Table 8.1: Environmental Management Plan

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
Design Phase									
1	Water supply system in COEs	Water quality in some COEs does not meet the essential water quality standards during baseline environmental monitoring i.e. TDS, E.Coli, Fecal Coliforms, Chlorine, Lead and Hardness was found in the drinking water sources. This could pose serious health issues to the students and staff.	07 COEs	Designer will consider the installation and provision of high-quality drinking water treatment options and disinfection units. For instance, chlorination or ozonation, or other suitable technologies can be used to disinfect water. Although arsenic was not detected in any site but studies have clearly shown the presence of high arsenic in Ravi river flood plain and Lahore is situated in Ravi River Flood plain. Therefore, presence of high arsenic in Lahore cannot be ignored and for the selection of appropriate drinking water treatment unit removal of arsenic in addition to other site-specific contaminants will be given a due consideration. As such a “Reverse Osmosis (RO)” treatment plant of	DD Environment - PIU	PIU, ICISDD,	GTTI Bahawalpur, CAMI Khanewal, GCT Multan, VTI, Multan GTTI Faisalabad, GCT Faisalabad, GITT Sheikhupura GATC, Lahore GTC, Gujranwala VTI, Green Town, Lahore	Drinking Water sources and Drinking Water Treatment Systems	Monthly during design stage

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				sufficient capacity could be a best fit as an all-in-one solution. RO can be used to reduce TDS and chlorides, lead etc. Softening of water can be considered where hardness of water is high. If RO systems are already installed, the efficacy and performance of RO units can be upgraded. In all such situation it is required that the suggested/selected treatment system is appropriate to address all the site-specific water quality issues (biological/chemical/physical). The COE management / staff will be given appropriate training to operate the RO system. An un-interrupted power supply system (needed for functional working of water supply and treatment system) or any alternate arrangement is in place, and they have					

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				enough supplies / funds for consumable components / filters / supplies essentially required for the proper operation of the recommended water treatment systems. It is also recommended to repair/ functionalize the out of order RO plants situated in respective COE e.g. VTI, Green Town, Lahore					
2	Consumables for Lab Equipment	At design stage, the equipment and consumables may have some hazardous substances. The impact is high likelihood is very low.	All COEs	Designer will consider the international conventions and local regulations on hazardous substances.	DD Environment - PIU	PIU, ICISDD,		Design	Monthly during design stage
3	Overdesign of COEs	The COEs are educational institutes and most of them are in urban environment. There is a possibility of over/unnecessary design elements or proposing new	All COEs	The designer will consider the minimum tree cut while proposing the location for new building blocks. This could be achieved by adopting the same project footprints or changing project footprints only where unavoidable.	DD Environment - PIU	PIU, ICISDD,		Design	Monthly during design stage

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		building blocks on existing open grounds. The impact is high but likelihood is low.		The design will be completely on need assessment. The design and location will be finalized after close coordination and consultation with the stakeholders. The design of the COE at GSTC, Murree will ensure not to disturb existing water boring facility (functional) located at site. Toilets facilities will be designed and recommended for males and females (as the case may be) at every floor of the COE. Sound proofing of the buildings could be ensured especially to avoid traffic noise (where required). It is also recommended to sound proof the rooms adjacent to mosque in COE of GCT, Wahdat Road, Lahore. Storm water drainage system of the COEs must be capable enough to deal with the urban					

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				flooding especially in GCT Sialkot where the whole GCT becomes flooded during monsoon season. The building layout / orientation will be designed in a way not to stop sunshine for students / staff of COEs proposed in Murree. Furthermore, sloped roof tops will be designed for easy snow removal.					
4	Building Load	The vertical construction on fragile structures of COEs may cause a risk of increased load of building which may ultimately exacerbate impact of natural disasters (e.g. earthquake). There are two COEs (GCTW Lahore and GCT Sialkot) that have very old infrastructure and any amendment may cause harm to	All COEs,	The designer must carry out building strength assessment before proposing the vertical blocks during detailed design. • Efforts will be made to repair and renovate the Shadi Lal Block in GCT, Lahore with care as it is an old structure The vertical construction will be done with light weight construction materials.	DD Environment - PIU	PIU, ICISDD,	All COEs specifically GCTW Lahore and GCT Sialkot	Design	Monthly during design stage

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		historical value of buildings.							
5	Wastewater Risks and Hazards	During baseline environmental monitoring, it was found that the concentrations of some toxic pollutants were high in sewerage/wastewater of some COEs. The higher concentrations of pollutants such as COD/BOD and heavy metals may pose serious risks to soil and water resources. Though, there is availability of septic tanks but at design stage, designer may ignore this threat to the environment, which would ultimately cause more threats during operation stage.	08 COEs	Designer will consider the options for wastewater treatment or reducing the pollutants' concentration load either through development of efficient septic tanks before the open release of wastewater into main sewers or environment. For CoEs of Textile & Garments the designer will give due consideration to the treatment of waste water released from the laboratories in addition to routine waste water from toilets etc., by carefully assessment of all potential scenarios of accidental and/or routine laboratory chemicals available in different training laboratories.	DD Environment - PIU	PIU, ICISDD,	GCT Lahore, GCTPP Lahore, GTTI Bahawalpur, GCT Bahawalpur, GCT Multan, CAMI Khanewal, GTTI Faisalabad and GCT Faisalabad.	Sewers and Septic Tanks	Monthly

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
6	Construction Vehicles Traffic Issues	The design provisions may skip the necessary requirements for construction camp and vehicle movement	All COEs	The designer will consider the traffic congestion and situation that may arise during project activities. A traffic management framework will be prepared at the stage of detailed design.	DD Environment - PIU	PIU, ICISDD,		Design, Traffic Management Plan	Monthly during design stage
7	Lack of Integration of IEE and EMP into Bidding Documents	The bidding documents may not be responsive to environmental and social considerations	All COEs	The proponent will consider the environmental and social considerations during detailed design. The IEE & EMP will be made compulsory part of Bidding documents. The estimates on environmental monitoring and enhancement will be incorporated in BOQs.	DD Environment - PIU	PIU, ICISDD,		Bidding Documents	Monthly during design stage
8	Site Specific Environmental Management Plan	There is a possibility of hiring multiple contractors and their capacity to prepare and develop site specific EMPs can be low	All COEs	The contractor(s) would prepare SSEMP taking help from IEE and EMP, that will cover the following aspects: • Define boundaries • Identify sensitive receptors & environmental values • Specify construction activities	Contractor, DD Environment - PIU	PIU, ICISDD	All COEs	Site Specific documents	Prior to construction

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				• Conduct risk assessment • Assign environmental management measures • Prepare monitoring plan • Prepare site plans • Prepare environmental work plan					
9	Renovation / construction activities in COEs, during active teaching / training sessions / semesters.	Unavoidable major disturbance in routine teaching / training activities in existing class rooms, labs, buildings and allied facilities. Unavoidable interference between contractor crew and students/teachers of the COE, that will adversely impact the safe learning environment.	All COEs	The proponent will assess and analyze the disturbance and impact of renovation / construction activity with the individual COE management and based on the scale, duration, timing, and intensity of the proposed activity consider following appropriate measures to avoid, minimize or mitigate the impact: • Re-scheduling of daily teaching hours to accommodate construction/renovation activity • Re-scheduling / break in classes to restart after completion of	DD Environment - PIU, COE Management	PIU, ICISDD,	All COEs	Satisfaction note from COE management on the arrangements for the continuation of COEs routine functions during construction activities	Monthly before the start of construction phase

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				proposed construction activities • Re-scheduling of daily working hours for construction workers to accommodate teaching activities • Accommodating / shifting classrooms to other existing / available rooms within COE to avoid any loss of teaching/training • Provisions of Temporary facilities to serve as classrooms for the construction duration • Shifting the impacted classrooms, hostels etc., to a temporary rented facility					
10	Visual Impacts of Solar Panels	The potential impacts could be visual and reflection. The PV modules are expected to be visible within the immediate vicinity and up to some	All COEs	It is suggested to use PV modules whose surface would absorb sunlight and minimize sunlight reflections. The modules will be efficient enough to absorb heat with low chances of reflection.	C&W Deptt / Supervision Consultant	DD Environment - PIU, PIU, ICISDD	All COEs	Inspection	Once

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		kilometers around the COEs and thus is likely to create visual impacts. These visual and reflection may create nuisance to nearby inhabitants (if any).							
Construction Phase									
1	Construction camps, material and equipment yards	Exploitation of local facilities/utilities such as electricity and temporary construction activities like material placement and storage may temporarily affect the routine matters of COEs administration.	All COEs	Contractor will prepare SSEMPs using the information and suggestions proposed in EMPs. Contractor will follow the best management practices for handling and disposal of the material if found during refurbishment. Contractor will ensure that the baseline conditions are recorded before establishing camps and other site facilities. Contractor will establish the camp where necessary and land is available. Contractor will maintain photographic record of area adjacent to the	Contractor	DD Environment - PIU, PIU, ICISDD,	-do-	Consumption Record, Photograph Record	Daily

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				camp site and other features are taken prior to commencement of any work activity which will be used as a reference during site restoration.					
2	Wastewater Generation at Construction Camps	Wastewater will be generated at the construction camps. If the generated wastewater is not properly treated or disposed of, this may contaminate the nearby surface water resources (if any) apart from soil contamination. The wastewater generation is estimated to be 800 liters/day for 25 construction workers for each COE which means that total wastewater generation for 19 COEs will be 16,000 liters/day.	All COEs	Domestic effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e. septic tanks. Contractor will ensure that latrines, septic tanks, and soaking pits or sumps are built at a safe distance from water body (tube wells or hand pumps), stream, or dry streambed and the bottom of the sump or soaking pits are above the ground water level. Proper monitoring to check the compliance of PEQS will be carried out (as advised by EHS Specialists).	Contractor	DD Environment - PIU / Supervision Consultant , PIU, ICISDD,	All COEs	Visible Signs, Inspection of Construction camp	Daily
3	Solid Waste Generation at	Considering the construction	All COEs	All the solid waste from the camps will be	Contractor	DD Environment -	All COEs	Visible Signs, Inspection of	Daily

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
	Construction Camps	workforce (about 25 in numbers / COE), an average solid waste generation rate of 0.5 kg/capita/day[107] is adopted for the estimation of solid waste generation. Based on this assumption, about 12.5 kg solid waste will be generated from construction camps on daily basis at each COE which means that total solid waste generation for 20 COEs will be 250 kg/day. The major components of the labour camp waste will be garbage, putrescible waste, rubbish and small portion of ashes and residues, etc. This waste would require proper disposal to		properly collected at source by placing containers and disposed of through proper solid waste management system. The Contractor will coordinate with local representatives and administration concerned department for the disposal of solid waste. The concerned department must develop a plan of action for transporting the waste to the disposal site for final disposal. It is the responsibility of the concerned department to ensure that the disposal site is properly lined to prevent the leachate from contaminating the groundwater. Secondly, the disposal site must be located away as far as practical from populated areas. The waste will be properly sealed in containers with proper		PIU / Supervision Consultant , PIU, ICISDD,		Construction camp	

[107] D. Hoornweg and P. Bhada-Tata. 2012. What a Waste : A Global Review of Solid Waste Management. U*rban Development Series; Knowledge Papers*. No. 15. World Bank, Washington, DC.

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		minimize land and water contamination.		labels indicating the nature of the waste. Toxic waste will be handled, stored, transported and disposed-off separately. Safe handling precautions and product specific information is found in Material Safety Data Sheet (MSDS) which must be located on site and accessible to all workers.					
4	Solid Waste Generation at Construction Sites	ıe construction waste will include damaged or spoiled materials, demolished materials, temporary and expendable construction materials etc. The construction waste types also include timber, metals, rubber, concrete, electric cables, old machinery/equipment, etc. The handling and storage of oil and other hazardous	All COEs	Site-specific waste management plan for each COE will be developed to implement an efficient and responsive solid waste management system during construction phase. Recyclable wastes e.g. steel bars will be sold to waste vendors. Site-specific plan will also contain exact location of excavation and quantum of soil to be excavated and disposed. Contractor must follow Best Management Practices for Asbestos safe handling, packaging	Contractor	DD Environment - PIU / Supervision Consultant , PIU, ICISDD,	All COEs	Visible Signs, Inspection of active construction sites	Daily

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		waste will be a source of environmental pollution during the excavation, foundation, levelling, carpeting and pavement activities. Due to old construction, there may be a possibility of presence of Asbestos during repair and refurbishment work.		and disposal. For this purpose, site-specific Asbestos management plan needs to be prepared by the contractor for each COE and seek prior approval from Supervision Consultant's EHS Specialist. The site-specific Asbestos management plan will cover ways to handle, store, precautions, transport, safe handover to trained professionals for its disposal. Reusable material will be used as a filling material during ground levelling. Solid waste generated during construction will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan.					
5	Excavation at Construction Site	Construction of new building blocks within premises of all COEs would involve	All 19 COEs	The actual amount of excavation material can be estimated during detailed design. Preferably no extra land will be excavated.	Contractor	DD Environment - PIU, PIU, ICISDD,	All 19 COEs	Boundary Marks, Visible Signs, Inspection of site	Once before construction, daily during excavation, Weekly

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		excavation. The excavation may cause health, safety, stability and aesthetic issues		Contractor will prepare SSEMP with exact location of excavation and quantum of soil to be excavated. Contractor will ensure that the movement of earth moving machinery is limited to the work area and that the erosion protection measures are taken, such as retaining wall (if required), avoidance of steep cut.					during construction
6	Disposal of Spoil Material	Requirements for disposal of fill, excavation, and/or spoil materials is expected.	All 19 COEs	Excavation materials produced from digging activities will be disposed off on daily basis. Use of spoil material during construction of buildings will be done, where possible, to minimize waste production. Contractor will submit a detailed for collection and transfer of spoil material to the approved sites prior any dumping of materials.	Contractor	DD Environment - PIU, PIU, ICISDD,	-do-	Spoil material quantum	Weekly

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
7	Loss of trees and vegetation	Construction of new building blocks may cause tree cutting at 14 COEs	14 COEs	Clearing of green surface cover for construction, cutting trees and other important vegetation during construction will be minimized. The exact amount of tree count can be verified during design and designer will make best possible use of skills to avoid tree cut. During the design stage of the project sites and finalizing the site orientation, it will be the priority to avoid those areas where there are chances of cutting of significant trees and clearing of vegetation. In case if it is not possible to avoid, then the project site will be restored to its original as much as possible by planting trees, and vegetation at the cleared land. It is pertinent to mention that trees will be relocated/transplanted/replanted (where possible)	Contractor	DD Environment - PIU, PIU, ICISDD	14 COEs (See table 8.2 for initial estimate)	Tree count	During Excavation and Machinery movement

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				instead of cutting and may be replanted within the 500 meters radius of its original location; Compensatory plantation will be planned to be undertaken at prescribed rates (at least 5 times of the number of trees cut). The contractor's staff and labor will be strictly directed not to damage any vegetation such as trees or bushes. All works will be carried out in a fashion that ensures minimum damage or disruption to the flora. The contractor will be responsible for the restoration of the site and PIU will ensure restoration as per the requirements. Landscaping and road verges to be re-installed on completion.					
8	Load on Sanitation and Sewage System	Population influx during project construction activities may	All 19 COEs	Access to nearby lavatories will be allowed or provision of temporary toilets will be made.	Contractor	DD Environment - PIU, PIU, ICISDD		Sewerage system inspection	Daily

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		cause severe impact on existing utilities such as sewerage and sanitation infrastructure of COEs as in most of the COEs have poor sewerage system.		Construction worker camps will be necessary, based on the scale of the works needed. The construction camp will be provided with toilets, soakage pits or portable lavatories or at least pit latrines. Disposal of surplus materials will also be negotiated through local authority approvals prior to the commencement of construction. If surplus materials arise from the excavation activities, it will be used elsewhere on the subproject before additional soil, rock, gravel or sand is brought in.					
9	Water Usage	Project activities at all COEs would increase the groundwater/drinking water consumption rate, due to sudden increase in number of consumers during construction.	All COEs	Contractors will make temporary arrangements for construction / drinking water in a manner that existing water users may not be affected. For this purpose, contractors will meet their water requirements through water bowsers tanks. No groundwater and water	Contractor	DD Environment - PIU, PIU, ICISDD	-do-	Less running hours of water pumping	Monthly

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				supply of COE will be utilized during construction period to avoid any conflict. Contractors will train the staff and labor on less water consumption and to minimize the wastage of drinking water.					
10	Exploitation / Disturbance of Utilities	Project activities at all COEs may trigger unnecessary exploitation of electric power and natural gas supplies. As the COEs have to bear all the expenses/dues of consuming electric or gas resources. Any exploitation or usage by contractor may cause impact on consumption of resources.	All 19 COEs	Contractor will bring or use their own power sources i.e. generators or gas cylinders for all kind of activities. The contract will include the bindings on contractor and in case any exploitation to COEs resources occurs, contractor will be bound to bear the utility bills.	Contractor	DD Environment - PIU, PIU, ICISDD	-do-	Utility Bills	Monthly
11	Traffic Congestion	Traffic congestion is expected in the vicinity of COEs due to increased number of vehicles and	All 19 COEs	Preparation of traffic management and construction machinery movement plan in each SSEMP will be made sure.	Contractor	DD Environment - PIU, PIU, ICISDD	-do-		Prior to and throughout the construction.

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		movement of construction machinery.		Submit temporary haul and access routes plan one month prior to start of works. Formulate and implementation of a plan of alternate routes for heavy vehicles. Installation of traffic warning signs, and enforcing traffic regulations during transportation of materials and equipment and machinery.					
12	Air Quality	It is expected that air quality in the vicinity of COEs may decline due to increased traffic volume, movement of construction machinery and generation of dust in from construction activities. This may affect the construction camps, COEs themselves and more specifically the sensitive	All 19 COEs	The construction work at COEs where sensitive receptors are nearby, will be scheduled during vacations only, to avoid any impact or disturbance to sensitive receptors. Client/Supervisory Consultant will make sure that no construction activity is done when the sensitive receptors/institutions are operational. The construction machinery and vehicles will be kept away from sensitive receptors as	Contractor	DD Environment - PIU, PIU, ICISDD	All CEOs, Specifically GCT Multan, GCT Bahawalpur, GCT Sialkot, GCT Lahore, GCT Gujranwala.	Air Quality Parameters as per PEQS and WHO	Instrumental monitoring on a quarterly basis

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		receptors nearby GCT Multan, GCT Bahawalpur, GCT Gujranwala, GCT Lahore and GCT Sialkot.		much as possible. Undertake regular spraying of water on traffic routes and places prone to cause dust pollution. Trucks carrying spoil materials will have tarpaulin cover to prevent spills during haulage. Suspended particulate matter (SPM) will be monitored at dust creating sites such as crushers, and dust mask will be issued to workers. Need of large stockpiles will be minimized by careful planning of the supply of materials from controlled sources. Stockpiles will be covered with tarpaulins when not in use and at the end of the working day to enclose dust. Aggregate material will be delivered to the batching and/or asphalt plant in a damp condition, and water sprays will be applied if					

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				needed, to reduce dust emissions. Fuel-efficient and well-maintained haulage trucks will be employed to minimize exhaust emissions. Ambient air monitoring will be conducted after periodic intervals as mentioned in the EMP.					
13	Noise	Noise will be generated due to use of drillers, machines inside buildings/facility. This can be a source of nuisance to neighboring properties and other class rooms / dormitories and common facilities. Noise levels may reach to as much as 85 decibels (dBA) at a distance of about 15 m from the source or operation of construction equipment (for less than 50% time	All 19 COEs	Construction camps and workshops will be located outside the premises of COEs. In this way, noisy operations of workshops will stay away from the COEs. Contractor will be responsible to provide the construction workers with suitable hearing protection like ear cap, or earmuffs at noisy workplaces. All construction equipment and machinery will be fitted in full compliance with the national and local regulations and with effective silencing	Contractor	DD Environment - PIU, PIU, ICISDD	All COEs, Specifically GCT Multan, GCT Bahawalpur, GCT Sialkot, GCT Lahore, GCT Gujranwala.	Noise levels	Instrumental monitoring on a quarterly basis

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		of work)[108]. The sensitive receptors nearby GCT Multan, GCT Bahawalpur, GCT Gujranwala, GCT Lahore and GCT Sialkot are likely to be affected by high levels of noise. However, this will be temporary in nature		apparatus to minimize noise. As a rule, the construction activities will be confined to daylight hours only. No construction activity will be conducted during night hours. Construction equipment like generators, that generate noise, will be enclosed or fitted with effective silencing apparatus to minimize noise. Contractor will take adequate measures to minimize noise nuisance in the vicinity of construction sites by way of adopting available acoustic methods such that at the edge of the work sites noise will be less than 55 dB(A) Leq during the day hours. Noise monitoring will be conducted after periodic intervals as mentioned in the EMP.				

[108] Several equipment has different noise thresholds – drills, excavators, trucks, compressors etc. which are specified by national governments. The monitoring of these equipment will rely on nationally approved threshold limits.

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
14	Ground Vibration	No heavy machinery or any blasting activity is anticipated to be used which could generate sever vibrations and cause damage to nearby structures. Furthermore, no deep excavations or pilings are expected during construction period and no damaged or structurally unsafe buildings are situated near new civil constructions works within the COEs which could be impacted. Most of the buildings around the project sites are not likely to be affected by the vibration induced impacts.	All 19 COEs	The building design, construction methods, construction machinery, construction equipment, construction materials, installation techniques will be selected to avoid and minimize chances of ground vibration. In case it is unavoidable the activity will be carried out with maximum safety of workers, COE staff and students and surrounding structures. All such activities will be properly planned and will be initiated after the approval of EHS specialist. All such activities will be implemented under strict supervision of technical supervisors and construction supervision consultant staff. Designer will assess the existing infrastructures stability and strength.	Contractor	DD Environment - PIU, PIU, ICISDD	All COEs, Specifically GCT Multan, GCT Bahawalpur, GCT Sialkot, GCT Lahore, GCT Gujranwala, GCTW Lahore.	Pre-Construction vibration survey of buildings likely to be affected by vibration induced impacts.	Prior to start of construction phase

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
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				A pre-construction vibration survey will be carried out by the contractor to identify buildings which can be severely impacted by the vibration induced impacts Contractor will apply shock absorbers where impulsive actions are proposed near the old buildings.					
15	Waste Issues	Solid waste and wastewater generation is anticipated during construction activities.	All 19 COEs	For solid wastes disposal, the waste disposal plan will be followed by the Contractor. No waste will be left in the open. Contractor will maintain the Photographic record of the area of the nominated waste disposal site in order to restore the site at the completion of the construction phase. Contractor will ensure that all the waste generated from different locations will be disposed off according	Contractor	DD Environment - PIU, PIU, ICISDD	All COEs	Site Inspections	Daily

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				to the Waste Disposal Plan. Contractor will ensure that all trucks used for the transportation of waste construction material will be covered and water resist. It is the contractor's contractual obligation to complete and follow the guidelines in case any private land is damaged / contaminated due to disposal of waste generated from the construction activities. Contractor will ensure that the movement of lifting machinery and vehicles is limited to the work area. Contractual clauses will require the contractor to produce a materials management plan (one month before construction commences) to identify all sources of cement and aggregates and to balance cut and fill. The plan will clearly state the methods to be employed prior to and					

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				during the extraction of materials and all the mitigation measures to be employed to mitigate nuisances to local residents. Contractual clauses will require the contractor to produce a solid waste management plan so that proper disposal of waste can be ensured					
16	Soil Contamination	Soil contamination is expected due to spill of lubricants, fuel, chemicals and other construction waste material.	All 19 COEs	To avoid the chemical and oil spills such materials will be properly stored and maintain good housekeeping by the Contractor. Contractor will ensure that the maintenance of vehicle (LTV and HTV) and other plant takes place only in designated areas underlined with concrete slabs and a system to catch surface runoff. The contractor will construct lined wash area for vehicle washing. Contractor will ensure effluents from plant washing and other potentially contaminated	Contractor	DD Environment - PIU, PIU, ICISDD	All COEs	Photograph, Inspection	Daily

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				effluents are released into soaking pit. Contractor will store and handle fuels, oils, and other hazardous substances according to standard safety practices such as secondary containment bunded area. Fuel tanks will be labeled accordingly by the Contractor. Contractor will ensure that fuels, oils, and chemical are stored in areas lined by an impermeable base and containing dykes. The Material Safety Data Sheets (MSDS) or Control of Substances Hazardous to Health (COSHH) sheets will be available at material storage area. Contractor will carry out vehicles fuel, oil, or battery fluid leakage check regularly					
17	Impact on Fauna	No major impact on the protected areas is expected. However, care will be taken during	01 COE	Contractor will sign a binding hat no intrusion or damage to protected area will take place	Contractor	DD Environment - PIU, PIU, ICISDD	GTTI, Bahawalpur	SOPs / Guidelines for Workers	Daily

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		construction at COE in Bahawalpur as Lal Suhanra Protected Area is 58 km away from GCT Bahawalpur.		during the whole construction period. Contractor will train the staff and labors to be careful about demarcated area and any involvement outside the construction camp will be monitored. Poaching, hunting, camping near the protected area will be banned.					
18	Social Issues	Local conflicts between workers and students/staff of COEs may occur, privacy of women in COEs may be at risk.	All 19 COEs	Contractor will ensure that workers follow the work ethics and will ensure that project staff interaction with students/staff and COE staff is minimum. Contractor will not allow any offence by their workers. Contractor and workers will respect the local conditions. Claims/complaints of the students/staff on construction nuisance/damages will be considered and responded promptly by the Contractor.	Contractor	DD Environment - PIU, PIU, ICISDD	All COEs	Concerns and complaints	Daily

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				Active construction sites will be cordoned off to maintain the privacy of the female students and staff. To maintain the privacy and minimum interaction of workers with students and staff members, other nearby gates of the COEs could be utilized instead of main gates.					
19	Public Health and Safety	Risks to community health and safety from construction activities, traffic/machinery movement, or failure of the building's safety features can be higher if construction sites are not fenced off properly. In addition, the prevailing Covid-19 situation may add risks of transfer either way i.e. from workers to community and	All 19 COEs	The contractor will follow Government of Pakistan Covid-19 guidelines for construction (Appendix-8) and guidance on Covid-19, which includes provision of masks, hand sanitizers etc. Training on health safety and environment will be conducted by specialist every 3 months. The Contractor will also prepare emergency response plan for such an outbreak in the construction camp. The construction activities will be performed in separated areas or at the remotest	Contractor	DD Environment - PIU, PIU, ICISDD	All COEs	HSE / Risk Logs	Daily

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		community to workers.		possible point to avoid any direct impact on public. Health, Safety and Environment (HSE) plan with an additional component of community Health and Safety will be developed and implemented by the contractor. The contractor will ensure that medical staff headed by qualified medical doctor, first aid equipment and stores, sick bay and suitable ambulance service are available at the camps all time. A proper screening of laborer will be done at the time of recruitment. Ensure that periodic awareness campaigns for COVID-19 / HIV/AIDS are undertaken for the project staff. Contractor will provide potable water and also shadow area to the workers at work place area for short breaks.					

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				The Contractor will depute guards at all entry points into construction sites 24 hours a day. Contractor will ensure appropriate arrangements and sufficient number of active emergency exits at each construction site. Contractor will ensure no machinery is left unattended in the project area. Claims from people in nearby vicinity of COEs will be well-addressed.					
20	Occupational health and safety issues	Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological hazards during project construction would be higher. The prevailing pandemic may also cause severe health issues. The students and staff	All 19 COEs	The contractor will follow Government of Pakistan Covid-19 guidelines for construction (Appendix-8) and ADB guidance on Covid-19, which includes provision of masks, hand sanitizers etc. Training on health safety and environment will be conducted by specialist every 3 months. The Contractor will also prepare emergency response plan for such an outbreak in the	Contractor	DD Environment - PIU, PIU, ICISDD	All COEs	HSE/ Risk Assessment	Daily

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		of COEs would also be prone to such risks.		construction camp. A comprehensive SSEMP and HSE plan will be developed and implemented by the contractor. The contractor will ensure that medical staff headed by qualified medical doctor, first aid equipment and stores, sick bay and suitable ambulance service are available at the camps all time. A proper screening of laborer will be done at the time of recruitment. Ensure that periodic awareness campaigns for COVID-19 / HIV/AIDS are undertaken for the project staff. Contractor will provide potable water and also shadow area to the workers at work place area for short breaks. The Contractor will depute guards at all entry points into construction sites 24 hours a day.				

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				Contractor will ensure appropriate arrangements and sufficient number of active emergency exits at each construction site. Contractor will ensure no machinery is left unattended in the project area. Providing adequate PPEs to the workers, warning signs. Potential for spread of vector borne and communicable diseases from labor camps will be avoided (worker awareness orientation and appropriate sanitation will be maintained) A monthly safety championship program at each site will be organized to encourage workers to adhere with health and safety requirements					
21	Orientation for Contractors, and Workers	Contractor and workers may have negligence to ensure compliance with	All 19 COEs	Special briefings and trainings for managers and / or on-site training for the contractors and workers on the local	Contractor, DD Environment - PIU	DD Environment - PIU, PIU, ICISDD	All COEs	Training Plan	Weekly

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		administrative rules of COEs.		rules and regulations will be conducted. SSEMP will consider all social and environmental issues. Sufficient number of Engineers/Sub-Engineers and other relevant staff will be deputed at sites, to assure all aspects of QA/QC at each site including the implementation of ESM.					
19	Handling, Transportation and Storage of Construction Materials	The transportation and installation of project equipment may have an interaction with the ongoing construction activities.	All 19 COEs	Civil contractor will cooperate and understand the importance of machinery transfer and installation in the COEs. The installation contractor will follow HSE guidelines and SSEMPs requirements. Equipment transfer plan will not coincide with major construction activities.	Contractor	DD Environment - PIU, PIU, ICISDD	All COEs Sites within the project area	HSE and Waste Management	Daily
22	Impact on Sensitive Receptors	Impact on Sensitive Receptors (other educational institutes adjacent	05 COEs	• Civil contractor will consider the sensitive receptors part of project area.	Contractor	DD Environment - PIU, PIU, ICISDD	GCT Multan, GCT Sialkot, GCT Gujranwala, GCT Lahore,	SSEMP	Daily

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		to GCTs in Multan, Lahore, Sialkot, Gujranwala and Bahawalpur.		• SSEMPs of these five COEs will consider a comprehensive plan for controlling environmental, health and safety risks to the students of these receptors. • Risk assessment will be done to avoid any impact to the institutes. Measures will be taken to control dust, noise and wastewater emissions. • Contractor will share a copy of SSEMP with the administration of receptors institutes.			GCT Bahawalpur		
23	Restoration/ Rehabilitation	The execution of construction work would have an impact on the existing land use, utilities and aesthetic values. The closure of construction activities may leave a certain impact on COEs.	All 19 COEs	Contractor will be asked to submit rehabilitation and restoration plan along with SSEMPs. Camp site is restored as per contract. Contractor will make sure that none of the COEs' utilities are disturbed or exploited. All extra products / materials, solid and liquid will be disposed off	Contractor	DD Environment - PIU, PIU, ICISDD	All COEs	Photograph	Before, Monthly

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				in accordance with the requirement of the IEE and contract document by the contractor. Contractor will make sure that site restoration is near to the baseline settings and the damage to land, property, and trees is compensated.					
24	Construction Workers / labour Safety	The execution of construction / renovation works and installation of equipment pose safety issues for the construction workers.	All 19 COEs	Best practices on Health and Safety will be adopted like: • Provision of Personal Protective Equipment to workers. • Safety trainings to the workers. • Contractor will engage drivers having all relevant licenses for operating construction vehicles and machinery. • Safe driving trainings to drivers • Adequate safety barricades for working at or near any elevated level and excavated level.	Contractor	DD Environment - PIU, PIU, ICISDD	All COEs	Visual inspection / observation • Use of PPE • Check record of safety inductions/ trainings • Compliance with best practices on health and safety.	Monthly

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				• Provision of electrical safety training procedures during electrical installations etc. • Provision of firefighting equipment and training before and during the construction. • Provision of shoring to the excavated areas on priority basis • Compliance with best practices on Health and Safety. • The contractor will have the obligation to protect the health and ensure safety of the workers involved in construction / renovation activities through preparation and implementation of OHS Plan. The contractor will supply PPE and ensure their use at the site such as safety gloves, masks, face shields, goggles, safety shoes, and safety helmet.					

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				First aid boxes will be available at each site. The workers will also follow the COVID-19 SOPs during work.					
Operation Phase									
1	Noise	Increase in noise levels in the area due to influx of more students is expected in operation phase. The noise levels are already high during night times as per baseline environmental monitoring results. According to IFC Guidelines, if the background noise levels already exceed the standard, a maximum increase in background levels of 3 dBa is allowed. The increased noise level may have less impact on COE buildings but the hostels may	All 19 COEs	The installation of double glazed windows and fixed glass windows with air conditioners are recommended to reduce noise in hostels and new buildings. (Safety signs such as “No Horns Please” will be placed at parking lots. Consideration of noise reducing measures i.e. operating the equipment in day time and closing the windows during classes. For machinery / equipment, installation of shock absorbers and proper lubrication is recommended.	PIU	Consultant, ICISDD	All COEs	Inspection	Start and Bi-annually

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		have more impacts.							
2	Health and Safety Issues to Students in Dormitories	The planned blocks in GCT Multan are across the road to other building blocks and there is a possibility of free movement between both blocks. The students/staff can be at risk of road accidents. Further, COEs and hostels may have ventilation and fire risks due to natural gas or cylinders uses	All 19 COEs	If building blocks are proposed on both sides of road then there will be a provision of pedestrian bridges in detailed design of COEs to avoid any accidents. In all buildings, firefighting equipment will be installed. Students/staff will be given training on HSE and fire risks. Proper installation of HVAC in COEs is recommended. First aid box will also be readily available in the buildings.	PIU	Consultant, ICISDD	All COEs	Pedestrian bridge, Risk Assessment at GCT Multan	Start and Bi-annually
3	Power Requirements	The addition of new building blocks and installation of new machinery/equipment would cause an impact on power requirements.	All 19 COEs	Designer will calculate the power requirements and will propose the installation of solar panels as an energy resource. The conversion of conventional lights to LED bulbs are recommended.	PIU	Consultant, ICISDD	All COEs	Electricity Bill	Start and Bi-annually

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
				Designer will also consider the green building concept.					
4	Ground Water Usage	The drinking water consumption would also increase due to increase in number of students/staff in COEs.	All 19 COEs	There will be a general thumb rule of preserving the natural resource and not wasting it. Training sessions will be conducted on groundwater preservation	PIU	Consultant ICISDD	All COEs	Running hours of water pumping	Monthly
5	Damage to Compensatory Tree Planting	The new saplings of trees which construction contractor may grow as compensation to the expected damage to green lawns and trees during construction, can be impacted by trespassers.	03 COEs	Engagement of landscape inspector to observe the growth of trees and well-being of grassy lawns.	PIU	Consultant ICISDD	All COEs	Tree Count	Monthly
6	Cleaning Mechanism of PV Solar Panels	With the passage of time, dust and soot deposit on the surface of PV modules which requires regular cleaning of PV panels on routine basis. About	19 COEs	The water supply system will be installed along the solar panel array for cleanliness purpose. There will be minimal discharge of wastewater from cleaning of solar PV modules. The wastewater emanating	Concerned COE	DD Environment - PIU, PIU, ICISDD	All COEs	Inspection	Twice a month

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		15,000 liters of water is required for 1 MW PV modules at one time[109]. If not cleaned regularly, efficiency of the solar system will be lower down day by day.		from cleaning operations will be recycled for plantation around the COEs. Periodic cleaning of the PV modules will be ensured at least bimonthly.					
7	Health and Safety Issues related to Solar Panels and System	There are occupational health and safety risks to workers who will be involved in the operation and maintenance activities of solar system. Risks generally associated to solar system's O&M are: exposure to a variety of hazards such electric shock, burn hazards; and exposure to chemicals, hazardous or	19 COEs	O&M of machinery and equipment of solar panels will be controlled and handled by efficient management, staff training, and related preventive measures. Provision of PPE's to the workers dealing with O&M of solar system. Proper training will be given to workers on health and safety measures.	Concerned COE	DD Environment - PIU, PIU, ICISDD	All COEs	Inspection	Monthly basis

[109] Renewable Resources (Private) Limited. 2017. *Initial Environmental Examination: Zorlu Solar Power Projec*t (prepared for ADB).

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		flammable materials (if any).							
8	Solid Waste Generation from Solar Power System	Different types of waste including municipal and hazardous wastes are likely to be generated during the operation phase of the COEs. The maintenance of solar system may generate small quantities of wastes, such as pieces of metal pipes, pipe fittings, copper, aluminum, rubber, silicon, glass as well as left over materials, etc. Solid wastes can also be generated from the operations of workshops within each COE whose composition depends on the activities being performed in the workshops. For example, food	19 COEs	A waste inventory of various waste generated will be prepared and periodically updated. Food waste and recyclables viz. paper, plastic, glass etc. will be stored in designated waste bins/containers. The recyclables will be periodically sold to local recyclers while food waste will be disposed through waste handling agency. Hazardous waste viz. waste oil etc. will be collected and stored in paved and bounded area and subsequently sold to authorized recyclers. Ensure immediate collection of solid waste after the completion of maintenance works. Regular trainings will be provided to staff involved in solid waste management.	Concerned COE	DD Environment - PIU, PIU, ICISDD	All COEs	Inspection	Monthly basis

Sr. No.	Project Components / Activity	Impacts	COEs	Mitigation Measures	Responsibility		Location to Implement	Parameters for Monitoring	Monitoring & Reporting Frequency
					Implementation / Reporting	Monitoring/supervision			
		technology lab may produce organic waste whereas automobile technology lab may produce waste lubricants, pieces of metals, etc. These waste can potentially cause soil and water contamination, if not properly managed.							

9.6. Contractor's SSEMPs

359. The contractor(s) will prepare SSEMP for each of the COE taking help from ADB's handbook on SSEMP, IEE and EMP, that will contain the aspects and key elements of following site-specific plans to eliminate, offset or reduce environmental, social and health and safety impacts during construction phase:

(i) Site plans, site boundaries, sensitive receptors & environmental values
(ii) Specify construction activities and conduct risk assessment
(iii) Prepare environmental mitigation and monitoring plan
(iv) Sanitation plan
(v) Soil pollution control plan
(vi) Dust control plan
(vii) Waste management plan
(viii) Occupational health and safety plan (including COVID-19 measures)
(ix) Vibration management plan
(x) Noise abatement plan
(xi) Traffic management plan
(xii) Construction camps management plan
(xiii) Campsite restoration plan
(xiv) Tree plantation/management plan
(xv) Social management plan
(xvi) Labor influx management plan
(xvii) Community health and safety plan
(xviii) Emergency preparedness plan
(xix) Asbestos management plan

9.7. Environmental Monitoring and Reporting

360. Environmental Monitoring provides timely and useful information to the project management and implementation agencies. Conceptually, "monitoring" means to check and balance, on a regular basis, the status of the project activities and realization of various developmental targets during construction and operation and maintenance (O&M) phases. It helps in timely identification/analysis and removal of the bottlenecks and expedites actions. Certain environmental parameters (physical, chemical and ecological) are selected and quantitative analysis is carried out. The results of analysis are compared with the guidelines; standards and pre-project condition to investigate whether the EMP and its implementation are effective for the mitigation of impacts or not.

1. Objectives

361. The objective of environmental monitoring program during the construction phase will be as follows:

(i) Monitor the actual project impacts on physical, ecological and socio-economic receptors;
(ii) Recommend mitigation measures for any unforeseen impact or where the impact level exceeds than the anticipated in the IEE;
(iii) Ensure compliance with legal and community obligations including safety during construction phase;

(iv) Ensure the safe disposal of excess construction materials, solid waste, water and wastewater and gaseous emissions;
(v) Appraise the adequacy of the IEE with respect to the project's predicted long-term impacts on the area's physical, ecological and socio-economic environment;
(vi) Evaluate the effectiveness of the mitigation measures proposed in the EMP, and recommend improvements in EMP, if required; and
(vii) Compile periodic incidents/accidents data to support analyses that will help to minimize future risks.

2. Major Receptors

362. The main receptors during the construction phase are mainly:

(i) Students and teaching staff within CEOs and settlements near the Project Area.
(ii) Tube wells, the sources of drinking water;
(iii) Agricultural fields including crops;
(iv) Trees and other plantation in vicinity of Project Area

3. Implementation of Monitoring

a. Contractor

363. Physical implementation of the EMP is the sole responsibility of Contractor during the construction of the project. Contractor will be responsible for in-house monitoring to ensure that the construction activities are being carried out as specified in the EMP.

b. DD Environment - PIU

364. DD Environment - PIU will be responsible to check the environmental monitoring activities (during construction phase) being carried out by the Contractor and will perform the following activities.

(i) Check whether monitoring of the environmental aspects of project during construction phase is being properly carried out and to ensure that the environmental requirements of the contract and the mitigation measures proposed in the EMP are implemented;
(ii) Undertake routine visual monitoring of construction activities, solid and liquid waste disposal, storm water drainage management, noise levels, exhaust gases etc.;
(iii) Review the monitoring reports that would be prepared by the Contractor and make recommendations (if any); and
(iv) To submit a monitoring report to Proponent and actions taken for rectification.

4. Environmental Monitoring Methodology

365. As mentioned earlier, the baseline environmental monitoring was originally conducted in July 2020 following all the required SOPs and guidelines. An independent environmental monitoring laboratory i.e. M/s Environmental Services of Pakistan Private Limited (ESPAK) was engaged for this purpose. The baseline environmental monitoring report prepared and submitted by M/s ESPAK is also annexed as Appendix-V to the IEE. The referred report also provides information on the methodology adopted for environmental monitoring. However, a similar process of the baseline monitoring for ground water, wastewater, ambient air and noise at all COE sites will be conducted again through an independent, EPA approved laboratory to determine the most recent baseline levels at the detail design stage and prior to the start of construction works.

Similarly, Table 8.2 below also provides information regarding parameters to be tested, their frequencies and responsibilities at each phase including detailed design, pre-construction, construction and operation of the project. Phase wise costing of environmental monitoring is also provided in Table 8.4.

366. Under the proposed monitoring methodology, it is recommended that PIU of ICISDD shall be responsible for all the monitoring activities. All the findings and results in the form of monitoring report will be finally shared with Punjab-EPA as well as with ADB as part of Semi Annual Monitoring Report. The monitoring program has been designed carefully considering the identified impacts mentioned in Chapter-7 and some additions or deletions probably in frequency may be taken up in this program after learning lessons from one-year operation of the project through Change Record Register. Table 8.2 provides environmental monitoring schedule for construction and operations stages of the project.

367. Monitoring mechanism for groundwater and wastewater samples will be discrete grab sampling and laboratory testing of water samples by EPA approved laboratory for monitoring whereas ambient air and noise levels will be monitored through onsite monitoring through certified equipment of same laboratory. Soil testing is also recommended to be performed from certified soil testing laboratory e.g., Pakistan Council of Scientific and Industrial Research (PCSIR), Soil Survey of Pakistan, etc.

368. Detailed methodology for conducting the monitoring will be prepared and shared with ADB by Supervision Consultant / PIU prior to commencement of the monitoring exercise.

5. Monitoring Parameters and Frequency

369. The major negative impacts of the Project activities are related to ambient air & noise, and water resources, which will directly or indirectly effect the environment and will cause health problems to the receptors residing in the surrounding of the power plant. In order to counteract these problems an environmental monitoring protocol has been proposed (Table 8.2). The environmental monitoring needs to be conducted through an independent, EPA approved laboratory. The proposed protocol contains the following monitoring parameters:

a. Physical Environment

370. For physical environment, following parameters will be monitored:
- (i) Ambient air quality
- (ii) Noise levels
- (iii) Water (Ground and surface)
- (iv) Wastewater
- (v) Solid waste disposal

b. Socio-economic Environment

371. Effects on the socio-economic environment during construction phase will be monitored by Social Safeguard Team, considering parameters like employees' accommodation and food related facilities, community health and safety, mobility of local women, code of conduct with COE people.

Table 8.2: Environmental Monitoring Plan

Project Phase	Parameters	Location	Frequency	Responsibility
Detailed Design Stage				
Ambient Air Quality	PM10, PM2.5, SO2, NOx, O3 CO, and VOC.	19 COEs	Once at During Detailed Design	Detailed Design Consultant
Ground Water Quality	Color, pH, Odor, Taste, Turbidity, TDS, TSS, Heavy Metals, Phosphate, NH3, Arsenic, Sulphate, Sulfide, Coliforms, Other Heavy Metals and Fecal Coliforms	19 COEs	Once at During Detailed Design	Detailed Design Consultant
Noise Level	Noise levels on dB (A) scale	19 COEs	Once at During Detailed Design	Detailed Design Consultant
Pre-Construction Phase				
Ambient Air Quality	PM10, PM2.5, SO2, NOx, O3 CO, and VOC.	19 COEs	Once, before starting any civil works	Contractors Submission to PIU and SCs
Ground Water Quality	Color, pH, Odor, Taste, Turbidity, TDS, TSS, Heavy Metals, Phosphate, NH3, Arsenic, Sulphate, Sulfide, Coliforms, Other Heavy Metals and Fecal Coliforms	19 COEs	Once, before starting any civil works	Contractors Submission to PIU and SCs
Noise Level	Noise levels on dB (A) scale	19 COEs	Once, before starting any civil works	Contractors Submission to PIU and SCs
Construction Phase (Complete i.e. Start to End)				
Ambient Air Quality	PM10, PM2.5, SO2, NOx, O3 CO, and VOC. Visual monitoring of dust	At representative sensitive receptors around 19 COEs	Quarterly	Contractor (s), Submission to PIU and SCs
Ground Water Quality	Color, pH, Odor, Taste, Turbidity, TDS, TSS, Heavy Metals, Phosphate, NH3, Arsenic, Sulphate, Sulfide, Coliforms, Other Heavy Metals and Fecal Coliforms	19 COEs	Quarterly	Contractor (s), Submission to PIU and SCs

Project Phase	Parameters	Location	Frequency	Responsibility
Wastewater Quality	PEQS 32 Parameters.	19 COEs	Quarterly	Contractor (s), Submission to PIU
Noise Level	Noise levels on dB (A) scale	At representative sensitive receptors around 19 COEs 19 COEs	Quarterly	Contractor (s), Submission to PIU
Soil	Oil and grease, Total Toxic Metals, Nitrate and Phosphate	19 COEs	Quarterly	Contractor (s), Submission to PIU
Operation Phase				
Ambient Air Quality	PM_{10}, $PM_{2.5}$, SO_2, NOx, O_3 CO, and VOC	At representative sensitive receptors around 19 COEs	Quarterly	PIU
Noise	Noise levels on dB (A) scale	At representative sensitive receptors around 19 COEs	Quarterly	PIU
Drinking Water	Color, pH, Odor, Taste, Turbidity, TDS, TSS, Heavy Metals, Phosphate, NH_3, Arsenic, Sulphate, Sulfide, Coliforms, Other Heavy Metals and Fecal Coliforms	19 COEs	Quarterly	PIU
Wastewater	PEQS 32 Parameters.	19 COEs	Quarterly	PIU
Soil	Oil and grease, Total Toxic Metals, Nitrate and Phosphate	19 COEs	Quarterly	PIU

9.8. Waste Management Framework

372. There is a possibility of exposure to hazardous substances from old building such as Asbestos. The WMF describes general procedures or guidance on waste management issues including hazardous waste. It has been assessed that various types of waste will be generated during the construction, rehabilitation phases of the proposed COEs, mainly at 15 sites. This plan also addresses how waste will be managed by Contractor. This WMF is intended to serve as;

(i) A primary waste management reference document;
(ii) A basis for the Contractor and Proponent (ICISDD) to develop a detailed WMP during construction and rehabilitation respectively; and,
(iii) A compliance bench mark.

1. Relevant National Rules, Regulations and Institutions

373. Following is the list of relevant legal requirements:
- (i) PEPA 1997 (Amended 2012) Section 11;
- (ii) PEQS for Wastewater Effluents;
- (iii) Hospital Waste Management Rules, 2005;
- (iv) Draft Hazardous Substances Rules, Punjab;
- (v) Draft Guideline for Solid Waste Management, 2005;
- (vi) Final Report for Domestic Solid Waste Management in Pakistan, 2002;
- (vii) Public Health Engineering Department, Punjab;
- (viii) Local Government Act; and
- (ix) EPD-Punjab.

2. Type of Waste

374. Following are the main types of expected wastes:
- (i) Solid Waste;
- (ii) Wastewater; and
- (iii) Other hazardous waste.

3. Construction Wastes and their Disposal Method

375. The waste envisaged to be generated during the construction phases of the proposed project include;
- (i) Steel;
- (ii) Concrete;
- (iii) Fuel;
- (iv) Wood;
- (v) Cotton;
- (vi) Paper;
- (vii) Plastics;
- (viii) Rubbish;
- (ix) Food;
- (x) Organic Waste;
- (xi) Wastewater;
- (xii) Waste Oil;
- (xiii) Medical treatment materials such as bandages, swipes etc.; and
- (xiv) Other types of wastes.

376. The anticipated waste will be collected, handled and stored through a properly designed Waste Management System. Contractor will develop details of this system for construction phase based on the general protocols as follows:
- (i) Best management practices for safe handling and disposal of hazardous/toxic material if found will be considered. Contractor would analyze all such materials from an EPA registered laboratory. The collection of material would involve covering suits, PPEs proper packaging of hazardous material, transportation will follow the international standards avoiding any kind of spill and release into the environment, disposal will be done in collaboration with city waste management company and EPA either through engineered landfill or incineration.
- (ii) Color coded waste buckets will be provided within the contractor's camp so that the waste will be categorized and separated accordingly;

(iii) Some of the construction waste/waste material to be generated at the construction site may be hazardous to the environment or to personnel. It is always important to read the MSDS of the materials or products that are located on-site; they may contain warning information that indicates a potential problem. All hazardous wastes will be clearly labeled. Scrap, Trash other waste will be placed in designated containers;

(iv) Divert the filtered waste to the nearest available landfill site. If the landfill site is not available then Contractor needs to develop a landfill at the area mutually agreed with the Proponent, Social Safeguard Team, Local Community, TMA and District Government Punjab;

(v) Based on the conditions of the region, organic waste will be frequently collected to avoid odor problems;

(vi) Temporary waste storage area will be prepared, maintained and visually inspected and recorded on regular basis by the HSE Section of Contractor during the construction phase;

(vii) Wastewater generated at contractor's camp will be disposed off in the soaking pit;

(viii) The final location of the pits will be mutually agreed on-site with Social Safeguard Team, HSE Section of Contractor and Proponent;

(ix) The contractor will keep accurate records that track the amount of waste generated and the disposal method used;

(x) Regular clean-up of scrap material, saw dust, rags, oil, paint, grease, flammable solvents and other residue of construction operations will not only remove or reduce the fire hazard, but shall promote general safety at the same time.

(xi) Site restoration and cleaning of all waste material after ending of contract period.

4. Transportation and Disposal Record Sample

377. Contractor will be responsible for the lawful transportation and disposal of the collected waste in approved facilities, a sample sheet of Transportation and Disposal Records is shown below in Table 8.3:

Table 8.3: Sample Sheet of Transportation and Disposal Records

NAME OF STATION				
MODE OF TRANSPORTATION				
WASTE DISPOSAL STATION				
VEHICLE NUMBER				
Waste Type	Hazardous Yes/No	Non-Hazardous Yes/No	Quality and Quantity of Waste	Disposal
SUPERVISOR SIGNATURE DATE			FACILITY SUPERVISOR SIGNATURE DATE	

9.9. Environmental Training

378. For the given EMP and all associated frameworks, it has been envisaged that training of concerned / responsible teams is an important task. Training and awareness programs will be developed for each phase. Following trainings as a minimum will be given to the implementing / executing agencies during the course of the project:

(i) Design Phase: PIU Training on Development of SSEMPs from main EMP & Compliance Assurance
(ii) Construction Phase: PIU Training on HSE and EMP Compliance Monitoring, Contractor Training on SSEMP implementation and HSE Management, Preventive Medical Treatment, Checkups and Pre-examination.
(iii) Operation: COEs Management / Administration staff training on HSE awareness

9.10. Health & Safety Management Framework

379. The Health and Safety Management Framework provides a basis for Contractor to create a detailed plan to reduce and remove any harm due to construction activities to local management, construction staff and local residents' health and ensure human safety of the management and construction staff at the project site.

1. Occupational Health and Safety Hazards

380. Hazards at the construction site can occur due to:

(i) Covid-19 spread
(ii) Over-exertion;
(iii) Slips and Fall;
(iv) Working on Heights;
(v) Exposure to heat (hot work);
(vi) Struck by Objects;
(vii) Moving Machinery;
(viii) Dust;
(ix) Confined Spaces and Excavations; and
(x) Other Site Hazards etc.

2. Safety Planning

381. The potential safety requirements that will be taken care of during construction are as follow:

(i) Government of Pakistan Covid-19 guidelines for construction will be followed religiously;
(ii) Everything needs to be properly ordered;
(iii) Confined space entry procedures;
(iv) Compress gas cylinder safety;
(v) Leakage and spillage control;
(vi) Compliance with safety belt requirements;
(vii) Provision of protection rail;
(viii) Provision of safety signs on construction site;
(ix) Inspection at open bulk excavation area;
(x) Measure for operation of electrical and mechanical equipment;
(xi) Forecasting and precautions against natural disaster;
(xii) Providing driving/operating safety requirements;

(xiii) Installation of traffic signs on construction roads;
(xiv) Safety guard during transportation of dangerous products;
(xv) Providing slip and fall trainings;
(xvi) Use of personal protective equipment (PPE) provides additional protection to workers exposed to workplace hazards;
(xvii) Controlled measures for confined spaces; and
(xviii) Disciplinary sanctions against offenders.

3. Health Plan

382. The HSE Section of the Contractor will be responsible for publicizing and implementing labor protection, covid-19 inspection, isolation of those who are infected from disease, vocational health and sanitary epidemic prevention policies and standards during construction, offering health training to the staff and applying preventive measures. Some of the clauses that will be duly taken care while preparing a Health Plan will include the following:

(i) Measures to avoid diseases on site;
(ii) Establishment of the construction staff's vocational health file; and
(iii) Establishment of the medical treatment room and configuring professional medical treatment and nursing staff.

4. Responsibility

383. Contractor will establish HSE Section as a standing organization for health and safety management and Covid-19 testing during the construction phase. The contractor construction units will be responsible for establishing the management system, implementation of management measures and ensuring realization of its objectives. While during the O&M phase, PIU and Contractor will be held responsible for all HSE issues.

384. The details of organizational structure, roles and responsibilities will be determined in detailed plan to be prepared by the Contractor.

5. Health and Safety Documentation

385. Contractor will be responsible for implementing the following procedure and rules during the construction phase. These include:

(i) Covid-19 log book
(ii) Permit to work system;
(iii) The field safety management rules;
(iv) Labor protection management rules;
(v) Fire-fighting management rules;
(vi) The field traffic management rules;
(vii) Working order management rules for special operation;
(viii) Emergency proposal, and location and arrangement of emergency exits;
(ix) Management rules for safety meeting;
(x) Various safety check records and meeting minutes; and
(xi) Training records.

6. Suggested Contents of Health and Safety Plan

386. The suggested contents of Health and Safety Plan to be developed by the Contractor are described below:

(i) Purpose
(ii) Scope of Application
(iii) Complying Basis
(iv) Health and Safety Objectives
(v) Organization and Responsibility
  a) Project Manager
  b) HSE Management Department of the Contractor
  c) Contractor Medical Treatment Room of the Contractor
  d) Occupational Health and Safety
  e) Community Health and Safety
(vi) Health Plan
  a) Labor Protection
  b) Sanitary Epidemic Prevention
(vii) Safety Plan
  a) Summary
  b) Qualification Review
  c) **3,658.54**Safety Training
  d) Construction Plans and Documents
  e) Control Measures
  f) Monitoring Measures
  g) Management of the Key Safety Accidents
(viii) Public Security Plan
(ix) Local Community Health and Safety

9.11. Traffic Management Framework

387. During the course of the construction of proposed Project, Contractor will provide the signage and/or traffic control to the extent deemed necessary by the conditions and amount of traffic using or accessing the site roads. These signs will inform, control, warn, shift, or stop traffic on all site roads affected by the project's heavy traffic. The following measures will be taken during the construction phase for the effective implementation of the traffic plan:

(i) Pakistan national and local traffic rules and regulations, instructions manual for motor vehicle and mobile machinery operation is to be followed;
(ii) No one will be allowed to drive motor vehicle or operate mobile machinery without a driving license;
(iii) It will be prohibited to drive or operate vehicle in case of over fatigued or mental disease;
(iv) Traffic speeds on unpaved roads will be limited to no more than 30 Km per hour;
(v) Traffic speed signs will be displayed prominently at all site entrances;
(vi) A daily routine checkup of vehicles will be conducted no less than 5 minutes before its service;
(vii) Use of appropriate signs, equipment, and traffic control measures that conform to the provisions in the Traffic Manual of city traffic police;
(viii) Traffic inspection and security during transportation;
(ix) Limit vehicular traffic designated access roads, construction laydown area worker, parking areas and the project site;
(x) All damaged, destroyed or modified pavement legend, traffic control devices, signing and striping associated with the proposed development will be replaced as required prior to issuance of a certificate of Occupancy; and
(xi) Construction signs, lighting and barricading will be provided during construction as required.

1. Material Transportation Routes

388. These routes would be specified for construction camp and will be established in such a way that there is a minimum hindrance or disturbance to the local communities and to the flow of traffic. The routes will be marked on a map by the Contractor and approved by District Traffic Police, District Government and concerned road authority.

2. Material Transportation and HSE Arrangements

389. Following arrangements will be made for Material Transportation and HSE:

(i) Transportation timings will preferably be at night, to minimize the traffic conflicts;
(ii) Filled trucks will be covered with tarpaulin to avoid fugitive dust and will be visually inspected for proper loading, sealing and decontamination;
(iii) Bulk solid debris will be removed from the trucks with shovels before leaving the site. Where necessary, trucks will be pressure washed before leaving the site. Pressure washing will only be used if other methods do not work;
(iv) Vehicles will be passed an annual inspection and carry a fitness certificate;
(v) A summary chart representing the load and maps showing the proposed route to the disposal facility will accompany with each truckload. In the event of an accident involving the transported material, it will immediately be notified to Social Safeguard Team of Proponent, Traffic Police; and
(vi) The truck drivers will be strictly instructed not to play music and use horns at night time to minimize disturbances.

3. Material Transportation Documentation

390. A field logbook will be maintained for the documentation. This logbook will additionally serve to document observations, onsite personnel, equipment arrival and departure times, a truck exit inspection checklist and other project information.

391. Field logbooks will document where, when, how, and from whom any vital project information is obtained. Logbook entries will be completed and accurate enough to permit reconstruction of field activities. Logbooks will be bound with consecutively numbered pages. Each page will be dated and the time of entry will be noted. All entries will be legible, written in black ink, and signed by the individual making the entries. Language will be factual, objective, and free of personal opinions or inappropriate terminology. If an error is made, corrections will be made by crossing a line through the error and entering the correct information. Correction will be dated and initialed. No entries will be obliterated or otherwise rendered unreadable.

392. Entries in the field logbook will include at a minimum the following for each field work date:

(i) Site name and address;
(ii) Recorder's name;
(iii) Time of site arrival/entry at site and time of site departure;
(iv) A Summary of any onsite meeting;
(v) Description of transport vehicles;
(vi) Quantity of materials in truck (approximate percentage of full load);
(vii) Names of waste transporters and proposed disposal facilities;
(viii) Quantity of material in truckloads; and
(ix) Levels of safety protection.