Cubic Meter
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Deputy Analyst:

Reviewed By:

Approved By:

Green Crescent Environmental Consultants Pvt Ltd. ★ PAKISTAN ★

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

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Sr. No# 25A/ 15524

Ambient Air Quality Monitoring

Job Reference Number	GCEC-PK-ISL-13/2026
Monitoring Point	Parking
Date of Intervention	29-Jan-2026 to 30-Jan-2026
Monitoring Coordinates	33°32'46.2"N 73°11'07.2"E

Sr. #	Time	CO (mg/m³)	NO (µg/m³)	NO_2 (µg/m³)	NO_x (µg/m³)	SO_2 (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)
1	12:10	2.30	30.80	49.10	79.93	38.60	37.02	147.36
2	13:10	2.20	30.70	47.40	78.10	38.60	38.31	161.33
3	14:10	2.30	31.40	46.50	77.96	38.60	41.75	149.75
4	15:10	2.20	31.60	46.90	78.46	38.60	44.13	142.44
5	16:10	2.20	30.20	48.40	78.55	38.60	40.52	167.95
6	17:10	2.30	31.70	47.20	78.91	38.60	24.16	175.79
7	18:10	2.30	30.20	48.50	78.71	38.70	37.05	155.46
8	19:10	2.20	30.50	47.30	77.73	38.60	25.53	147.34
9	20:10	2.40	32.00	45.70	77.62	38.70	30.95	143.95
10	21:10	2.20	31.20	44.30	75.51	38.60	29.74	147.33
11	22:10	2.30	29.10	44.70	73.76	38.60	31.02	149.52
12	23:10	1.70	31.50	46.60	78.05	38.60	22.03	143.93
13	00:10	1.80	30.20	48.00	78.18	38.60	22.92	153.86
14	01:10	1.70	31.20	46.60	77.71	38.60	20.41	143.62
15	02:10	1.90	32.00	45.10	77.03	38.60	24.11	128.11
16	03:10	2.00	31.20	47.60	78.78	38.70	30.02	137.11
17	04:10	1.80	32.70	47.10	79.77	38.60	29.07	134.81
18	05:10	1.90	32.90	47.70	80.62	38.70	27.45	133.77
19	06:10	2.20	32.30	49.20	81.55	38.60	25.14	159.89
20	07:10	2.30	30.80	47.00	77.79	38.70	44.12	159.46
21	08:10	2.50	30.90	48.20	79.08	38.80	39.33	149.65
22	09:10	2.20	30.70	45.70	76.40	38.60	41.31	160.94
23	10:10	2.40	32.00	46.90	78.85	38.70	39.65	156.53
24	11:10	2.40	30.30	45.90	76.20	38.70	40.56	151.77
Average Concentration		2.15	31.18	46.88	78.06	38.64	32.54	150.14

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Green Crescent Environmental Consultants Pvt Ltd. ★ PAKISTAN ★

17 of 21

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15523

Ambient Air Monitoring Location#3

PARKING

(Islamabad)

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

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Sr. No# 25A/ 15526

Meteorological Data

Job Reference Number	GCEC-PK-ISL-13/2026
Monitoring Point	Parking
Date of Intervention	29-Jan-2026 to 30-Jan-2026
Monitoring Coordinates	33°32'46.2"N 73°11'07.2"E

Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
12:10	17	E	2.4	72	724.8
13:10	17	NE	3.1	59	723.4
14:10	19	NE	2.0	55	722.2
15:10	19	E	2.1	51	722.0
16:10	19	N	2.7	54	721.7
17:10	17	NE	2.0	59	721.7
18:10	14	N	2.7	68	722.0
19:10	13	NE	2.4	74	722.9
20:10	12	E	2.1	75	746.1
21:10	12	E	1.8	79	746.1
22:10	11	NE	1.9	81	743.9
23:10	9	NE	1.5	84	750.1
00:10	8	E	1.3	88	746.0
01:10	8	SE	1.4	88	748.0
02:10	4	NW	1.8	89	747.4
03:10	4	NW	1.9	90	750.0
04:10	4	E	1.8	86	746.3
05:10	4	N	1.8	84	750.4
06:10	4	NW	0.7	80	748.5
07:10	4	E	0.9	76	747.5
08:10	4	E	1.1	69	747.5
09:10	9	N	1.7	52	746.9
10:10	12	N	1.9	55	746.7
11:10	16	N	1.9	57	746.7

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Deputy Analyst:

Reviewed By:

Approved By:

Green Crescent Environmental Consultants Pvt Ltd. ★ PAKISTAN ★

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

ANNEXURE-D

Noise Level Monitoring Report

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15517

Noise Level Monitoring Report

Job Reference Number	GCEC-PK-ISL-13/2026
Monitoring Point	Near C & B Block
Date of Intervention	27-Jan-2026 to 28-Jan-2026
Monitoring Coordinates	33°32'51.0"N 73°10'57.9"E

Sr. #	Time	Method/Technique	Unit	Results LAavg	NEQS (Commercial)
		Night Time			
1.	23:10	Noise Meter	dB	53.1	
2.	00:10	Noise Meter	dB	52.3	
3.	01:10	Noise Meter	dB	47.7	
4.	02:10	Noise Meter	dB	54.6	
5.	03:10	Noise Meter	dB	46.6	55.0
6.	04:10	Noise Meter	dB	44.6	
7.	05:10	Noise Meter	dB	48.5	
8.	06:10	Noise Meter	dB	47.5	
	Night Time Average		dB	49.38	55.0
		Day Time			
9.	07:10	Noise Meter	dB	61.1	
10.	08:10	Noise Meter	dB	60.1	
11.	09:10	Noise Meter	dB	56.6	
12.	10:10	Noise Meter	dB	59.9	
13.	11:10	Noise Meter	dB	62.7	
14.	12:10	Noise Meter	dB	57.8	
15.	13:10	Noise Meter	dB	65.4	
16.	14:10	Noise Meter	dB	63.5	
17.	15:10	Noise Meter	dB	66.0	65.0
18.	16:10	Noise Meter	dB	58.0	
19.	17:10	Noise Meter	dB	64.4	
20.	18:10	Noise Meter	dB	63.2	
21.	19:10	Noise Meter	dB	61.5	
22.	20:10	Noise Meter	dB	68.6	
23.	21:10	Noise Meter	dB	63.7	
24.	22:10	Noise Meter	dB	65.4	
	Day Time Average		dB	62.39	65.0

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Deputy Analyst: Aleem

Reviewed By:

Approved By:

Green Crescent Environmental Consultants Pvt. Ltd. PAKISTAN

10 of 21

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15522

Noise Level Monitoring Report

Job Reference Number	GCEC-PK-ISL-13/2026
Monitoring Point	Sports Room/Ground
Date of Intervention	28-Jan-2026 to 29-Jan-2026
Monitoring Coordinates	33°33'02.6"N 73°10'59.7"E

Sr. #	Time	Method/Technique	Unit	Results LAavg	NEQS (Commercial)
		Night Time			
1.	23:40	Noise Meter	dB	43.1	
2.	00:40	Noise Meter	dB	45.3	
3.	01:40	Noise Meter	dB	48.1	
4.	02:40	Noise Meter	dB	46.6	
5.	03:40	Noise Meter	dB	44.6	55.0
6.	04:40	Noise Meter	dB	43.5	
7.	05:40	Noise Meter	dB	40.4	
8.	06:40	Noise Meter	dB	43.4	
	Night Time Average		dB	44.37	55.0
		Day Time			
9.	07:40	Noise Meter	dB	53.9	
10.	08:40	Noise Meter	dB	55.8	
11.	09:40	Noise Meter	dB	50.5	
12.	10:40	Noise Meter	dB	54.2	
13.	11:40	Noise Meter	dB	57.3	
14.	12:40	Noise Meter	dB	51.9	
15.	13:40	Noise Meter	dB	56.3	
16.	14:40	Noise Meter	dB	56.6	
17.	15:40	Noise Meter	dB	56.4	65.0
18.	16:40	Noise Meter	dB	52.1	
19.	17:40	Noise Meter	dB	59.3	
20.	18:40	Noise Meter	dB	57.9	
21.	19:40	Noise Meter	dB	56.0	
22.	20:40	Noise Meter	dB	55.9	
23.	21:40	Noise Meter	dB	58.5	
24.	22:40	Noise Meter	dB	53.4	
	Day Time Average		dB	55.38	65.0

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Deputy Analyst: Reviewed By: Approved By:

Green Crescent Environmental Consultants Pvt Ltd ★ PAKISTAN ★

15 of 21

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15527

Noise Level Monitoring Report

Job Reference Number	GCEC-PK-ISL-13/2026
Monitoring Point	Parking
Date of Intervention	29-Jan-2026 to 30-Jan-2026
Monitoring Coordinates	33°32'46.2"N 73°11'07.2"E

Sr. #	Time	Method/Technique	Unit	Results LAavg	NEQS (Commercial)
Night Time					
1.	23:10	Noise Meter	dB	55.7	
2.	00:10	Noise Meter	dB	54.3	
3.	01:10	Noise Meter	dB	53.4	
4.	02:10	Noise Meter	dB	57.0	
5.	03:10	Noise Meter	dB	49.6	55.0
6.	04:10	Noise Meter	dB	48.7	
7.	05:10	Noise Meter	dB	52.8	
8.	06:10	Noise Meter	dB	51.4	
Night Time Average			**dB**	**52.87**	**55.0**
Day Time					
9.	07:10	Noise Meter	dB	61.7	
10.	08:10	Noise Meter	dB	60.8	
11.	09:10	Noise Meter	dB	56.3	
12.	10:10	Noise Meter	dB	59.4	
13.	11:10	Noise Meter	dB	62.1	
14.	12:10	Noise Meter	dB	60.5	
15.	13:10	Noise Meter	dB	64.6	
16.	14:10	Noise Meter	dB	65.6	
17.	15:10	Noise Meter	dB	68.0	65.0
18.	16:10	Noise Meter	dB	57.6	
19.	17:10	Noise Meter	dB	63.7	
20.	18:10	Noise Meter	dB	62.5	
21.	19:10	Noise Meter	dB	60.9	
22.	20:10	Noise Meter	dB	67.6	
23.	21:10	Noise Meter	dB	63.0	
24.	22:10	Noise Meter	dB	63.7	
Day Time Average			**dB**	**62.38**	**65.0**

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Deputy Analyst: Reviewed By: Approved By:

Green Crescent Environmental Consultants Pvt Ltd. PAKISTAN

20 of 21

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

ANNEXURE-E

Pictorial Evidence for Air, Water and Noise Monitoring

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 15528

Pictorial Evidence for Ground & Surface Water Sampling & Ambient Air Monitoring

Figure 1: Ground Water Sampling from New Pump

Figure 2: Ground Water Sampling from Old Pump

Figure 3: Surface Water Sampling from Sawan River

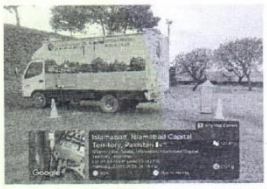

Figure 4: Ambient Air Monitoring Near C&B Block

Figure 5: Ambient Air Monitoring at Sports Room/Ground

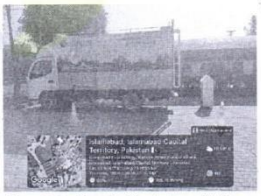

Figure 6: Ambient Air Monitoring at Parking

End of Report

Pakistan Office: House No. 388-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145