

8 ENVIRONMENTAL AND SOCIAL IMPACTS AND RISKS AND MITIGATION MEASURES

This Chapter assesses the suitability of the project and its site from E&S perspective and estimates the magnitude and significance of key E&S risks and impacts associated with the project.

8.1 Risk Screening

To study the risks and impacts involved with the project, risk screening criteria based on AIIB's ESF was employed as shown in the **Table 8-1** and the risk assessment for this project is presented in the **Table 8-2**. Mitigation measures for impacts that are substantial and higher in rating is presented in Section 8.2. Those with moderate to low ratings, mitigation measures are included in the rationale column in **Table 8-2**.

Table 8-1: Impacts and Risk screening criteria

Risk Category	Screening Criteria
High	The resource/receptor would likely experience a large magnitude impact that would last for a long time, extend over a large area, exceed national/international standards, endanger public health and safety, threaten a species or habitat of national or international significance, and/or exceed a community's resilience and ability to adapt to change. The Project may have difficulty in complying with the applicable ESF requirement, and significant mitigation would likely be required.
Substantial	The resource/receptor would experience a clearly evident change from baseline conditions and would approach but not exceed applicable standards. The Project would comply with the applicable ESF requirement, but mitigation would be required.
Moderate	The resource/receptor would experience a noticeable effect, but the magnitude of the impact is sufficiently small (with or without mitigation) that the overall effect would remain well within applicable standards. The Project would comply with the applicable ESF requirement, but mitigation may be required.
Low	The resource/receptor will either not be affected or the likely effect would be imperceptible or indistinguishable from natural background variation. The Project would comply with the applicable ESF requirement and mitigation would typically not be required.

Table 8-2: Impacts and Risks assessment for the Project

ESF Standards, Environmental Impacts and Social Risks	Risk Ratings before Mitigation and Control		Rationale	Mitigation	Risk Ratings after Mitigation and Control	
	Construction Stage	Operation Stage			Construction Stage	Operation Stage
ESS1: Assessment and Management of E&S Risks and Impacts						
Cumulative impacts	Low	Low	There are no major cumulative impacts except the transportation of materials for local construction industry and the Project using local access or diversion roads when N5 is closed due to construction.	Mitigation measures include coordination between construction and local traffic under the monitoring of NHA to avoid major consequence.	Low	Low
Lack of appropriate E&S personnel with Construction Supervision Consultant (CSC), Contractors and the Implementing Agency (IA)	Substantial	Low	Appropriate E&S personnel are essential to implement, supervise, and monitor the ESMP, LMP, and OCHS Plan. Supervision and monitoring during project implementation provide information about key environmental and social aspects of the project and the effectiveness of mitigation measures. Such information enables the IA and the Bank to evaluate the success of mitigation and allows corrective action to be taken when needed. Inadequate resources will lead to major impacts and risk in the physical, biological and social environment and eventual harms to environment and non-compliances with ESMP requirements.	Mitigation measures include compliance of this EIA particularly following guidance for creating different plans and staff requirements with education, experience and training in the ESMP and in the bidding documents.	Low	Low
Inadequate implementation of ESMP, LMP, OCHSMP.	Substantial	Low	Lack of experience of the contractor in implementing environmental, health and safety standards required by the ESF. Lack of resources and qualified Environment, Health, and Safety (EHS) staffs with various organization will become bottlenecks for the correct implementation, supervision, and monitoring of the ESMP. The ESMP and other plans identify measures and actions in accordance with the mitigation hierarchy and hierarchy of control that reduce potentially adverse environmental impacts and social risks to acceptable levels. Inadequate implementation will result in major concern from the community and risking the health and safety of the workforces and lead to major injuries and illness.	- Recruit qualified contractors who maintains environmental sustainability in corporate strategy. - Avoid contractors with poor environmental, health, and safety management. - Contractor's qualifications stated in the ESMP are included as the pre-qualification criteria in the short-listing process. - Ensure that the conditions of the ESMP is correctly reflected in the contractor's bidding documents and the supervision consultant's TOR. - EHS bills of quantities are included in the specifications. - Education, qualification and training requirements of personnel are included in the bidding documents and considered by the supervision consultant when they give approval to the contractor. - Prepare C-ESMP, and OCHSMP based on the Chapter 9 and Chapter 10 ESMP. - Recruit qualified staffs to implement the C-ESMP, and OCHSMP.	Low	Low
ESS1: Labor and Working Condition						
Working Conditions	Moderate	Low	Around 800 construction workers will be on project sites and 70 percentage of them will be sourced from the local communities. The local people are mostly poverty-stricken with lower incomes and poor access to social services. Poor enforcement of labor laws in Pakistan may lead to labor right abuses. Therefore, working condition is susceptible to not meet the standards due to the existing baseline condition.	- Mitigation measures include construction related skill development, employment of local workers by the Contractors, supervision from the PIU-HQ to ensure the Contractors are following the labor standards, training for the workers on the existing GRM so they know their rights and responsibilities, and availability of complaint box allowing for workers to report any wrongdoings. - Effective compliance of LMP.	Low	Low
Worker Accommodations	Moderate	Low	Workers will either be accommodated in their homes or on site in worker's camp. Poor sanitation and hygiene, overcrowding, fire safety issues, traffic safety, pest control, and poor ventilation	Mitigation measures include having dedicated cleaning staff, routine checks of the conditions of the accommodations, penalties (to act as deterrent rather than with the intention for punishment)	Low	Low

ESF Standards, Environmental Impacts and Social Risks	Risk Ratings before Mitigation and Control		Rationale	Mitigation	Risk Ratings after Mitigation and Control	
	Construction Stage	Operation Stage			Construction Stage	Operation Stage
			are the likely impacts that need to be addressed in the dormitories assigned for workers since they can impose particular risks in cooking and washing facilities. Additionally, they are exposed to greater risks of being infected by communicable diseases due to difficulty in socially isolating in their given living condition.	for workers who are careless and intentionally do not uphold the safety and hygiene standards. Preparation of Camp Management Plan by the contractor and its approval by CSC		
Child and forced labor	Low	Low	As discussed previously, the baseline condition of the enforcement of labor rights is poor and since the local community faces high level of poverty, child labor and forced labor are one of the likely labor rights risks.	- Mitigation measures include adding legal requirements in Contractor contracts that they must not employ underage workers, and positive identification before hiring. - The contractor will comply with the labor laws of the Country. - When sourcing for primary suppliers, the project will require such suppliers to identify the risk of child labor/forced labor and serious safety risks.	Low	Low
Risk of falling in water or drowning during bridge construction and maintenance over water	Moderate	Moderate	The construction of bridges and their maintenance over water will require many workers to be working on elevated structures. The controls of these risks to be considered in the Occupational and Community Health and Safety Management Plan of contractors and NHA. During operation risk of falling will be lower than the construction stage.	- Contractors will prepare and implement Occupational Health and Safety (OHS) management plan that would include standard operating procedures (SOPs) for all works, requirement of conducting Job Hazard Analysis and preparing Method Statements containing OHS aspects, OHS training requirements, incident recording and reporting protocols. - Subcontract the work to a specialized company who has good track record. - Minimize manual works overwater and use mechanical equipment instead. - Provision should be made for: - As appropriate the passive safety system such as fencing, guard and mid-rails in the scaffold, safety nets to prevent workers from falling into water; - The rescue of workers in danger of drowning; - Safe and sufficient transport. - Availability and use of life jackets.	Low	Low
Occupational Health and Safety (OHS)	substantial	Substantial	- Occupational health and safety risks in Pakistan are heightened due to weak safety practices, poor labor rights enforcement, and inadequate worker accommodations. Key hazards include heavy equipment operation, man/machine interaction, hazardous materials, trip and fall risks, dust, noise, falling objects, and electrical dangers, especially during construction. - While risks decrease in the operational phase, maintenance work near live equipment and energized overhead lines still presents significant hazards.	- Contractors will prepare and implement OHS management plan that would include standard operating procedures (SOPs) for all works, requirement of conducting Job Hazard Analysis and preparing Method Statements containing OHS aspects, traffic interface planning, working at height and hot work permit, barricading, OHS training requirements, incident recording and reporting protocols. - NHA will prepare a similar Plan/System for the operation phase.	Moderate	Moderate
Employment generation	Positive		Approximately 800 jobs are expected to be created during the construction phase (200 skilled and 600 unskilled or low skilled). Most unskilled positions are likely to be sourced from the local districts and communities, thereby sharing project benefits with affected communities. They will be in roles as laborers, security, catering, cleaning, and drivers of vehicles. Employment generation will contribute to household income and will improve households' socioeconomic conditions, providing greater	A skill development plan is proposed to train local workers in construction trade, such as, welding, mechanic, operation of heavy equipment and construction machinery, etc.	-	-

ESF Standards, Environmental Impacts and Social Risks	Risk Ratings before Mitigation and Control		Rationale	Mitigation	Risk Ratings after Mitigation and Control	
	Construction Stage	Operation Stage			Construction Stage	Operation Stage
			security and reducing people's sensitivity to socioeconomic shocks and impoverishment risks. For the local impoverished people, this can increase their wellbeing and resilience. The employment will also contribute to skills development and professional experience, therefore making the beneficiaries more employable in the future, further reducing vulnerability.			
Enhancement of economic growth due to improved road connectivity		Moderate	The proposed reconstruction of Phase 1A (ICT section) N5 will reduce congestion, enhance traffic flow, ease movement of road users and goods and thus generate movement of more cargo by road and correspondingly economic growth.	• AIIB supports sustainable infrastructure and productive sectors to foster economic growth and improve lives. Aligned with the SDGs, it integrates economic, social, and environmental dimensions of sustainability. The Bank adheres to sustainable development principles in project planning and execution, as outlined in its Environmental and Social Policy.		
ESS1: Resource Efficiency and Pollution Prevention						
Land use change	Substantial	Low	Land will be cleared for the highway expansion (ICT Section of 17.5 km 2-lane), service road (3 km 2-lane both way), 14 bus bays, 11 controlled U-turn using median strips and to build access roads for material transportation. Land clearance will occur during the early stage of construction period for a limited amount of time. The sensitivity of the soil at the construction site is considered medium since it is susceptible to erosion. In addition, there will be about 1,500 m ² land required for the construction camp and yard for each section of the road.	Mitigation measures would include proper land clearance planning, spoil management measures, vegetation clearance and erosion management, sediment management, design of storm water drainage in construction areas as well as design and implementation of site erosion control.	Low	Low
Landscape aesthetic	Moderate	Low	A change in the visual appearance of the landscape will occur during construction and operation phase when 01 flyover, 12 pedestrian bridges, 3 km service roads and noise barriers will be constructed at selected urban locations. The new change in landscape might be deemed cause of concern to residents and visitors which could lead to complaints.	Mitigation measures would involve careful siting of project components and improve landscape through plantations.	Low	Low
Air pollution	Substantial	Moderate	Ambient air quality monitoring found very high concentration of SO₂ (54.8 µg/m³ in average in Section 7 against the national standard of 40 µg/m³), PM₁₀ (127.5 µg/m³ in average in Section 7 against the national standard of 45 µg/m³), and PM_{2.5} (44.5 µg/m³ in average in Section 7 against the national standard of 15 µg/m³), exceeding the stringent emission standards (WHO, NEQS, IFC). Airshed in major cities of Pakistan are already degraded as transboundary pollution is a major contributor to fine particulate matter in South Asia, while elevated SO₂ concentrations primarily result from the high prevalence of diesel-fueled vehicles, traffic congestion at intersections, deteriorating pavement conditions, and emissions from coal-fired power plants. Local air quality including dust is expected to deteriorate further due to emissions from construction plants, equipment, and exacerbation by traffic congestion. The impact on air quality is considered significant, driven by activities such as construction plant operations, traffic diversions, site clearance, earthwork, and excavation. These emissions will be concentrated along the highway corridor during the construction phase.	Mitigation measures would include emissions management from construction vehicles, frequent sprinkling of water on unpaved roads, regular maintenance of vehicles and construction equipment, and preventing the release of emission from burning waste materials. Dust control measures will consist of regular vehicle and equipment maintenance program, proper construction materials planning, dust management, and frequent water sprinkling. The NHA in collaboration with federal EPAs and the Climate Change Division (CCD), may establish a Continuous Emission Monitoring System (CEMS) to assess air quality in the project area. This system will monitor major intersections and sensitive receptors in accordance with the stringent emission standards (WHO, NEQS, IFC) for a specified duration, capturing air quality concentrations during the operational phase. Additionally, planting greenbelts along the highway is a preferred method to mitigate air pollution.	Moderate	Low

ESF Standards, Environmental Impacts and Social Risks	Risk Ratings before Mitigation and Control		Rationale	Mitigation	Risk Ratings after Mitigation and Control	
	Construction Stage	Operation Stage			Construction Stage	Operation Stage
			Dust generation, particularly in dry conditions, will have substantial effects extending beyond the immediate vicinity. A major source of dust pollution will be the resuspension of particles from unpaved roads due to construction traffic. Given the limited capacity of the local community to adapt, the potential degradation of air quality is a significant concern. During the operation phase, the expanded highway capacity, along with service roads for local traffic, protected U-turns, pedestrian bridges, flyovers, and underpasses, will enhance traffic flow, reducing congestion and lowering overall traffic emissions, thereby contributing to improved air quality.			
Disturbance due to noise and vibration	Moderate	Substantial	- Baseline noise monitoring along the Phase 1A (ICT section) highway revealed high noise levels, with average daytime readings of 75 dBA at Section 7 exceeding the standard of 65 dBA for commercial area. Nighttime levels were also elevated at 64 dBA, surpassing the 55 dBA standard. - Following a thorough review of the survey locations, it was found that noise monitoring was primarily conducted near the roadway rather than at receptor locations. Future monitoring should prioritize receptor sites to more accurately capture ambient noise levels, which are likely to be lower than those recorded near the road. - Construction activities may further disturb nearby settlements and businesses due to noise and vibrations from vehicles and equipment on service roads and the highway, as well as from construction camps, potentially disrupting local wildlife. - Operational noise impacts are expected to increase due to higher traffic volumes due to uninterrupted flow in the 6-lane main highway and traffic segregation. Preliminary forecasts from the Traffic Noise Model (TNM 3.0) anticipate average noise levels along highway, will rise to 86.2 dBA by 2030 and 88.2 dBA by 2045.	- Mitigation measures include requiring contractors to add provisions for noise and vibration management, organize the loading and unloading of trucks, and handling operations for the purpose of minimizing construction noise on the work site. - Avoiding/minimizing noisy works during the night time as far as possible and maintaining community liaison to aware people about the construction activity. - A more comprehensive noise assessment will be conducted later, including additional noise measurements, modeling, and assessments—particularly at noise-sensitive locations. Based on the detailed results of noise modeling at receptor locations, tailored noise mitigation measures will be implemented. This approach takes into account concerns from some affected groups who oppose physical barriers, as these may block visibility and access to their businesses, potentially discouraging customers. - Vibration measurement during construction phase by the contractor near the settlements/sensitive receptors. - Timing of the construction works to be conducted during the recommended operational hours, to reduce vibration levels to residential properties; - Residents to be pre-warned of high vibration events; - Noise barriers along highways are effective structures designed to mitigate noise pollution from traffic. Depending on the topography and sensitivity of receptors, any of the following noise barriers can be considered: - earth mounds (berms) that absorb sound, - solid barriers made from materials like concrete, wood, or metal, which can reflect sound, - transparent barriers often made of acrylic or glass, these allow visibility while reducing noise.	Low	Moderate
Potential hazards caused by fuels, bitumen and other toxic chemicals	Moderate	Low	Accidental spills of oils, fuels, bitumen, and lubricants from construction equipment, machineries, and asphalt plant are expected during the construction and operation phase to both the land and water sites.	Spills and leaks will be contained through appropriate means such as bunding. Chemicals and oils will be stored on cemented platform and in a covered area with spill containment arrangements.	Low	Low

ESF Standards, Environmental Impacts and Social Risks	Risk Ratings before Mitigation and Control		Rationale	Mitigation	Risk Ratings after Mitigation and Control	
	Construction Stage	Operation Stage			Construction Stage	Operation Stage
				A waste management plan will be developed to deal with the wastewater produced from construction sites and camps as well as a design for spillage control and wastewater treatment.		
Poor management of solid waste	Moderate	Low	Solid waste generated from campsites will primarily consist of paper, plastic, food, organic, and metal waste. The Contractor is responsible for ensuring proper segregation of waste on-site and for accurately recording the quantities of each type of waste generated. In addition, surplus construction spoil will be generated, some of the material will be utilized for embankment construction.	Mitigation measures include introducing waste management system to avoid, minimize, reduce and reuse waste including defining material ordering, use and handling measures. Moreover, waste material storage areas, borrow pits and materials laydown areas should be carefully designed and sited. Appropriate measures should also be introduced for materials storage, handling and use. Construction surplus spoils will be recycled as much as possible for embankment construction and other usage. The remaining unused spoil will be disposed of in designated approved area agreed by the NHA.	Low	Low
Pollution associated with borrow pits	Moderate	Low	Excavation activities associated with borrow and open pits may lead to land disputes, soil erosion, loss of arable land, vegetation depletion, and landscape degradation. Additionally, these pits can weaken road embankments and pose safety hazards to humans, livestock, and wildlife. If left unaddressed, they may become breeding grounds for mosquitoes, contributing to public health concerns and deteriorating hygiene conditions in the Project Area.	- Obtain necessary permits from competent authorities for new borrow and open pits and verify permits for existing ones. - Regulate excavation depth, ensuring slopes do not exceed a 1:4 gradient to maintain stability. - Monitor and control soil erosion around borrow pits to protect adjacent lands. - Prevent mosquito breeding by implementing proper drainage or other mitigation measures if water accumulates in borrow pits. - Manage excavation responsibly, preserving the top 20 cm of soil for future vegetation and utilizing pits for construction waste disposal. - Ensure safety by properly fencing borrow areas and restricting unauthorized access to prevent hazards to residents.	Low	Low
Pollution of surface water and groundwater resources from spills and leaks, and discharges from camps and office	Low	Low	Chemicals can be leached into water via the corrosion of metals and degradation of plastics which can affect aquatic ecology. This makes it crucial to carefully select project materials which would minimize the leaching of chemicals. Moreover, pollution events may arise from sediment release, chemical spillage or incorrect handling of wastewater can cause direct mortality of fauna and flora. It is estimated that wastewater will be produced is 25,600 liters/day from Section 7 during construction, respectively. Spills and leaks which reach ground water will occur for the construction and operation phases). Spills and leaks which reach ground water may happen if a spill is able to reach a water table below a construction/maintenance site. The probability of spills and leaks which reach ground water occurring is considered low because good practice measures mean there should not be a spill of sufficient volume to reach the ground water, however, the magnitude of harm is significant.	- Avoid storing liquids where there is a high risk of water pollution or land contamination (e.g., on bare ground or unsealed surfaces, next to drains, creeks etc.). - Proper waste disposal system is to be implemented to minimize pollution - All fuel, oils, chemicals, hydraulic fluids, on-site toilets etc. must be stored in the construction site compound which shall be bounded - Optimize use of resources (oil, water, etc.) to minimize the amount needed - Make incidence reporting a priority in case of spills and leaks - Train staff to recognize spills and the appropriate measures to take - Keep continuous inspection for leaks prior to each construction activity (e.g., concrete pouring) - All pouring of concrete, sealing of joints, application of water-proofing paint or protective systems, curing agents, etc. for outfalls must be completed in dry weather - Locations where concrete or other wet materials are to be used, bounded steel decks must be used to capture any spilled	Low	Low

ESF Standards, Environmental Impacts and Social Risks	Risk Ratings before Mitigation and Control		Rationale	Mitigation	Risk Ratings after Mitigation and Control	
	Construction Stage	Operation Stage			Construction Stage	Operation Stage
				concrete, alkaline water displaced from inside tubular steel piles or spilled sealants or other materials • The fueling equipment should be equipped with breakaway" hose connections that provide emergency shutdown of flow in case of failure of connection. • Absorbents should be present at places of refueling. • All camps and other facilities will have appropriate effluent treatment and disposal mechanism • Regular monitoring of water quality near Project Area		
Hazardous Materials	Moderate	Moderate	Improper handling of hazardous materials such as petrochemicals during construction and operation, can contaminate both land and water emerging from various sources like construction activities, accidental spill during operation.	• Minimize use of hazardous materials. • Use standard operating procedures defined in the associated Material Safety Data Sheet (MSDS) • Providing training to the workers and awareness raising of the communities about hazardous material used at the site • Appropriate arrangements (cemented base and covered area) for storing hazardous materials • Security arrangements for storage of hazardous materials.	Low	Low
Changes in water quality from waste and as a result of accidental spills and leakages of petroleum products	Low	Low	The construction process may create plastic, other waste, and use of petroleum products, which if incorrectly managed could enter the water body and impact aquatic habitat and species.	Mitigation measures include requiring Contractors to prepare and implement a waste management plan, segregate and reuse or recycle all the wastes, and cemented base and bounded area for storing hazardous materials and train and instruct all personnel in waste management practices and procedures as a component of the environmental induction process.	Low	Low
Flood	Moderate	Low	• Considering the slopes, topography of the Project area of Section 7 (ICT section), 2022 flood impacts, and development on the sides of the road at some locations, caused the existing cross drainage structures (12 culverts and 2 bridges) choked with mud and minor damages. The hydraulic analyses for the cross drainage structures and culverts against 25 year return period flood and checked to pass 50 year return period flood, while, 100 year return period flood is used for the bridges, • The main flood causes are monsoon rains and climate change-driven snowmelt. Flood restrictions alter natural flow, increasing risks if the road is not properly designed. The impact is moderate but requires mitigation.	• Regular cleaning, repair, and maintenance are needed for effective flood drainage. • Three culverts require an additional barrel each to accommodate increased flood discharge due to climate change. • Culverts need extra cells/barrels to ensure adequate capacity, as some are partially blocked or damaged. • Proper drainage structures with sufficient capacity should be provided to prevent flooding, especially during heavy rains. • Box culverts should be included to mitigate flood damage and protect road embankments. • Protection works and embankments must be designed for a flood return period of at least 20 years.	Low	Low
Climate change benefit and GHG emission	Low	Low	• The main sources of greenhouse gases (CO ₂) during the construction activities will include both mobile and stationary sources. The mobile sources will be the construction machinery and vehicles while the stationary source will be the batching and asphalt plants. • During operation, it is estimated that CO ₂ emission from daily traffic in the Phase 1A (ICT section) road operation will be 4.24 million ton in 2030 and 6.45 million ton in 2045 which will be higher than the 2024 emission of 3.53 million ton.	To minimize CO ₂ emissions and environmental impact during construction, the following measures should be implemented: • Regular vehicle maintenance to ensure engine efficiency. • Minimizing idling of construction vehicles. • Exploring alternative energy sources where feasible. • Enforcing stringent emission standards (WHO, NEQS, IFC) for construction vehicles and equipment.	Low	Low
ESS1: Community Health and Safety						

ESF Standards, Environmental Impacts and Social Risks	Risk Ratings before Mitigation and Control		Rationale	Mitigation	Risk Ratings after Mitigation and Control	
	Construction Stage	Operation Stage			Construction Stage	Operation Stage
Traffic and Road Safety	Moderate	Low	There will be an increase in traffic due to construction as a large number of trucks will be hauling materials to the worksites. The expected increase could reduce the capacity of the existing road network, cause wear and tear due to the construction vehicles using the roads as well as contribute to noise, dust and safety issues. The rise in traffic volume would lead to a higher rate of traffic and road safety issues which makes it crucial to promote traffic safety awareness in communities in the Area of Influence and along the transportation route. School students from the settlements and towns along the Phase 1A (ICT section) highway are seen commuting and crossing the highway, compromising their safety. This will aggravate during construction.	- Mitigation measures include road condition surveys, controlling vehicle movement, final road diversion, and ensuring proper road maintenance. - The contractor will prepare and implement a traffic management plan that would include drivers' training in defensive driving techniques, speed control, placement of flagmen where needed (e.g., along the populated areas and markets), placement of sign boards, liaison with the community and increasing community awareness regarding project related traffic.	Low	Low
Increase habitat for disease vector	Low	Moderate	Borrow pits and puddles most often in the perimeter of camps, create stagnant water pockets, which can become a breeding ground for midges and mosquitoes. If the project provides an increase in habitat for disease vectors, then there could be an increase in cases of vector-borne diseases such as malaria, chikungunya, and dengue within the local populations, particularly in those that are vulnerable. The increased risk will occur mainly in the operation phase when all panels and floats are installed.	- Develop support in nearby communities, and create community awareness by educating the communities about vector-borne diseases and transmission. - During construction, minimize the presence of stagnant water and puddles by improving the drainage facilities. - Monitoring regime will be implemented during the operation stage	Low	Low
Community Exposure to Health Issues and Labor Influx; Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH); Sexually transmitted diseases and substance use	Low	Low	- Crowded worker dormitories and a larger workforce could lead to a rise in the spread of certain diseases. - Labor influx in the project sites, particularly in impoverished communities, may increase the likelihood of exploitive and coercive sexual relations with community members, particularly minors in exchange for goods or money. Phase 1A highway traverses through conservative area and women are normally accompanied by their male guardians, therefore, it reduces the exposure of women to labor force and any exploitative actions. Workers' camp will be located in designated areas approved by NHA or close to communities, which will allow for greater supervision of the workers. - The influx of people may bring communicable diseases to the project area, including sexually transmitted diseases (STDs), or the incoming workers may be exposed to diseases to which they have low resistance. Workers with health concerns relating to substance abuse, mental issues or STDs may not wish to visit the project's medical facility and instead go anonymously to local medical providers, thereby placing further stress on local resources.	- Mitigation measures would include performing medical screening and requiring proof of vaccination prior to any employment. Moreover, the contractor should conduct induction training or workshops to introduce the basics of health and hygiene and the necessary preventive measures against them. - Establish workers' camps separated from local communities with strict protocols for interaction with local communities in order to avoid project impacts from labor influx. - Contractor will develop a Code of Conduct (CoC) for all site personnel. All site personnel will sign this CoC and will abide by it. - Project staff will receive training on the prevention of SEA/SH. Engagement of skilled trainers to raise awareness among project workers of the risks, expected behaviors, and consequences of violations, communicated through training, and publicized codes of conduct. It may also be important to raise awareness of the risks among community members and local health authorities and inform them about available grievance mechanisms. - Arrange and support local organizations and/or government initiatives on community STD education, prevention, and treatment programs. - Extensive training for awareness raising strategy which describes how workers and local communities will be	Low	Low

ESF Standards, Environmental Impacts and Social Risks	Risk Ratings before Mitigation and Control		Rationale	Mitigation	Risk Ratings after Mitigation and Control	
	Construction Stage	Operation Stage			Construction Stage	Operation Stage
				- sensitized to SEA and SH risks, and the worker's responsibilities under the CoC - The routes/places used by the women will be avoided as far as possible. If unavoidable, alternate routes will be identified for the communities, if required, especially along routes frequented by women folk, such as route to the local well or water source. - Construction crew will avoid entering villages and settlements. - Communities will be informed and consulted before commencing works inside or near the communities. - Provision related to SEA/SH will be incorporated in the bidding document, - Identification and mapping of the service providers.		
Social and Cultural Conflicts	Moderate	Low	There is a potential for cultural conflicts between the contractor's workforce and local inhabitants, particularly due to differences in attitudes, increased demand for local resources, and competition between local and migrant job seekers. Social tensions may arise if local communities perceive an imbalance in employment opportunities or if international contractors are engaged. Resistance to the contractor's workforce and dissatisfaction with hiring practices could lead to social disturbances. Use of local amenities by project workers may overburden and eventually lead to conflicts.	- Establish formal communication channels with affected communities to foster engagement and trust. - Develop and implement a social grievance redress mechanism (GRM) to address concerns effectively. - Collaborate with local elders, community leaders, and NGOs to facilitate smooth interactions between the workforce and residents. - Provide cultural sensitivity training for non-local laborers to familiarize them with local customs and traditions. - Prioritize hiring local labor for construction activities to promote economic benefits for the community. - Ensure proper implementation of the framework GRM outlined in the Stakeholder Engagement Plan (SEP) to prevent community unrest.	Low	Low
Emergency Preparedness and Response	Low	Low	In the case of any internal or external emergency and natural disaster, a response procedure should be available depending on the level of emergency of the situation and would require proper preparedness by the project stakeholders.	- Mitigation measures include preparing an emergency response plan (ERP) by the Contractor at site level as part of the OCHSMP and an Emergency Preparedness and Response Plan (EPRP) by NHA at the Project level to contain larger emergencies and framework is presented in Annex 8-1 - NHA will work with the local authorities to coordinate with the national emergency response network in the areas of influence and to ensure implementation of the project specific emergencies and make arrangements with external emergency services (Fire, ambulance, Rescue 1122, etc.), if the resources available with the Contractor is not sufficient to contain an emergency.	Low	Low
ESS 1: Conserving Biodiversity and Sustainable Management of Natural Resources						
Losses of trees and terrestrial habitat due to land clearance	Substantial	Low	There may be temporary and permanent terrestrial habitat loss and degradation at construction, camp, and yard area. It is estimated that ICT section of the highway construction affecting a total of 630 trees located within the RoW, which include beneficial and medicinal trees as well. This will result in the direct loss of plants and habitats and displacement of fauna. Soil	- Camp selection will be made complying with E&S requirements and will follow ECP 15. - Mitigation measures include minimizing land clearance, restricting activities to designated areas, and properly planning camps, machinery movement, and temporary roads to protect vegetation.	Low	Low

ESF Standards, Environmental Impacts and Social Risks	Risk Ratings before Mitigation and Control		Rationale	Mitigation	Risk Ratings after Mitigation and Control	
	Construction Stage	Operation Stage			Construction Stage	Operation Stage
			erosion arising from clearance could result in loss of plant species.	- Construction camps should be established in areas with little to no vegetation, and alternate routes for access and diversion road should be chosen to avoid environmental impact. - Camp locations will be selected to minimize environmental effects, reduce costs, and limit land use. - Compensate each tree with 10 trees planted with a total of 6300 saplings, through a plantation enhancement program.		
Introduction or spread of non-native invasive species	Low	Low	Construction of the Project will increase the potential for establishment and/or spread of alien invasive species (AIS) of plants, which in turn may contribute to the degradation of the habitats and exclusion of native species. Some of the terrestrial plant species recorded during the surveys were identified as AIS. There is potential for known alien or invasive plants to spread, or others to be introduced, with negative impacts on the habitats present. The spread of invasive alien plants species could also occur in aquatic habitats through seeds or plant fragments transported through equipment/machinery from outside the area, as well as algae and encrusting species. This may cause loss and degradation of aquatic habitats and changes in water quality and habitat suitability for aquatic species.	Mitigation measures include performing visual inspections to ensure the workers or materials do not have seed or pollen on them so as to prevent the movement of AIS between locations.	Low	Low
Killing or injury of species	Moderate	Low	Birds, with individuals likely to disperse from roads with approaching vehicles and from construction areas. There is potential for death to be caused through destruction of nests during habitat clearance (sociable lapwing are ground-nesting). Additionally, some species are hunted, trapped or susceptible to egg-collecting in parts of their range (including the sociable lapwing and vulture species). These may lead to negative impacts on populations present in the Aol. Effective mitigation will remove risk of poaching/hunting by personnel and reduce unintentional risk from vegetation clearance. A small chance of accidental killing remains, especially for ground-nesting or less mobile species. During construction, there may be increased pressure on fisheries due to the presence of construction staff and increase in local populations. However, the implementation of the existing fishing ban (standard good practice) should reduce the magnitude of change on fish to minor and the probability of this impact low.	Mitigation measures include introducing and enforcing speed limits for vehicles. A hunting ban imposed on Project staff alongside other standard mitigation for road safety and habitat clearance.	Low	Low
Fauna	Low	Moderate	The movement and operation of noisy machinery and vehicles during construction can disrupt wildlife by causing stress, altering their behavior, and potentially displacing them from their natural habitats. Loud noises, vibrations, and human activities may disturb breeding, feeding, and resting patterns of various species. Additionally, the establishment of construction camps and frequent movement of heavy equipment can fragment habitats, block migration routes, and limit access to essential resources such as water and food. These disruptions may lead	To mitigate the impact of noisy machinery and construction activities on wildlife and their habitats, the following measures can be implemented: - Noise Control: Use barriers, silencers, and low-noise machinery; schedule noisy activities during daylight hours. - Wildlife-Friendly Planning: Avoid sensitive areas, establish wildlife corridors, and restrict access to critical habitats. - Regulated Machinery Movement: Designate specific routes, enforce speed limits, and use temporary bridges where needed.	Low	Low

ESF Standards, Environmental Impacts and Social Risks	Risk Ratings before Mitigation and Control		Rationale	Mitigation	Risk Ratings after Mitigation and Control	
	Construction Stage	Operation Stage			Construction Stage	Operation Stage
			to long-term ecological imbalances, forcing wildlife to relocate or adapt to new, often less suitable, environments. To minimize these impacts, mitigation measures such as designated wildlife corridors, noise reduction strategies, and careful placement of construction sites should be considered. Expansion of Phase 1A (ICT section) highway from 4-lanes to 6-lanes and constructing service road in both sides will affect wildlife movement during operation.	- Monitoring & Awareness: Conduct wildlife monitoring, train workers, and set up a grievance mechanism. - Habitat Restoration: Rehabilitate disturbed areas, minimize land clearance, and collaborate with conservation experts. - Biodiversity friendly cross-drainage structures must be planned based on the species and their movement patterns.		
ESS 1: Stakeholder Engagement and Information Disclosure						
Continuous engagement of stakeholders during implementation	Moderate	Moderate	The identified stakeholders have different types of stakes associated with various aspects of the project depending on their professions and involvements.	Mitigation measures include public consultations and participation of stakeholders throughout the project lifecycle. This would ensure that concerns about the impacts of the project are addressed earlier rather than later. A Stakeholder Engagement Plan (SEP) has been prepared for this purpose.	Low	Low
ESS 2: Land Acquisition and Involuntary Resettlement						
Resettlement of affected people	Substantial	Low	All work related to reconstruction of the Phase 1A (ICT section) N5 shall be carried out within the existing RoW of NHA, therefore no permanent land acquisition will be required. However, the Project activities will pose resettlement related impacts of during the Project implementation. According to the engineering design of the road, resettlement issues on the existing road are substantial in nature. In addition, there are seasonal fruits and vegetable vendors in movable carts, which can be affected during construction, however, they can continue their trade during operation by just moving their carts back on the shoulders of the reconstructed N5.	- Fair and timely compensation will be provided to all affected individuals losing their livelihoods along the route. - Relevant stakeholders, including affected individuals, will be actively engaged in designing effective livelihood restoration measures. - The Resettlement Action Plans (RAPs) included livelihood restoration plans, with continuous monitoring of commercial activity recovery. - An initial compensation assessment for income loss will be conducted based on the preliminary road alignment and construction camp locations, with updates following the final alignment determination. - Awareness programs and training sessions will be conducted to inform affected individuals about project benefits, land acquisition reasons, and compensation procedures.	Low	Low
Temporary Land Acquisition	Moderate	Low	The Contractors will require temporary land acquisition for the development of Contractor camps and yards, i.e., material stockpile, workshops, equipment parking and washing areas. The approximate area required for the establishment of one Contractor's camp facilities will be tentatively 1,500 m ² . Land utilization for the Project activities and subsequent operation of the Project may induce temporary in the existing land use pattern. This impact can be categorized as moderate in nature.	- Construction camps will be established on acquired land to avoid leasing issues. If not feasible, land will be leased before construction, with agreements made directly between contractors and private landowners. The LAA, 1894 will not apply, as leases will be temporary and negotiated in the local language. - Camps will be at least 500 meters from settlements, built-up areas, and cultural sites. The contractor must submit a camp development/management plan for approval before construction. Wherever possible, waste or barren land at higher elevations will be used to minimize environmental impact.	Low	Low

8.2 Mitigation Measures

The section presents the key mitigation measures following mitigation hierarchy of ESS1 (Avoid, Minimize, Mitigate, and Compensate/Offset) for the substantial to higher risk rating evaluated in **Table 8-2**. Impacts and risks assessed as moderate and low in **Table 8-2** will be addressed by the mitigation measures proposed in **Table 8-2** and the Environment Code of Practices (ECPs) (discussed later in Chapter 9 in this document). The residual risks, which are risks after mitigation, are assessed for each of the impacts, with rationale provided for residual risks of moderate ranking and higher.

8.2.1 Inadequate Implementation of ESMP

Environmental and Social Management Plan (ESMP) along with LMP, and OCHSMP are instruments that detail the mitigation and monitoring measures to be taken during the implementation and operation of the Project to eliminate or offset adverse environmental and social impacts, or to reduce them to acceptable levels; and the actions needed to implement these measures. **Table 8-3** presents the mitigation measures for the risks of inadequate ESMP implementation.

Table 8-3: Risks of inadequate implementation of ESMP

Mitigation Hierarchy (ESS1)	Measures
Avoid	- Recruit qualified contractors and supervision consultant who maintains environmental sustainability in corporate strategy. - Avoid contractors with poor environmental, health, and safety management.
Minimize	- Contractor's qualifications stated in the ESMP are included as the pre-qualification criteria in the short-listing process of bidders. - Ensure that the conditions of the ESMP is correctly reflected in the contractor's bidding documents and the supervision consultant's TOR. - EHS bills of quantities are included in the specifications. - Education, qualification and training requirements of personnel are included in the bidding documents and considered by the supervision consultant when they give approval to the contractor.
Mitigate	- Prepare C-ESMP, and OCHSMP based on the Chapter 9 and Chapter 10 ESMP. - Recruit qualified staffs to implement the C-ESMP, and OCHSMP. - ESMP shall keep enough provisions of resources
Compensate/Offset	Update C-ESMP, OCHSMP and Labour Management procedures when (a) there is a change in the scope of the project, (b) there is a change in construction methodology/technique based on site condition, (c) following significant incident, and (d) at the end of the Project (to allow for improvements in subsequent projects).

Residual risks: Low.

8.2.2 Occupational and Community Health and Safety

Details are presented Chapter 9 in the document.

Residual risks: *Moderate*; even with all safety measures in place, the consequences of failure of the measures are high as fatality may occur, resulting in the moderate residual rating.

8.2.3 Landuse Change

Land will be cleared early in the highway expansion project, including service roads, bus bays, U-turns, and access roads. The soil, classified as medium sensitivity, is prone to erosion. Additionally, 1,500 m² per section will be required for construction camps and yards. **Table 8-4** presents mitigation measures using the mitigation hierarchy for land use change impact.

Table 8-4: Impacts of landuse change

Mitigation Hierarchy (ESS1)	Measures
Avoid	- Optimize design to minimize land clearance, especially in ecologically sensitive areas. - Utilize existing cleared or degraded land for construction camps and material yards. - Avoid unnecessary removal of vegetation, especially in erosion-prone areas. - Restrict access roads to pre-existing routes where feasible to reduce additional land disturbance.
Minimize	- Implement phased construction to limit the area of active land clearance at any given time. - Apply soil stabilization techniques such as silt fences, mulching, and temporary vegetation cover to prevent erosion. - Maintain buffer zones and natural drainage patterns to reduce soil degradation. - Use dust suppression measures (e.g., water sprinkling) to prevent soil loss and air pollution. - Implement controlled excavation and regrading to reduce the extent of disturbed land.
Mitigate (restore)	- Rehabilitate cleared land post-construction through revegetation with native plant species. - Restore topsoil in disturbed areas to facilitate natural regeneration. - Implement slope stabilization and erosion control measures (e.g., terracing, geotextiles). - Convert temporary construction yards into green spaces or reuse them for community benefits.
Compensate/Offset	- Develop compensatory afforestation programs (10 saplings for each tree felled) in collaboration with local communities. - Implement soil conservation programs in nearby areas affected by land clearance. - Provide compensation or alternative livelihoods for affected landowners where applicable.

Residual Risk: *Low*

8.2.4 Impacts on Ambient Air Quality

Ambient air quality monitoring shows high SO₂, PM₁₀, and PM_{2.5} levels exceeding national standards, with major sources including diesel vehicles, traffic congestion, and coal power plants. Construction activities will further degrade air quality through emissions from equipment, site clearance, and traffic diversions, with dust resuspension from unpaved roads worsening the impact. Given the community's limited ability to adapt, air quality degradation is a significant concern. Measures presented in **Table 8-5** aim to reduce the construction-

related air quality impact while supporting broader efforts to improve air conditions in the region.

Table 8-5: Impacts on ambient air quality

Mitigation Hierarchy (ESS1)	Measures
Avoid	• Select construction equipment and vehicles with lower emissions (e.g., Euro V or VI-compliant engines). • Use grid power or renewable energy sources for construction plants instead of diesel generators. • Plan construction activities to avoid peak traffic hours, reducing congestion-related emissions. • Identify alternative routes for material transport to minimize traffic congestion near urban areas.
Minimize	• Implement strict dust control measures, such as regular water sprinkling on unpaved roads and stockpiles and ensure ESMP keeps enough provision as a line item in the cost. • Enforce emission control measures for construction machinery, including regular maintenance and low-sulfur diesel use. • Install dust suppression barriers and windbreaks at construction sites. • Require trucks transporting fine materials (e.g., sand, cement) to be covered to prevent dust dispersal. • Optimize traffic flow by improving service road conditions in one side for construction traffic for smooth diversions to minimize congestion-related emissions, while construction takes place in the other side.
Mitigate	• Implement roadside vegetation and tree-planting programs to absorb dust and pollutants. • Stabilize exposed surfaces and reclaimed land post-construction to prevent long-term dust emissions. • Enhance road pavement conditions in affected areas to reduce resuspension of dust. • Conduct post-construction air quality monitoring to assess improvements and ensure compliance with standards.
Compensate/Offset	• Support local initiatives for air pollution control, such as promoting clean energy alternatives. • Implement community awareness programs on air pollution and mitigation strategies. • Collaborate with policymakers and development partners on regional air quality management efforts, particularly for transboundary pollution. • Develop a long-term emission reduction strategy, including incentives for public transport and cleaner fuels.

Residual Risk: *Low*

8.2.5 Noise Level during the Operation of Phase 1A (ICT section) Highway

Operational noise is expected to rise due to increased traffic on the reconstructed 6-lane highway with service road for local traffic. Measures presented in **Table 8-6** to control and mitigate operational noise impacts while ensuring sustainable highway development.

Table 8-6: Impacts of noise on the sensitive receptors

Mitigation Hierarchy (ESS1)	Measures
Avoid	• Design the highway alignment to bypass densely populated or noise-sensitive areas. • Establish buffer zones between the highway and residential or commercial areas. • Encourage land use planning that restricts noise-sensitive developments near the highway.
Minimize	• Consider constructing noise barriers (e.g., vegetative barriers, sound walls, earthen berms) along high-impact sections of Sections 7 (ICT section). • Use noise-reducing asphalt pavement to lower tire noise. • Implement speed restrictions in urban areas to minimize noise levels. • Promote traffic management measures to prevent congestion-related honking and acceleration noise. • Encourage the use of electric and hybrid vehicles through policy incentives.
Mitigate	• Based on the outcomes of noise modeling at receptor locations, customized noise mitigation measures will be implemented. This approach considers that some affected groups oppose physical barriers, as such structures could obstruct visibility and access to their businesses, potentially deterring customers. • Implement large-scale roadside tree planting to act as natural sound barriers. • Provide noise insulation solutions (e.g., double-glazed windows, soundproofing) for affected buildings through a partnership program between owners of the buildings and NHA. • Conduct post-construction noise monitoring and adjust mitigation strategies accordingly.
Compensate/Offset	• Establish a community noise impact fund to support affected residents with mitigation measures. • Collaborate with local authorities to develop long-term noise reduction strategies. • Invest in public transportation alternatives to reduce reliance on private vehicles and decrease traffic noise over time.

Residual Risk: *Low*

8.2.6 Losses of Trees and Terrestrial Habitats during Construction

Highway construction will cause 630 trees, including medicinal species, leading to habitat loss, fauna displacement, and soil erosion. Measures presented in **Table 8-7** aim to minimize habitat loss, promote ecological recovery, and enhance biodiversity conservation.

Table 8-7: Losses of trees and terrestrial habitats

Mitigation Hierarchy (ESS1)	Measures
Avoid	• Optimize highway alignment to minimize habitat disruption and avoid ecologically sensitive areas. • Designate alternative sites for construction camps and yards to reduce deforestation. • Preserve high-value trees, particularly medicinal and beneficial species, where feasible.

Mitigation Hierarchy (ESS1)	Measures
Minimize	• Implement phased clearing to reduce the extent of habitat disturbance at any given time. • Establish buffer zones around ecologically sensitive areas to protect remaining habitats. • Apply erosion control measures (e.g., silt fences, revegetation, terracing) to prevent soil degradation. • Relocate displaced fauna to suitable nearby habitats in consultation with wildlife experts.
Mitigate	• Replant native tree species in cleared areas, prioritizing beneficial and medicinal plants. • Restore degraded land with native vegetation post-construction. • Implement soil stabilization techniques to prevent long-term erosion and habitat loss.
Compensate/Offset	• Develop compensatory afforestation programs, planting at least 10 times the number of lost trees. • Support biodiversity conservation initiatives in affected regions. • Collaborate with local communities for sustainable forest management and restoration programs.

Residual Risk: *Low*

8.2.7 Resettlement of Affected People

Mitigation measures are presented in **Table 8-8** for the potential impacts of spills and leaks of petroleum and other hazardous liquid through seepage in ground water.

Table 8-8: Impacts due to resettlement of Project Affected People

Mitigation Hierarchy (ESS2)	Measures
Avoid	• Adjust road design to minimize displacement of religious structures, businesses, and residences. • Utilize available space within the existing Right of Way (RoW) to reduce resettlement needs. • Plan construction phasing to avoid prolonged disruption to livelihoods and commercial activities.
Minimize	• Implement Resettlement Action Plan prepared under the Project with fair compensation and livelihood restoration strategies. • Provide advance notice and consultation with affected communities to ensure smooth transitions. • Establish alternative access routes or diversion to maintain business continuity and reduce economic losses. • Ensure temporary relocation sites are adequately equipped with essential services.
Mitigate	• Support displaced individuals with livelihood restoration programs, such as skill training or financial aid. • Restore public and religious structures at suitable locations in consultation with local communities. • Implement a grievance redress mechanism to address concerns efficiently.

Mitigation Hierarchy (ESS2)	Measures
Compensate/Offset	• Offer financial compensation, alternative business spaces, or land in case of unavoidable displacement. • Establish community development initiatives to enhance socio-economic resilience. • Engage local businesses in project-related supply chains to create new employment opportunities.

Residual risk: *Low*

8.2.8 Impact on Protected Area

There is no game reserve and wildlife sanctuaries present in the Project Aol. The Margalla Hills National Park buffer area is located in Section 7 of Phase 1A (ICT section) highway. Consultation with IWMB revealed that the Margalla Hills National Park buffer area is located 2,017 m away from the RoW. However, Project Aol falls 17 m away from the National Park buffer. The national park buffer will not be affected directly due to the Project construction. Thus, no direct impact on the protected area and endangered species of Flora and Fauna are expected.

8.3 Climate Change Risk and Vulnerability Assessment

Detailed climate change assessment for the N5 road expansion, was carried out for Section 7 by using the climate models. The major findings of the assessment are as follow:

- In the Section 7 (ICT section), average monthly temperatures are projected to rise significantly by 2085, with increases as high as 4°C. Under the SSP 2-4.5 scenario, temperatures are expected to increase by 1.8°C by 2050 and 2.5°C by 2085, whereas under SSP 5-8.5, the rise could reach 2.9°C by 2050 and 4.9°C by 2085. Additionally, annual rainfall is anticipated to rise by 8.2% by 2050 and 7.4% by 2085 under SSP 2-4.5, while under SSP 5-8.5, rainfall could increase by 11% by 2050 and 21% by 2085. Floods and extreme temperatures are identified as key climate-related hazards that the road projects will face in the future. The analysis shows that extreme rainfall is expected to intensify. An ensemble of bias-corrected GCMs predicts a rise in rainfall by 2.5% for a 25-year return period, 2.3% for a 50-year return period, and 2.1% for a 100-year return period under SSP 2-4.5. Under SSP 5-8.5, the projected increases are 3.9%, 4.1%, and 4.3%, respectively, all of which have been incorporated into the project's engineering design. It is recommended to adopt SSP 5-8.5 results in the design.

The detailed report is attached in **Vol. 3: Climate Change Assessment**. The Assessment shows that by addressing climate-related risks upfront, it aims to ensure long-term sustainability and resilience of critical infrastructure in the face of future climate changes.

Furthermore, climate vulnerability and risk assessment of Section 2, 7 & 8 was carried out (refer ESMPF) by using the tool⁹ which identified the four major hazard. The identified hazards and their measures are as follow:

Table 8.9: Climate Change Risks Identification and Preliminary Assessment

Sr. No.	Hazard	Section 7 (ICT section)	Mitigation Measures
1	River Flood	High – Major water bodies crossing Nullahs	Engineering and Design Measures (Climate Resilient Design of Cross Drainage Structures)
2	Earthquake	Medium – Fall in 2B Zone (Moderate) as per the seismic zoning of Pakistan under BCP 2007/2021.	Engineering and Design Measures (Earthquake Resilient Infrastructure)
3	Water Scarcity	Medium – there is no physical water scarcity issue in the project area, however, Pakistan is facing the economic water scarcity which will also be reported in proposed subproject area. The proposed subproject area falls under water stressed category.	Environmental and Nature-Based Solutions (Implement xeriscaping (low-water landscaping), Minimizing Water Use in Construction and optimize concrete mix designs to reduce water consumption) Policy and Planning Measures (Outline of Project Level Emergency Preparedness and Response Plan (Refer Annex 8-1))
4	Extreme Heat	High – During summer high temperature prevail during day time in the surrounding areas of the subproject	Environmental and Nature-Based Solutions (Reforestation and Vegetation Zones: Plant trees along roadsides to provide shade and reduce pavement temperature, reduced soil erosion and reduce wind and storm impact) Policy and Planning Measures (Outline of Emergency Preparedness and Response Plan (Refer Annex 8-1))

⁹ Global Facility for Disaster Reduction and Recovery (GFDRR) in collaboration with the World Bank Group (WBG) developed a tool which has been utilized to consider the climate change impacts of disasters on new and existing development Subproject. The tool identifies and robustly assess the level of river flood, urban flood, coastal flood, earthquake, landslide, cyclone, water scarcity, extreme heat, wildfire, tsunami, volcano.

9 OCCUPATIONAL AND COMMUNITY HEALTH AND SAFETY

This Chapter provides an in-depth examination of the Occupational and Community Health and Safety Management System (OCHSMS) during both the construction and operation stages. While Chapter 8 briefly addresses the occupational hazards and risks associated with these stages, this chapter expands on those discussions in greater detail. The OCHSMS includes the Contractors' high-level corporate policies, processes, and Standard Operating Procedures (SOPs). A list of these processes and SOPs relevant to Phase 1A (ICT section) of the Project is presented in this chapter, with the understanding that they will be further refined and developed by the Contractors during construction, incorporating site-specific and operational details.

9.1 Purpose

This chapter provides guidance to assist the Contractor in developing a comprehensive OCHSMP. Its primary objective is to ensure that all project activities are meticulously planned, executed, monitored, and managed in alignment with established health, safety, and management practices, procedures, and standards.

This chapter serves as a practical guidance for the Contractor, offering a structured approach to managing Occupational Health and Safety (OHS) and Community Health and Safety (CHS) risks. It aligns with the requirements of AIIB's Environmental and Social Standard 1 (ESS1), the World Bank Group Environmental Health and Safety Guidelines (EHSGs), and the relevant provincial OHS Acts and regulatory frameworks and requirements (refer to Chapter 2 for specific Acts and Regulations).

Additionally, the Contractor is encouraged to comply with the following international guidelines to enhance safety and management practices:

- ILO Code of Practice. 1992, Safety and Health in Construction Industry, ISBN 92-2-107104-9
- Safety and Health in Building and Civil Engineering Work, ILO Codes of Practices
- American National Standard Institute (ANSI) for Personal Protective Equipment (PPE). As for example, Eye and Face Protection (ANSI Z87.1-1989), Head Protection (ANSI Z89.1-1986), Foot Protection (ANSI Z41.1-1991) or equivalent acceptable to the Engineer.
- Good International Industry Practices (e.g., OSHA)

9.2 Scope

This guidance is applicable on all operational activities related to the Project. Some of the key high-risk activities may involve the following:

- Vehicles and driving;
- Scarifying existing pavement;
- Cutting of trees;

- Diversion of traffic;
- Operation of mobile equipment on site and on community roads;
- Work at height and dropped objects;
- Material haulage;
- Manual handling;
- Lifting and crainage;
- Scaffolding;
- Operation of Batching and Asphalt Mixing plants;
- Hot work (asphalt);
- Maintenance and operation of the site camp;
- Use of security forces; and
- Electrical works.

9.3 Objectives and Targets

This guidance is developed on the following objectives:

- Safe operation with Zero harm to community members and all site personnel including Contractor's Staff and visitors
- Meet or exceed the contractual safety obligations

Project specific measurable targets to achieve above objectives will be established by the Contractor. The determination of these targets will be based upon Contractor's continual improvement philosophy, external peer group benchmarking and stakeholders' input. The Contractor will establish targets for each project site for every fiscal year. Some examples of these targets are listed below to guide the contractor about the expectation from NHA:

- Total Recordable Injury Rate¹⁰ of 1.5 or less (or based on the Contractor previous yearly trend)
- Lost Time Injury Frequency Rate¹¹ of 0.5 or less (or based on the Contractor previous yearly trend)

Senior Leaderships of the Employer, the Engineer, and the Contractor (General Manager, Project Manager, Resident Engineer, Construction Manager and Technical Director) will need to be fully committed to achieve the above-mentioned targets. Leading and lagging indicators should be established by the Contractor to drive performance to meet these targets. Following are some leading indicators showing senior management commitment. Complete details of all Key Performance Indicators (KPIs) should be presented in "PR12: Measurement" Process of Contractor's project specific OHS guidance (the OHS processes are discussed later on in this Chapter).

¹⁰ A rate of injuries and illnesses computed from the following formula: (Number of injuries and illnesses X 200,000) / Employee hours worked.

¹¹ A rate of lost time computed by: ([Number of lost time injuries in the reporting period] x 1,000,000) / (Total hours worked in the reporting period).

- All General Manager, Resident Engineers and Project Managers to complete 1 Walk-through Inspection per month.
- All Construction Managers to complete 2 Walk-through Inspections per month with their assigned Health and Safety Officer.
- All OHS supervisors complete 1 site inspection weekly.

9.4 Risk Assessment

Risk assessment is a systematic process used to identify hazards and risk factors that could potentially cause harm (hazard identification), analyze and evaluate the associated risks (risk analysis and evaluation), and determine effective strategies to eliminate hazards or control risks when elimination is not feasible (risk control). Regularly conducting risk assessments enables construction and operation and maintenance (O&M) stakeholders to maintain regulatory compliance. Additionally, risk assessments support health, safety, and technical teams in implementing corrective measures to safeguard workers against health and safety threats throughout the construction and operational phases.

9.4.1 Risks Assessment Codes

The Risk Assessment System and the assignment of Risk Assessment Codes (RACs) are designed to systematically identify and manage workplace hazards. RACs are determined based on three key factors: the severity of the hazard, the probability of its occurrence, and the number of individuals exposed or potentially impacted in the event of an incident. While all hazards should be addressed promptly, the Hazard Risk Assessment System offers a structured method for ranking safety risks. It aids decision-makers in making well-informed choices about hazard control by providing a consistent and defensible approach to prioritizing safety hazard mitigation efforts. This prioritization considers available resources, competing demands, and organizational priorities to effectively allocate efforts where they are needed most.

9.4.2 Likelihood and Consequence of Hazards

RACs are determined by assigning values to the likelihood or probability of an outcome occurring and the consequence or severity of the potential outcome. These values are then plotted on a risk matrix, which helps visualize the hazard's position within the matrix. This position is used to assign an appropriate RAC number to the specific hazard or activity, facilitating a clear and consistent evaluation of risk levels.

The Likelihood or probability Code is considered numerical (1 to 5). These are presented in **Table 9-1**.

Table 9-1: Likelihood ratings

Sr. No.	Likelihood	Definition
1	Remote (1)	Unlikely to occur but known in the sector; probability 0.1%-1%
2	Possible (2)	Likely to occur once or more during construction/ organization; probability 1%-10%

3	Occasional (3)	Likely to occur once every two years or more; probability 10%-50%
4	Likely (4)	Occurs more than once or twice per year, is continuous or certain to occur; probability 50%-80%
5	Frequent (5)	Multiple occurrences have happened frequently in the industry; probability >80% and above

Next is the Consequence or severity Code, varies from 1 to 5 and is presented in **Table 9-2**.

Table 9-2: Consequence ratings

Sr. No.	Consequence	Definition
1	Incidental (1)	No impact or minor First Aid injury
2	Minor (2)	First aid injury (e.g., minor cuts and bruises, eye irritation from dust) or very minor health effect
3	Moderate (3)	Lost Time/ Non-Lost Time injury (e.g., sprains, fracture, cut, lacerations, burns or bruises) or health effect (i.e., deafness or dermatitis)
4	Serious (4)	Major injuries: amputations, major fractures, multiple injuries, or health effects: severely life shortening disease, occupational illness, Single Fatality (drowning)
5	Catastrophic (5)	Multiple fatalities or Multiple permanent disabilities

9.4.3 Risks Assessment Matrix

The risks assessment matrix is presented in **Table 9-3**, enables the Occupational Health and Safety (OHS) team to prioritize workplace hazards by categorizing them as high, substantial, moderate, or low. Hazards classified as high require the most stringent controls and immediate attention. In some cases, this may necessitate canceling the associated activities from the project altogether. By implementing specific workplace controls, hazards can be managed more effectively, potentially shifting their risk classification to a more acceptable level. The matrix also emphasizes that the ultimate form of hazard control is elimination. If a hazard can be eliminated - whether by removing the task that exposes workers to the hazard or by outsourcing the task to a specialized contractor - the hazard no longer exists. This approach allows the hazard to be fully removed from the project's control process, achieving the highest standard of safety management.

Table 9-3: Risk Matrix

Likelihood Severity	Remote (1)	Possible (2)	Occasional (3)	Likely (4)	Frequent (5)
Incidental (1)	Low (1)	Low (2)	Low (3)	Low (4)	Low (5)
Minor (2)	Low (2)	Low (4)	Low (6)	Moderate (8)	Moderate (10)
Moderate (3)	Low (3)	Low (6)	Moderate (9)	Substantial (12)	Substantial (15)
Serious (4)	Low (4)	Moderate (8)	Substantial (12)	High (16)	High (20)
Catastrophic (5)	Low (5)	Moderate (10)	Substantial (15)	High (20)	High (25)

9.4.4 Summary of Assessed Risks

The Project's potential risks and their significance have been assessed using the methodology described above. The Contractor will prepare a risk register using the likelihoods and consequences presented in **Table 9-1** and **Table 9-2**. The risk register will present a summary of these risks and their significance along with the control measures. Risk register will be revisited by the Contractor once construction details are available. The following are some of the anticipated risks assessed for the Project:

- Work at Height
- Operation of mobile equipment on site and on community roads including passenger vehicles, truck dumpers, excavators, graders, loaders etc.;
- Electrical Systems
- Hazardous Materials
- Material Haulage (Loading and Unloading)
- Traffic and Pedestrian Interface Planning
- Severe Weather
- Lifting and Hoisting
- Scaffold Erection
- Working Near or Over Water
- Poor illumination
- Excavation Operation and associated risk to community members.
- Management of Security Forces
- Fire
- Plant Construction and Operation (batching and asphalt missing)

9.5 Management System Processes

The Management System Processes are a critical component of the Contractor's OCHSMP, serving as the second-tier documents following the overarching policies. These processes provide the detailed guidelines and operational frameworks necessary to effectively implement and maintain the OCHSMP. The Contractor will need to develop the following health and safety Management System Processes based on the project and site requirements:

PR01: Induction Process PR02: Risk Assessment (Job Hazard Analysis, Critical Risk Protocols, and Personal Risk Assessment) PR03: Meetings PR04: Personnel Competency and Training PR05: Short Service Worker Program (with tools for assessment) PR06: Reward and Recognition PR07: Disciplinary Process PR08: Permit to Work Process	PR09: Work Observation Process PR10: Personal Protective Equipment (PPE) PR11: Incident Investigation PR12: Measurement - Leading and Lagging Indicators PR13: OHS Compliance Audit PR14: Inspections PR15: Communications PR16: Document Control PR19: Risk Management
--	---

9.6 Standard Operating Procedures (SOP), Work Instructions and Forms

Standard Operating Procedures (SOPs) and Work Instructions are predominantly technical in nature and serve as third-tier documents within the overall risk management framework.

These documents provide detailed, step-by-step guidance for executing specific tasks safely and efficiently.

Supporting tools such as forms and checklists play a crucial role in ensuring the effective implementation of the controls outlined in the SOPs.

The Contractor should develop the following SOPs as part of the Health and Safety Plan, based on a project-specific risk assessment. This list is non-exhaustive, and additional SOPs may be required depending on the specific needs and risks of the Project:

SOP 01: Work at Height SOP 02: Mobile Equipment SOP 03: Barricading and signs SOP 04: Cell Phone Use SOP 05: Safe Driving SOP 06: Material Haulage (Loading and Unloading) SOP 07: Traffic and Pedestrian Interface Planning SOP 08: Severe Weather SOP 09: Lifting and Hoisting SOP 10: Scaffold Erection SOP 11: Working Near or Over Water SOP 12: Illumination	SOP 13: Electrical Systems SOP 14: Hazardous Material Management SOP 15: Equipment Inspection and Maintenance SOP 16: First Aid SOP 17: Project Worker Welfare Facilities SOP 18: Camp Management SOP 19: Emergency Response Plan SOP 20: Management of Security Forces SOP21: Fire SOP22: Plant Construction and Operation (batching and asphalt missing) Others
---	--

9.7 Project Organization

9.7.1 Contractor Organogram

A typical Contractor's organogram is presented in **Figure 9-1**. And efforts should be made to maintain an organogram like this, especially to make direct link between health and safety and Project Manager (senior leadership).

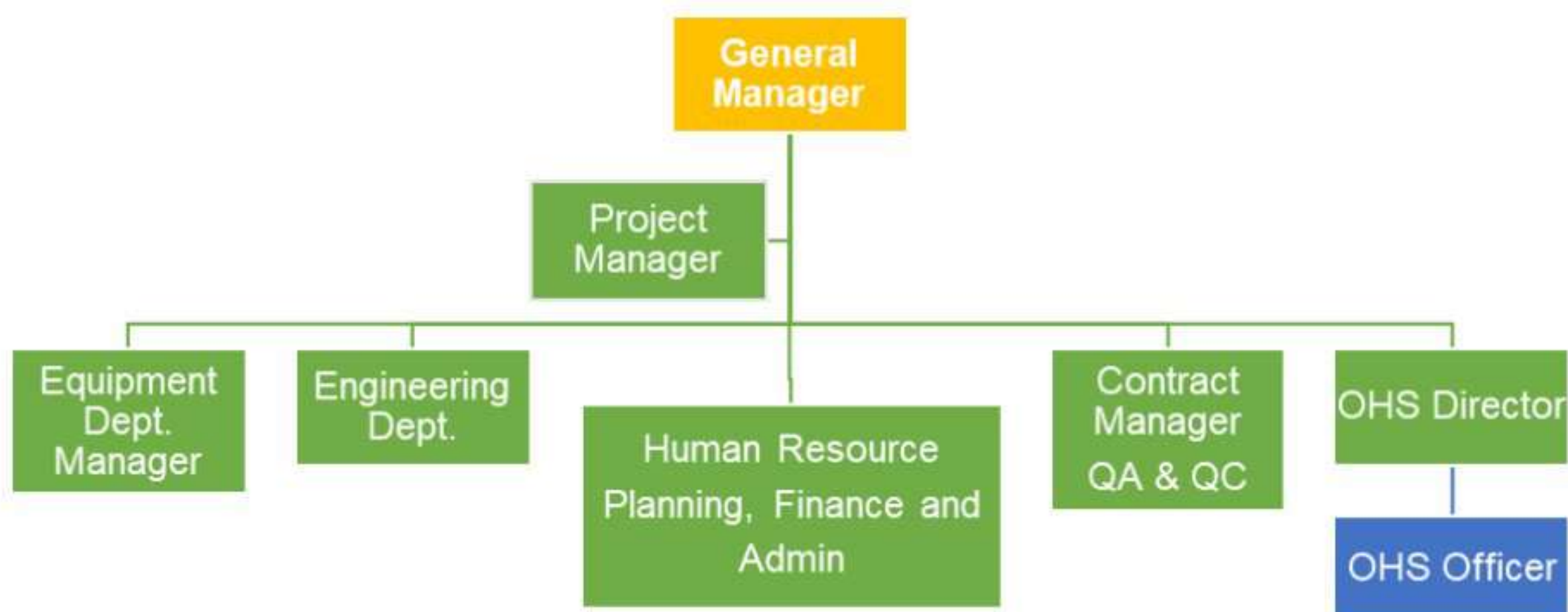


Figure 9-1: Contractor Organogram

9.7.2 OHS Organogram

The Contractor's typical health and safety organization should look like as presented in **Figure 9-2**.



Figure 9-2: Contractor's OHS Organization

9.7.3 Roles and responsibilities

These typical roles and responsibilities give a holistic understanding pertaining to implementation of the OHS and CHS Plans which comprises multiple processes and SOPs. However, each process and SOP may also have additional specific requirements pertaining to a specific role.

General Project Manager

- Overall accountability for the development, implementation and maintenance of the Health and Safety Plan.
- Accountable for allocation of sufficient resources for the execution of the plan.
- Ensure that empowered and competent personnel are available for the execution of the plan
- Make sure that senior leadership (all directors, Construction Managers and other line management personnel) are fully aware of their responsibilities as per the Processes and SOPs of the Health and Safety Plan.
- Discourage achievement of operational results at the cost of safety violations
- Develop a culture where it is safe to speak up and provide the time, people and resources to respond to OHS concerns identified by their workers
- Review Executive Summary of incidents, ensure that Root Causes are being identified and resources are provided for the closure of Preventive and Corrective Actions

Project Manager

- Overall accountability for the development, implementation and maintenance of the Health and Safety Plan.
- Accountable for allocation of sufficient resources for the execution of the plan.
- Ensure that empowered and competent personnel are available for the execution of this plan
- Make sure that Sr. Leadership (all directors, Construction Managers and other line management personnel) are fully aware of their responsibilities as per the Processes and SOPs of the Health and Safety Plan.
- Demonstrate visible leadership, walk to talk behavior to reinforce the implementation of the Health and Safety Plan
- Attend monthly Health and Safety Committee/Progress Review Meeting and monitor the performance through leading and lagging indicators.
- Discourage achievement of operational results at the cost of safety violations
- Develop a conducive culture where Personnel are authorized to STOP¹² unsafe work without fear of retribution
- Develop a culture where it is safe to speak up and provide the time, people and resources to respond to Health and Safety concerns identified by their workers.
- Ensure that Work Observation program is utilized, and all incidents are fully investigated
- Review Executive Summary of incidents, ensure that Root Causes are being identified and resources are provided for the closure of Preventive and Corrective Actions
- Encourage reward and recognition where personnel demonstrate safe behavior or identify hazards and fairly apply disciplinary process when personnel cut short.

OHS Director

- Be a Subject Matter Expert of the Health and Safety Plan. Provide training and awareness regarding the implementation of the Health and Safety Plan that includes multiple Processes and SOPs
- Convene monthly Health and Safety Committee/Progress Review meeting and share implementation progress, points of concern
- Be familiar with all local, national, and international laws that are applicable to the operations.
- Establish and maintain a professional relationship with Company /Contractor and subcontractor representatives.
- Establish an audit system that measures the effectiveness of the Health and Safety Plan

¹² ILO COP 2.2.12. Where there is an imminent danger to the safety of workers, the employer should take immediate steps to stop the operation.

OHS Officer

- Be a Subject Matter Expert of the Health and Safety Plan. Provide training and awareness regarding the implementation of the Health and Safety Plan that includes multiple Processes and SOPs
- To be familiar with all local, national, and international laws that are applicable to Operations.
- Raise concern in the monthly Health and Safety Committee/Progress Review meeting regarding implementation of controls stipulated in the Health and Safety Plan.
- Provide training to staffs on the Health and Safety Plan. Conduct regular sessions for all project team members to inculcate the requirements of the Health and Safety Plan.
- To report to the Contractor's Management Team on implementation progress, monthly KPIs.
- To ensure that sufficient training and induction of all personnel is being provided and maintained.
- To ensure that visit induction is given to all visitors before they are allowed to visit the site.
- To develop the Health and Safety awareness of all personnel employed on the project and ensures their participation in all aspects of the health and Health and Safety program
- Provide guidance for the purchase of personal protective equipment
- Regular inspection of construction safety and security as per PR09: Work Observation Process
- Provide guidance to employees regarding their emergency response responsibilities.
- Decide whether a potential rescue service or team is adequately trained and equipped to perform permit space rescues of the kind needed at the facility and whether such rescuers can respond in a timely manner, and organize drills
- Review of Health and Safety management plan annually.

OHS Staff/ Supervisor

- Perform the assigned inspections and discuss the findings with OHS Officer
- Ensure communication procedure and system to communicate emergency events to site technical supervisor and emergency authorities (e.g., Incident Response Center (IRC) and/or Police, health centers)
- Communicate with construction site personnel to help them understand the hazards of the site and understand the demands of the operating personnel about Health and Safety matters.

Site Technical Supervisors (part of the technical team)

- They allocate tasks and check that the project workers are implementing Health and Safety requirements to standard. They provide feedback and guidance on Health and Safety implementation.
- Ensure that the controls stipulated in Permit to Work (if needed) are implemented and STOP the work when critical controls are missing or compromised

- Discuss Job Hazard Analysis (JHA) and conduct effective Tool Box Talk with all project workers. Ask questions to ensure that they have a good understanding.
- Ensure that all new employees receive training as per PR01: Induction Process and PR05: Short Service Worker Process
- Conduct worksite observations, discuss safety concerns with project workers
- Develop a culture where it is safe to speak up and provide the time, people and resources to respond to Health and Safety concerns identified by their workers. They are also responsible for escalating issues that can't be resolved by the project workers or at the supervision level to Health and Safety Team or senior management.
- Responsible for making an incident scene safe and secure and for ensuring that hazards, near misses and incidents are entered into the reporting system.
- Ensure all project workers use appropriate PPEs and train them how to use PPEs.

Workers

- Conduct Personal Risk Assessment Take 5 (Stop, Look, Assess, Control, and Monitor) and do not proceed to work if unsafe to do.
- Use authority to STOP work if observe an unsafe work by fellow worker or SSW.
- Report hazards and at-risk behavior as and help the Contractor management to develop a conducive safety culture.
- Use PPE as provided.
- Conduct a visual inspection of equipment in the beginning of the operation and ensure that equipment is de-energized before working on a piece of equipment.
- Ensuring that they wear appropriate PPE for the activity that they undertake.
- Be aware and mindful of hazards related to any work activity; do not undertake a job or task if physically or mentally not fit.
- Seek clarification for uncertainty relating to a task with the Supervisor.
- Do not undertake a job if not competent to do so.
- Raise improvement opportunities.
- Report near misses and actual incidents immediately to the supervisor.

10 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This chapter describes how the identified impacts and risks (refer to Chapters 8 and 9) will be managed, with mitigation and enhancement measures as well as monitoring. Mitigation and enhancement measures are collated and expanded upon in the Environmental and Social Management Plan (ESMP). The ESMP is organized by management plans, institutional setup, capacity building and training, and presents key monitoring and performance indicators.

For each topic, this chapter identifies mitigation and enhancement measures. Where feasible, the mitigation hierarchy as per ESS1 are followed. The following sections present management measures and monitoring requirements for the impacts and risks.

10.1 Contractors' Qualification

It is recommended that all contractors procured under the Project be compliant with ISO 9001 Quality Management, ISO 14001 Environmental Management and ISO45001 Occupational Health and Safety Management or equivalent. These will be done by NHA imposing the requirements of ISO certifications during prequalification or technical evaluation of contractors. In addition, all subcontractors under the major contractors will also be subject to ISO 14001 and ISO45001 audit provisions by the main Contractor during the course of the project.

10.2 Various Mitigation and Control Measures

The ESMP includes different types of mitigation and control measures and sub plans for significant impacts and risks: (i) general and non-site-specific measures in the form of Environmental and Social Codes of Practices (ECPs) presented in Annex 10-1 to address general construction and operation matters identified as moderate and low in significance prior to mitigation and prevention in **Table 8-2** and Annex 9-1; (ii) project specific and to the extent possible, site-specific mitigation measures for substantial and higher impacts and risks are presented in Chapter 8; (iii) C-ESMP with site-specific and contract-specific management plans to be prepared by the Contractor; (iv) OCHS Management System Processes and Standard Operating Procedures to be prepared by the Contractors; and (v) proposed plans in this ESMP to address significant and cumulative impacts.

10.3 Environmental and Social Code of Practices for Construction

The environmental and social codes of practice (ECPs) are generic, non-site-specific guidelines for the construction phase. The ECPs consist of environmental and social management guidelines and OHS practices to be followed by the contractors for sustainable management of all environmental, social, health and safety issues. The ECPs are listed below and details are presented in Annex 10-1.

- ECP 1: Waste Management
- ECP 2: Fuels and Hazardous Goods Management
- ECP 3: Water Resources Management
- ECP 4: Drainage Management

- ECP 5: Soil Quality Management
- ECP 6: Erosion and Sediment Control
- ECP 7: Topsoil Management
- ECP 8: Topography and Landscaping
- ECP 9: Borrow Areas Development & Operation
- ECP 10: Air Quality Management
- ECP 11: Noise and Vibration Management
- ECP 12: Protection of Flora
- ECP 13: Protection of Fauna
- ECP 14: Road Transport and Road Traffic Management
- ECP 15: Construction Camp Management
- ECP 16: Cultural and Religious Issues
- ECP 17: Construction and Operation Phase Security

10.4 Contractor's Environmental and Social Action Plan

The Contractor will prepare a 'Contractor's Environment and Social Management Plan' (C-ESMP) demonstrating the manner in which they will comply with the requirements of Site-Specific Management Plans, ECPs and the mitigation measures proposed in this EIA Report. The C-ESMP will be submitted before the start of any construction activities (maximum of 90 days) of Contractor's mobilization and be approved by the Engineer. The C-ESMP will form the part of the contract documents and will be used as monitoring tool for compliance. Violation of the compliance requirements will be treated as non-compliance leading to the corrections or otherwise imposing penalty on the contractor.

10.5 Occupational and Community Health and Safety Plan

The Contractor will also prepare an occupational and community health and safety Management (OCHSM) plan devising the general guidelines for the identified hazards and control measures along with the OHS Management Processes and Standard Operating Procedures presented in Chapter 9 of this EIA. The OHS shall comply with ESS1, World Bank Group General Environmental Health and Safety Guidelines, Chapter 2: Occupational Health and Safety, 2007; Sindh, KP and Punjab Labour and OHS Acts; and ILO Code of Practices 1992, Safety and Health in Construction Industry; and Safety and Health in Building and Civil Engineering Work, ILO Codes of Practices. If the guidelines stated before cannot address a specific OCHS management in the project, Good International Industry Practices will be applied, as for example, OSHA and ISO45000.

Review and update of the OCHSM plan will be done,

- a) when there is a change in the scope of the project,
- b) there is a change in construction methodology/technique based on site condition,
- c) following significant OHS hazard or a major accident, and
- d) at the end of the Project (to allow for improvements in subsequent projects).

OCHS Plan should contain general guidance for all identified risks under each work activities. It also contains management system processes and standard operating practices. Processes

and SOPs should be presented in three discrete headings, (a) Contractor's Standards on the identified risk management, (b) Expected Site specific OCHS hazard and risks during construction, and (c) Control Measures proposed by the Contractor.

10.6 Risk Assessment and Management

Risk assessment (RA) will be done by Contractor for each construction task focusing on job tasks as a way to identify risk before they occur, based on the guidance provided in Chapter 9. The outcome of the RA will be the risk register, which will focus on the relationship between the worker, the task, the tools, and the work environment. Ideally, after identifying uncontrolled hazards, steps should be taken to utilize hierarchy of control: elimination, substitution, engineering controls, administrative controls and personal protective equipment, to minimize them to an acceptable risk level. Many workers are injured and killed at the worksite every day. The RA should be one of the major components of the larger commitment of the Contractor's health and safety management system.

The RA should be conducted on many jobs in the worksite. Priority should be given to the following types of jobs:

- Jobs with the highest injury or illness rates;
- Jobs with the potential to cause severe or disabling injuries or illness, even if there is no history of previous accidents;
- Jobs in which one simple human error could lead to a severe accident or injury;
- Jobs that are new or complex to the construction or have undergone changes in construction processes and procedures; and
- Jobs complex enough to require written instructions.

10.6.1 EHS in Method Statement

The Contractor will include an EHS Chapter in each Method Statement. This EHS section will be based on the RA and other provisions of OCHS Plan and environmental issues of the site and specific to construction methods to be followed by the Contractor. This section will be reviewed by the EHS Specialists of the Engineer/Construction Supervision Consultant (CSC) and confer approval along with other technical parameters to be reviewed by the engineering team of the CSC. Each revision of the method statement shall also be reviewed by the EHS Specialists and their concurrence will be required to get the method statements approved.

10.6.2 Field Engineer's EHS Oversight

There will be limited supervision staffs available in EHS to cover all work sites and project shifts in the project. Therefore, it will become impossible to supervise and monitor EHS parameters in every site in a continuous basis. Hence, site engineers can be delegated certain EHS oversight. Engineers monitoring forms including available for inspection (AFI) and Daily Monitoring Forms (DMF) and checklists will be designed to include EHS aspects. EHS should be made also a key responsibility of site engineers.

Training program will be devised by CSC on engineers' oversight in EHS and will be offered by EHS specialists of the Contractor and CSC to address EHS immediately when identified and raise it to EHS specialists if further action is required. The training on engineers' oversight should convey the following messages:

- Engineers would assume greater responsibility for overseeing the EHS as part of their daily routine work,
- Engineers would review and approve each site's readiness to commence the work as per the design specifications, certifying whether Contractors are meeting the requirements of the Method Statements, and withholding funds from them that are not complied with.
- Engineers would impose financial penalties on the Contractor with nonexistent or non-compliant EHS matters; and
- Engineers will assist workers in recognizing environment friendly and safe work measures and procedures necessary to protect the natural environment and occupational health and safety of workers and prevent illnesses, injuries and fatalities during construction.

10.6.3 Request for Inspection

Poor temporary structures such as scaffold, access walkways, stairs, and ladders are some of the major causes of the accidents in construction industry. For technical verifications of the temporary structures, specifications in the bidding documents define the material, stability, strength and deflections of each temporary structure. However, this clause is often ignored in construction industry as the main focus is the permanent structures. Therefore, Request for Inspection (RFI) or Availability for Inspection (AFI) for temporary structures will be required, as a pre-requisite for the readiness of site. Along with the technical requirements (e.g., complete drawings, calculations relating to stability, strength, and deflections), health and safety parameters will also be inspected for all temporary structures. During these RFI/AFI, both technical and EHS personnel of the CSC will inspect the requirements and certify the technical quality and the readiness of the site to commence the permanent work.

10.7 Inclusion of Relevant Components of ESMP in Contract Documents

The ESMP of the Project along with the ECPs and occupational hazards and risks will be included in the contractors' bid documents. The technical specifications of the bid documents will clearly state that contractor will need to comply with the mitigation and control measures provided in the ESMP, ECPs, OCHSMP, World Bank Group EHS General Guidelines and stringent emission standards (WHO, NEQS, IFC).

10.7.1 BOQs in Bidding Documents

The following items will be included in the bills of quantities (BOQs) of bidding documents

- After the award of the contract and before mobilization, the Contractor will prepare and submit two separate plans, C-ESMP and OCHSMP in compliance with this EIA, ESS2, WBG EHS Guidelines, ILO COPs, and stringent emission standards (WHO, NEQS,

IFC). The preparation and their revisions and updates will also be quantified and presented as line items in the Contract.

- Quantities of personal protective equipment (PPE), first-aid boxes, ambulance, health care facility with Pakistan Medical and Dental Council licensed doctors and nurses.
- Provision of Environmental and OHS Staffs for the entire construction period. Detail staff requirements are presented later in the Chapter.
- Providing and maintenance of Dust Measurement Meters for spot measurements (2 number).
- Quarterly 24-hour Ambient Air Quality Monitoring of PM10, PM2.4, NO2, SO2, and CO.
- 24 hour continuous noise monitoring at 4 sites for each Section of the highway close proximity of settlements during the construction work.

10.7.2 Payment Mile Stones

Payments to contractors will be linked to environmental, health and safety performance, measured by completion of the prescribed environmental and social mitigation measures in the C-ESMP and control measures described in the OCHS plan. In addition, for any non-compliance causing damages or material harm to the natural environment, workers, public or private property or resources, the Contractor will be required to either remediate / rectify any such damages in a timeframe specified by and agreed with the engineer (CSC), or pay implementation agency (IA) for the cost (as assessed by IA) of contracting a third party to carry out the remediation work. For repeated non-compliance the Contractor will be penalized. The penalty of non-compliance of the requirements of the C-ESMP and OCHS Plan will be enforced in the form withhold the specific percentage of the total Civil Work's Instruction of Payment Certificate (IPC). The penalty will be imposed after all contractual instruments are applied and a Non-compliance Report (NCR) is issued by the Engineer.

10.8 Institutional Arrangements

10.8.1 Existing Environmental and Social Arrangements in NHA

NHA operates an Environment, Afforestation and Land Section (EALS), which is currently overseen by the Member (Administration). The organizational structure of this section is illustrated in **Figure 10-1**. Despite its critical mandate, EALS is currently overextended, bearing the responsibility of managing a wide array of projects. These include those financed by the Government of Pakistan as well as numerous initiatives supported by International Financial Institutions (IFIs) such as the Asian Development Bank (ADB), Asian Infrastructure Investment Bank (AIIB), the World Bank, CPEC, and others. Furthermore, EALS also serves as the Focal Point for Climate Change within NHA, adding to its already substantial workload.

Given the increasing complexity and volume of development activities, the current capacity of EALS is insufficient to meet operational demands effectively. To ensure timely and effective project implementation, there is an urgent need to strengthen the institutional capacity of EALS through both structural reforms and resource augmentation. This concern has also been formally recognized by AIIB in their Project Note, where the limited institutional capacity of EALS was flagged as a significant risk that could lead to delays in project implementation.

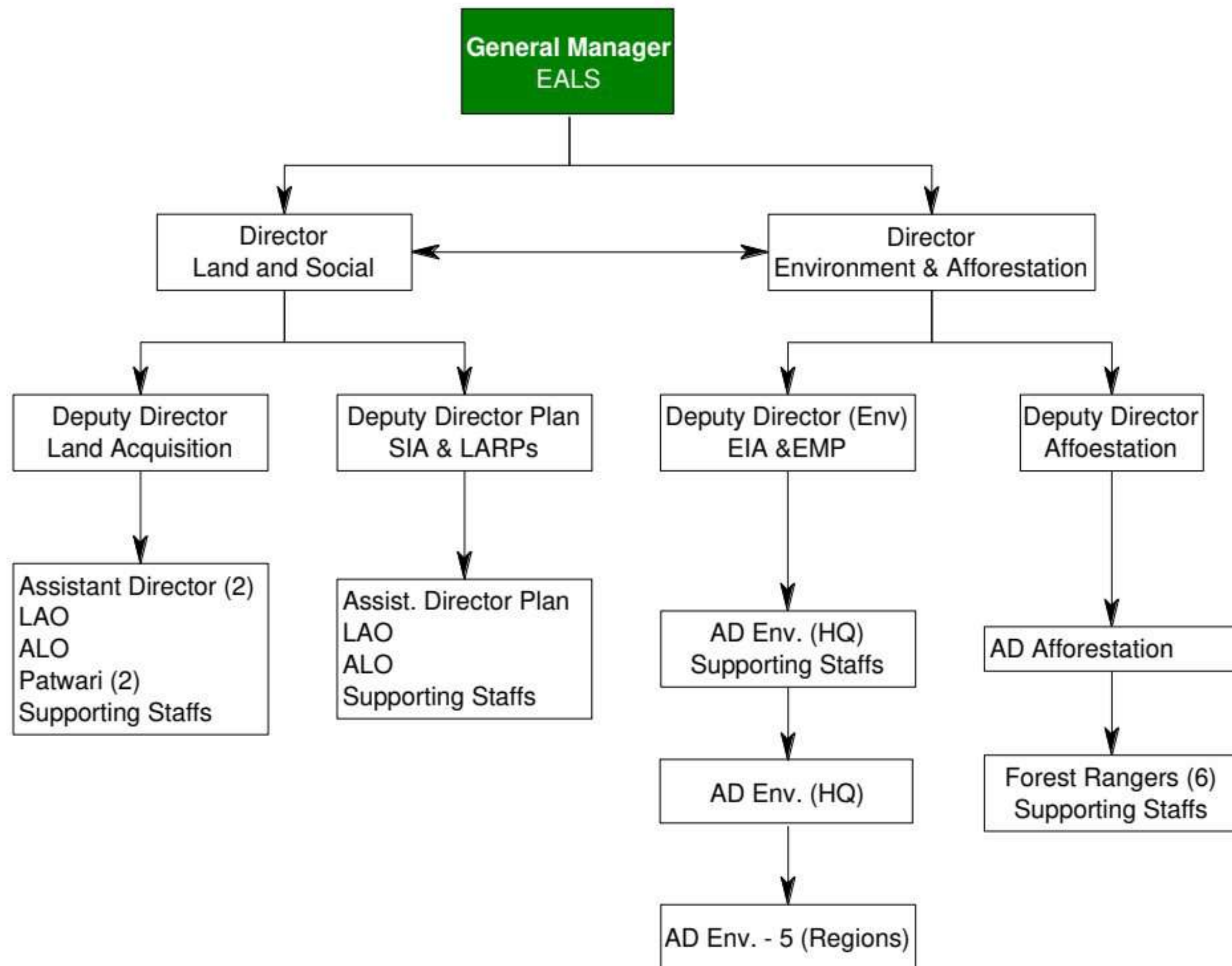


Figure 10-1: Environment, Afforestation and Land Section (EALS) of NHA-HQ

10.8.2 Institutional Arrangements for Implementation of E&S Instruments during Construction Phase

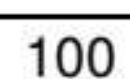
The key players involved during construction phase of the proposed Project are the PIU-HQ-NHA as employer / proponent and RIU(s) at each Section, concerned EPAs, the Construction Supervision Consultants (CSC), Third Party Validation Consultant and the Contractor(s). The roles and responsibilities of these organizations are outlined below.

The following staff will be involved in the implementation of E&S Instruments:

- PIU-HQ (General Manager (Engineer) NHA-HQ) / Proponent / Employer;
- PIU-HQ EALS/ESHS;
- RIU(s) at each Section (Project Director(s) and its E&S Staff);
- CSC;
- Third-party Validation Consultant; and
- Contractor's Staff.

The PIU-HQ NHA will make Contractors bound through contract documents to implement the E&S instruments and other terms and conditions of the relevant Permits including NOCs from Concerned EPAs and concerned agencies. The E&S instruments will be included as a clause

EIA (Phase 1A)



CS CamScanner

The General Manager (Engineer) NHA-HQ of PIU-HQ is the executive head of the entire N5 project. He is responsible for necessary policy, administrative and financial decisions and actions for effective and timely implementation of the project as per the approved framework and implementation schedules. He will be responsible for overall implementation of the project including environmental and social management aspects and hiring of contractors and consultants. The General Manager (Engineer) NHA-HQ PIU will be assisted by Project Director(s) of each project section for the onsite administration and other matters with close coordination with General Manager (Engineer) NHA-HQ PIU. PIU-HQ will be assisted by the following E&S specialists for implementation during project implementation:

- One Environment Specialist,
- One OHS Specialist,
- One Resettlement and Social Safeguard, Specialist.
- One Stakeholder Engagement/Public Relations Specialist
- One Climate Change Specialist, and
- One Gender Specialist.

The roles and responsibilities of the E&S staff of PIU-HQ are provided in ESMPF.

10.8.4 Regional Implementation Unit (RIU)

The RIUs will be established at regional level offices, which will be headed by the Project Director (PD), an executive head of the concerned Project Section. He will be responsible for necessary administrative and financial decisions and actions for effective and timely implementation of the project as per the approved framework and implementation schedules. The PD will be responsible for overall implementation of the project including environmental and social management aspects at site. The PD-RIU will be assisted by E&S Staffs of the concerned project Section for the onsite administration and other matters with close coordination with ESHS of PIU-HQ. The following E&S staffs of each RIU are proposed and will be at site during project implementation stage:

- Social and Resettlement Specialists
- Gender Specialist,
- Labor Specialist,
- Communication Specialist,
- OHS Specialists;
- Environment Specialists.

The E&S Staff at RIU will be responsible to monitor the compliance of E&S instruments during construction phase. The compliance will require monitoring of environmental, OHS, and social parameters and observations at the construction sites to evaluate compliance.

Furthermore, E&S Staff at RIU shall be responsible for:

- Regular site visits of the construction sites to review the environmental and social performance of the Contractor(s);
- Make sure that the Contractor is implementing the additional measures suggested by the CSC in environmental and social monitoring reports;
- Assist ESHS Section-PIU-HQ in the assessment of the livelihood loss and negotiation with the affectees for fixation of compensation to be paid for temporary impacts;
- Assist in checking genuine ownerships of the claimants, in consultation with the Revenue staff for prompt payment to the affectees;
- Assist the Contractor for the timely payments of negotiated prices;
- Assist Contractor(s) for obtaining necessary approvals from the concerned departments;

- Ensuring that the required environmental and social training is provided to the concerned site staff;
- Review contractor(s) monthly and quarterly monitoring and CSC progress reports of environment and social related activities;
- Report immediately within 24 hrs to PIU-HQ when environmental and social incidents (fatal and high potential) are occurred, while record of other incident and report will be the part of ES monitoring & Compliance; and
- Maintaining interface with the other lined departments/stakeholders in coordination with PIU-HQ.

10.8.5 Construction Supervision Consultant (CSC)

CSC will be responsible for the following tasks:

- Responsible for the supervision of RAP implementation;
- Supervise civil works, ensuring compliance with C-ESMP, OCHS Management Plan (OCHSMP), LMP, and all design parameters including quality requirements,
- Ensure Contractors include an EHS section in all Method Statements by addressing relevant EHS issues for each construction task,
- Supervise contractor's implementation of C-ESMP and OCHSMP and address noncompliance through work observation, inspection, and audits,
- Conduct EHS trainings for Contractors, the Employer and CSC staffs,
- Provide input, advice and approve method statements relating to ESHS issues,
- Prepare monthly and quarterly reports and submit to RIU and PIU-HQ.

The EHS staffs of CSC along with the person-month proposed for each position are presented in **Table 10-1**.

Table 10-1: Positions and proposed person-month of CSC

Sr. No.	Expertise	No. of Positions	Input (PM)
A	International Consultants		
1	Int'l Environment, Health and Safety Specialist	1	30
	<i>Subtotal (A)</i>		
B	National Consultants		
1	Environmental Specialists	1	30
2	Occupational Health and Safety Specialists	1	30
4	Social Specialists (including LAR, LMP and SEA/SH)	1	30
5	Communication Specialist	1	30
6	EHS Supervisors	4	120
8	Social Surveyors	1	30

10.8.6 Contractor

Contractors will be responsible for the following:

- Preparation of C-ESMP with site specific mitigation plans for approval of CSC before mobilization.

- Preparation of Occupational and Community Health and Safety Management Plan based on construction methods, site specific hazards and guidance presented in Chapter 9.
- Implementation of C-ESMP and OCHSMP as well as mitigation, monitoring, and control measures proposed in the ESMP and OCHS Guidance.
- Prepare separate monthly reports for addressing environmental and social impacts and OCHS issues.

The following personnel are required in the contractor's environmental and social team:

- Lead EHS Manager
- Environmental Specialist (1 numbers)
- Social Specialist (SEA/SH, 1 numbers)
- OHS Specialists (1 numbers for Section 7 ICT section)
- Community Liaison/Communication Officer (1 numbers)
- EHS Supervisors (4 numbers for Section 7 ICT section)
- Flagman (2 numbers for Section 7 ICT section)
- Medical Doctors (1 number with PMDC Licensed and all medical facilities including ambulance)
- Medical Technicians (1 number for Section 7 ICT section)

The Contractor shall appoint one Lead EHS Manager who shall be responsible for ensuring that the environment, health and Safety Management is adhered to the approved C-ESMP and OCHSMP. The Lead EHS Manager shall be a graduate with at least a Bachelor Degree in OHS/engineering/ environmental management and have experiences of more than 15 years in environment, health and safety works in infrastructure construction. They will be suitably qualified and experienced persons acceptably fluent in the English language. They shall have obtained a vocational certification issued by NEBOSH (National Examination Board in Occupational Safety and Health), or Board of Canadian Registered Safety Professional or an equivalent certification. The Lead EHS Manager or his designates (equally qualified) shall be available at Site on a 24h/day basis and their deputies shall carry out regular and random checks of all parts of the Site where work is taking place.

10.8.7 Third-party Validation (TPV) Consultant

The TPV will be carried out through independent E&S Specialists / Consultants (TOR are attached as **Annex 2 of ESMPF**). They will monitor the environmental and social parameters and conduct field surveys at the construction sites to evaluate compliance level. They will be engaged to conduct the external and independent monitoring of the implementation of the E&S instruments. This external monitoring agency is to conduct biannual and final evaluation of the E&S Instruments implementation and recommend changes if and when necessary to the ESHS Section.

Roles and responsibilities of TPV Consultant will be the following:

- Carry out independent monitoring at critical locations during construction phase and monitoring the implementation of E&S instrument at project area;

- Monitor GRM and resolution of complaints;
- Inform ESHS Section, NHA and AIIB of any significant impacts arising during construction; and
- Observe and amend/prepare (if required) of corrective action plans.

The TPV Consultant will carry out external monitoring on implementation of C-ESMP, LMP, OCHSMP, and will consist of the following team members on intermittent basis:

- Environmental, Health and Safety Specialist
- Social Specialist
- OHS Specialist
- EHS Supervisors - 2 numbers
- Social Surveyors - 2 numbers

10.9 Environmental and Social Management

10.9.1 Construction Stage Site Specific Management Plans

Contractor will be required to prepare site specific management plans and include in the C-ESMP along with the ECPs, prior to his mobilization and commencement of construction works, for approval of PIU-HQ and CSC. The key sub-plans are described below:

- **Material Transportation Plan** will be prepared by the contractor to prevent accidents during transportation by using motor-vehicles to the project sites and using other means. The plan should address specific details on the site conditions, the exact route to be followed and the conditions of the road. It is recommended that Contractor propose alternative routes for review and approval by the Engineer. A commitment must be made by the Contractor to repair the road to its original condition, if any local road is damaged due to the heavy loaded traffic of the Project.
- **Pollution Prevention Plan** will be prepared as part of C-ESMP and implemented by the contractors on the basis of the ECPs and WBG EHS Guidelines that will be part of the bidding documents. The Plan will be submitted to the CSC for their review and approval before contractor mobilization.
- **Construction Camp Management Plan** will be prepared as part of C-ESMP by the contractor based on ECP 14. The Plan will include the camp layout, details of various facilities including supplies, storage, and disposal. The Plan will be submitted to the CSC for their review and approval before camp establishment.
- **Emergency Preparedness Plan** will be prepared by the contractor after assessing potential risks and hazards that could be encountered during construction.
- **Communication Plan** to deal with the interaction of the community, complaints management, workers recruitment, notice of works and workers conduct with locals.

10.9.2 Mitigation Plan

The mitigation, safety inspections, and audit plans are the key element of ESMP to be prepared on the basis of impact and risk assessment described in Chapter 8. The Plan describes the potentially negative impacts and risk during construction and operation, lists mitigation and prevention measures to address the negative impacts and risks, and assigns

responsibilities for implementation, prevention and monitoring and inspecting of these measures. The Mitigation and prevention Plan is given in **Table 10-2**. Contractor will make sure they present the implementation status of mitigation and preventive measures identified in this Table in every monthly report, with quantifiable information.

Table 10-2: Mitigation, Compensation, Enhancement, and Prevention Plan

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
ESS1: Assessment and Management of Environmental and Social Risks and Impacts				
Cumulative impacts	Mitigation measures include coordination between construction and local traffic under the monitoring of NHA to avoid major consequence.	Pre-bidding		PIU-HQ
Lack of appropriate E&S personnel with CSC, Contractors and the Borrower	- ESMP defines the education, qualification, training and experience requirements. - Recruit all personnel listed in the ESMP as per the requirements.	Pre-bidding process	Evaluation as per the requirements of ESMP	PIU-HQ
Inadequate implementation of C-ESMP, LMP, OCHSMP.	- Recruit qualified contractors who maintains environmental sustainability in corporate strategy. - Avoid contractors with poor environmental, health, and safety management. - Contractor's qualifications stated in the ESMP are included as the pre-qualification criteria in the short-listing process. - Ensure that the conditions of the ESMP is correctly reflected in the contractor's bidding documents and the supervision consultant's TOR. - EHS bills of quantities are included in the specifications. - Education, qualification and training requirements of personnel are included in the bidding documents and considered by the supervision consultant when they give approval to the contractor. - Prepare Contractor's Environmental and Social Management Plan (C-ESMP), OCHSMP based on the EIA.	Planning prior to construction, implementation throughout. System review and re-planned for operations.	C-ESMP, LMP, OCHSMP.	Contractor, CSC, PIU-HQ, RIU

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
	Recruit qualified staffs to implement the C-ESMP and OCHSMP.			
ESS1: Labor and Working Conditions				
Labor management,	Implement Labor Management Procedure (LMP)	Planning prior to construction, implementation throughout. System review and re-planned for operations.	LMP; Stakeholder engagement with workers Worker representation committees Supply chain analysis and due diligence procedure	PIU-HQ, RIU, CSC, Contractor
Working condition	Mitigation measures include skill development, local employment, RIU-supervision for labor standards, worker training on GRM, a complaint box for reporting issues, and effective LMP compliance.	Throughout project lifecycle	LMP	CSC, RIU Contractor
Worker accommodations	- ECP 14: Construction Camp Management - ensure that the Contractors are following the labor standards, training for the workers on the existing GRM so they know their rights and responsibilities, and availability of complaint box allowing for workers to report any wrongdoings. - dedicated cleaning staff, routine checks of the conditions of the accommodations, penalties (to act as deterrent rather than with the intention for punishment) for workers are careless and intentionally do not uphold the safety and hygiene standards.	Throughout project lifecycle	Workers' accommodation plan and LMP	CSC, RIU Contractor

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
	Mitigation measures provided in LMP			
Child and forced labor	- Adding legal requirements in Contractor contracts that they must not employ underage workers, and positive identification before hiring. - The contractor will comply with the labor laws of the Country. - When sourcing for primary suppliers, the project will require such suppliers to identify the risk of child labor/forced labor and serious safety risks. The PIU-HQ and the consultants will review and approve the purchase of primary supplies from the suppliers following such risk identification/assessment. Where appropriate, the Project will be required to include specific requirements on child labor/forced labor and work safety issues in all purchase orders and contracts with primary suppliers. In particular, NHA will require bidders to provide two declarations: a Forced Labor Performance Declaration (which covers past performance), and a Forced Labor Declaration (which covers future commitments to prevent, monitor and report on any forced labor, cascading the requirements to their own sub-contractors and suppliers).	Throughout project lifecycle	LMP	CSC, RIU, Contractor
Risk of falling in water or drowning during bridge construction and maintenance over water	Contractors will implement an OHS management plan with SOPs, job hazard analysis, method statements, training, and incident reporting. Work should be	Construction	OCHSMP	CSC, RIU Contractor

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
	subcontracted to experienced firms, minimizing manual overwater tasks using mechanical equipment. Safety provisions include passive systems (fencing, guardrails, safety nets), worker rescue measures, safe transport, and mandatory life jackets.			
Occupational Health and safety	- Contractors will prepare and implement OHS management plan that would include standard operating procedures (SOPs) for all works, requirement of conducting Job Hazard Analysis and preparing Method Statements containing OHS aspects, traffic interface planning, working at height and hot work permit, barricading, OHS training requirements, incident recording and reporting protocols. - NHA will prepare a similar Plan/System for the operation phase.	Throughout project lifecycle	OCHSMP	CSC, RIU, Contractor
Safeguarding personnel, property and the risks from presence of a security force	ECP 17: Construction and Operation Phase Security	Planning prior to construction, implementation throughout.	Security management plan	RIU in collaboration as deemed relevant with a security service provider and Contractor
ESS1: Resource Efficiency and Pollution Prevention and Management				
Land use change	Mitigation measures would include proper land clearance planning, spoil management measures, vegetation clearance and erosion management, sediment management, design of storm water drainage in construction areas as	Design and procurement period	Comply with design requirements	CSC, RIU, Contractor

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
	well as design and implementation of site erosion control.			
Landscape aesthetic	Mitigation measures would involve careful siting of project components and improve landscape through plantations.	Design and procurement period	Comply with design requirements	RIU, CSC, Contractor
Air pollution	- Emissions management from construction vehicles, frequent spray of water on unpaved roads, and preventing the release of emission from burning waste materials. - Dust control measures would consist of proper construction materials planning, dust management planning, and water spraying where needed. - Prevent release of dust and emissions from burning waste materials, construction vehicles, and generators, and their management - ECP 1: Waste Management - ECP 2: Fuels and Hazardous Goods Management - ECP 7: Topsoil Management - ECP 9: Air Quality Management - ECP 13: Road Transport and Road Traffic Management	Throughout construction and operation	Air quality management plan	CSC, Contractor, RIU
Noise and vibration	Noise and vibration management, organize the loading and unloading of trucks, and handling operations for the purpose of minimizing construction noise on the work site, use lower wattage flat lens fixtures that direct light down and reduce glare during the night, thus reducing light pollution.	Throughout construction and operation	Noise and vibration management plan Air quality management plan	CSC, RIU, Contractor

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
	- Using noise control mechanisms (eg, noise canopy over generators and compressors) - Avoiding/minimizing noisy works during the night time as far as possible - Maintaining community liaison - Using light diffusers where necessary - ECP 10: Noise and Vibration Management			
Potential hazards caused by bitumen and other toxic chemicals	- Spills and leaks will be contained through appropriate means such as bunding. Chemicals and oils will be stored on cemented platform and in a covered area with spill containment arrangements. - A waste management plan will be developed to deal with the wastewater produced from construction sites and camps as well as a design for spillage control and wastewater treatment. - ECP 2: Fuels and Hazardous Goods Management	Throughout construction and operation	OCHSMP	CSC, Contractor, RIU
Spoil management measures	- ECP 1: Waste Management - ECP 7: Topsoil Management	Prior to construction	Spoil management plan	CSC, Contractor
Pollution associated with borrow pits	- Obtain and verify permits for borrow pits, regulate excavation depth (1:4 slope), control soil erosion, prevent mosquito breeding, preserve topsoil for vegetation, use pits for waste disposal, and ensure safety with fencing and access restrictions. - ECP 9: Borrow Areas Development & Operation	Throughout construction	Borrow material management	contractor RIU
Wastewater from construction camps and other site facilities	Avoid storing liquids where there is a high risk of water pollution or land contamination	Prior to construction; During construction	Design Waste management plan	RIU, contractor and designers

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
	(e.g., on bare ground or unsealed surfaces, next to drains, creeks etc.). • Proper waste disposal system is to be implemented to minimize pollution • All fuel, oils, chemicals, hydraulic fluids, on-site toilets etc. must be stored in the construction site compound which shall be bunded • Optimize use of resources (oil, water, etc.) to minimize the amount needed • Make incidence reporting a priority in case of spills and leaks • Train staff to recognize spills and the appropriate measures to take • Keep continuous inspection for leaks prior to each construction activity (e.g., concrete pouring) • All pouring of concrete, sealing of joints, application of water-proofing paint or protective systems, curing agents, etc. for outfalls must be completed in dry weather • Locations where concrete or other wet materials are to be used, bunded steel decks must be used to capture any spilled concrete, alkaline water displaced from inside tubular steel piles or spilled sealants or other materials • The fueling equipment should be equipped with "breakaway" hose connections that provide emergency shutdown of flow in case of failure of connection.			

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
	- Absorbents should be present at places of refueling. - All camps and other facilities will have appropriate effluent treatment and disposal mechanism - Regular monitoring of water quality near Project Area - ECP 1: Waste Management - ECP 3: Water Resources Management - ECP 14: Construction Camp Management			
Stormwater in construction areas	- ECP 1: Waste Management - ECP 4: Drainage Management - ECP 3: Water Resources Management - ECP 14: Construction Camp Management	Prior to construction	Design	RIU, contractor and designers
Site erosion	- ECP 5: Soil Quality Management - ECP 6: Erosion and Sediment Control - ECP 7: Topsoil Management	Prior to construction Throughout construction period	Design Sedimentation and erosion control plan	RIU, contractor and designers
Leaks and spills	- ECP 1: Waste Management - ECP 2: Fuels and Hazardous Goods Management - ECP 3: Water Resources Management	Design prior to construction. Throughout construction period.	Design Spill management plan Traffic management plan Water resources management plan Construction traffic management plan	RIU, contractor and designers
Safe drinking water	ECP 3: Water Resources Management	Throughout project	Water resources management plan	contractor; RIU
Stockpiling arrangements and pollution prevention	- ECP 1: Waste Management - ECP 2: Fuels and Hazardous Goods Management - ECP 3: Water Resources Management	Construction	Ecological management plan within the ESMMP spill management plan water resources	contractor

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
	ECP 7: Topsoil Management		management plan waste management plan	
Solid waste management	- Implement waste management system to avoid, minimize, reduce and reuse waste including defining material ordering, use and handling measures. Moreover, waste material storage areas, borrow pits and materials laydown areas should be carefully designed and sited. Appropriate measures should also be introduced for materials storage, handling and use. - Introduce measures for waste segregation where applicable - Define storage and transportation requirements for various types of wastes - Define final disposal arrangement/location for various types of wastes - ECP 1: Waste Management - ECP 2: Fuels and Hazardous Goods Management	Throughout construction and operations	Waste management plan	contractor
Measures for materials storage, handling and use	- ECP 1: Waste Management - ECP 2: Fuels and Hazardous Goods Management	Throughout construction and operations	Materials management plan	contractor
Re-use construction material	ECP 1: Waste Management	During design and construction	Materials management plan	contractor
Traffic management including Speed restrictions; Vehicle monitoring; Trained drivers and licensed contractors, road maintenance;	- Mitigation measures include road condition surveys, controlling vehicle movement, final road routing, and ensuring proper road maintenance. - The contractor will prepare and implement a traffic management plan that would include drivers' training in defensive driving	Construction	Traffic management plan	contractor

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
Designated crossing points; on site traffic management; Minimize vehicle journeys and fuel consumptions; and accident action planning	techniques, speed control, placement of flagmen where needed (eg, along the populated areas and markets), placement of sign boards, liaison with the community and increasing community awareness regarding project related traffic. • ECP 13: Road Transport and Road Traffic Management			
Operational phase traffic management	• ECP 13: Road Transport and Road Traffic Management	Operations	Traffic management plan	RIU
Structural adaptation measures - Adding flexibility and low regret climate adaptation measures for dealing with floods, droughts, heatwave events	• Locate camp on higher and stable ground • Design access roads with consideration of flood and drought risks • Provide shading, insulation and ventilation at work sites • Locate transmission line towers and their foundations out of known flood zones and avoiding steep slopes if possible • For transmission towers and their foundations, increase concrete mix/strength to be more resilient to flood, drought, heat and lightning strikes • Insulate and protect critical service infrastructure • Adapt traditional construction materials to withstand higher temperatures • Include debris screens for drainage systems, additional construction joints to allow for more thermal expansion, slope protection / stabilization measures and monitoring	Detailed design	Design	RIU and contractor

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
Climate resilience decision making	- Use an adaptive management and systems approach with regards to operating regime - Include monitoring, evaluation and reporting requirements in this plan or through other management plans.	Construction	Climate risk management plan (with guidance from IHA Hydropower Sector Climate Resilience Guide 2019)	RIU
Temporary flood reduction measures	- Store temporary flood barriers for deploying in a storm/heavy precipitation event. - Prepare temporary additional drainage and temporary debris screens - Plan for increased road drainage, and road surfacing on temporary/unsurfaced roads - Revise construction schedule during extreme flood event	During construction	Climate risk management plan (following IHA Hydropower Sector Climate Resilience Guide 2019)	contractor
ESS1: Community Health and Safety				
Community Health and Safety Risks in the Communities close Proximity of the Project; labor influx; SEA/SH risks	- Mitigation measures would include performing medical screening and requiring proof of vaccination prior to any employment. Moreover, the contractor should conduct induction training or workshops to introduce the basics of health and hygiene and the necessary preventive measures against them. - Vaccination programs can also be organized in the camp and any positive cases of COVID-19 should be dealt with diligently. - Establish workers' camps separated from local communities with strict protocols for interaction with local communities in order to avoid project impacts from labor influx.	Throughout project lifecycle	Community health and safety plan	RIU Contractors

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
	- Contractor will develop a Code of Conduct (CoC) for all site personnel. All site personnel will sign this CoC and will abide by it. - Project staff will receive training on the prevention of SEA/SH. Engagement of skilled trainers to raise awareness among project workers of the risks, expected behaviors, and consequences of violations, communicated through training, and publicized codes of conduct. It may also be important to raise awareness of the risks among community members and local health authorities and inform them about available grievance mechanisms. - Arrange and support local organizations and/or government initiatives on community STD education, prevention, and treatment programs. - Extensive training for awareness raising strategy which describes how workers and local communities will be sensitized to SEA and SH risks, and the worker's responsibilities under the CoC - The routes/places used by the women will be avoided as far as possible. If unavoidable, alternate routes will be identified for the communities, if required, especially along routes frequented by women folk, such as route to the local well or water source.			

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
	- Construction crew will avoid entering villages and settlements. - Communities will be informed and consulted before commencing works inside or near the communities. - Provision related to SEA/SH will be incorporated in the bidding document, - Identification and mapping of the service providers.			
Management of project-induced influx and local community effects from availability of short-term salaries	- Compile influx management strategies incorporated across the employment and procurement policy, stakeholder engagement plan, community health and safety plan, community investment plan and security plan into this plan. - Identify additional actions as required, for instance ring fence community investment funds for spatial planning or support for local initiatives to address greater demand for community and infrastructure, hold influx forum every year during construction, support counselling services in response to known anti-social behavior (including gender-based violence), and support financial management awareness services.	Planning prior to construction, implementation throughout. Plan updated for operations if risk assessment indicates ongoing influx.	Influx management plan	RIU Contractor
Traffic Management; Traffic and Road Safety	- Mitigation measures include road condition surveys, controlling vehicle movement, final road routing, and ensuring proper road maintenance. - The Contractor will prepare and implement a traffic management plan based on the	Construction	Traffic management plan	contractor

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
	recommendations made by the road safety study (separately carried out for N5) that would include drivers' training in defensive driving techniques, speed control, placement of flagmen where needed (e.g., along the populated areas and markets), placement of sign boards, liaison with the community and increasing community awareness regarding project related traffic. ECP 13: Road Transport and Road Traffic Management			
Training on human rights	Train managers and key staff in anticipated interactions between the project and human rights issues to embed the project's commitments on delivering on human rights policies and procedures	All phases	ESMP; LMP	RIU
Emergency Preparedness and Response	- Preparing an emergency preparedness and response plan (EPRP) by the Contractor at site level as part of the OCHSMP and by NHA at the Project level to contain larger emergencies. - NHA will work with the local authorities to coordinate with the national emergency response network in the areas of influence and to ensure implementation of the project specific emergencies and make arrangements with external emergency services (Fire, ambulance, etc.), if the resources available with the Contractor is not sufficient to contain an emergency.	Design, pre-construction, construction, and throughout project lifecycle	Emergency Preparedness and Response Plan	RIU Contractor

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
ESS 1: Biodiversity, Conservation, and Sustainable Management of Living Natural Resources				
Losses of trees and terrestrial habitat due to land clearance	- Mitigation measures include minimizing land clearance, restricting activities to designated areas, and properly planning camps, machinery movement, and temporary roads to protect vegetation. - Construction camps should be established in areas with little to no vegetation, and alternate routes for access and diversion road should be chosen to avoid environmental impact. - Camp locations will be selected to minimize environmental effects, reduce costs, and limit land use. - Compensate each tree with 10 trees planted with a total of 6300 saplings, through a plantation enhancement program. - ECP 5: Soil Quality Management - ECP 6: Erosion and Sediment Control - ECP 7: Topsoil Management - ECP 8: Topography and Landscaping - ECP 11: Protection of Flora - ECP 12: Protection of Fauna	Operation	ESMP	RIU and Contractors
Habitat rehabilitation and restoration	Include habitat rehabilitation and restoration on the sites affected temporarily by construction (these are unknown at this stage). The nature and areas of habitats to be restored on these sites will be determined following stakeholder consultation led by the RIU.	Implement immediately after construction	Ecological management plan within the ESMMP (Vegetation removal and restoration plan within this)	Led by RIU with contractor implementation support

Impacts and Risks	Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
Killing or injury of species	- introducing and enforcing speed limits for vehicles. - A hunting ban imposed on Project staff alongside other standard mitigation for road safety and habitat clearance. - ECP 11: Protection of Flora - ECP 12: Protection of Fauna	Throughout project lifecycle	Ecological management plan within the ESMP (Wildlife rescue and relocation plan within this)	contractor
ESS1: Stakeholder Engagement and Information Disclosure				
Stakeholder engagement carried out in a meaningful and inclusive way, providing access to remedy	Detailed measures available in Stakeholder Engagement Plan	Stakeholder engagement plan (current version developed as part of this EIA) Implementation prior to construction, during construction and operations	Stakeholder engagement framework in ESMS Stakeholder Engagement Plan	RIU, possibly with support of a communications company
Data security policy	Prepare and implement a data security policy to ensure secure handling of personal data by the project	All phases	Data security policy	RIU
ESS 2: Land Acquisition and Involuntary Resettlement				
Resettlement of affected people	- Fair and timely compensation will be provided, through stakeholder engagement and livelihood restoration. The RAP will include a recovery plan with ongoing monitoring. Income loss assessments will be updated as needed. Awareness programs will inform affected individuals about project benefits, land acquisition, and compensation. - Implement Resettlement Action Plan	Project preparation and implement stage	RAP	RIU

Impacts and Risks		Details of mitigation/enhancement measure	Implementation timing	Implementation method	Responsibility
Temporary Acquisition	Land	Construction camps will be on acquired land; if not feasible, leased through direct agreements without LAA, 1894 applicability. Camps will be 500m from settlements and cultural sites, with an approved management plan. Waste or barren land at higher elevations will be prioritized to reduce environmental impact.	Prior to the mobilization of main Contractor	RAP	RIU

10.10 Plans to Address Project Impacts and Risks

Five ESMP Sub plans have been proposed to address direct project and cumulative impacts, to guide environmental and social management procedures and the implementation of prescribed mitigation and enhancement measures during the construction and operational phases of the Project. This section will be further updated when engineering design is finalized. The following sub-plans have been proposed under the Project to be implemented by the Contractor and RIU:

10.10.1 Tree Plantation / Reforestation Plan

The basic purpose of afforestation/plantation of suitable species in the Project area is to reduce the risk been made due to different construction activities for the proposed Project. The expected risk made will be compensated by planting of saplings to enhance green cover and improve the overall environment of the area. Afforestation will not only reduce the risk been made but will also increase the green cover, carrying capacity and aesthetics of the area along with many positive aspects and impacts.

Plantation will be done after the construction work immediately. Plantation of indigenous trees species is highly important to maintain the biodiversity and ecological balance. It is also important to prevent global warming, soil erosion and pollution. Afforestation purifies the environment and helps in reducing the carbon dioxide level. Along with the importance of construction, the afforestation activity will further help in enhancing the socio-economic condition of the area and Project sustainability.

The Forest Department and Capital Development Authority Islamabad may also be engaged for carrying out the proposed activates. The details are attached as Annex 10-2. Plantation and Maintenance of the plantation will be responsibility of EALS NHA.

10.10.2 Project Induced Labor Influx Management Plan

The plan is to recruit one Contractor for the entire project and they may develop one or more construction facilities – one for Section 7 ICT section. The project expects to involve direct workers, contracted workers and primary supply workers. It is estimated that approximately 800 direct jobs are expected to be created during the construction phase and 50 in the operations phase. Most unskilled positions are likely to be sourced from the local districts and neighboring communities, thereby sharing project benefits with communities. Many of the workers are expected to be employed from the existing highway reconstruction projects, therefore, reducing new workers coming into the area.

The construction work, with the promise for more development in the project locations – particularly in selected central places/markets, may further attract diverse groups of in-migrants, namely, families/followers, traders/entrepreneur, small business/shop owners, suppliers of construction-related materials and various other service providers will move into the area to benefit from the project construction for more than two years period. This may lead to potential negative socio-cultural impacts, including a wide range of concerns such as gender-based violence, sexual exploitation and abuse of women/children, generating tensions

between the local residents of the remote and isolated and rather conservative communities and the in-migrant groups.

The Contractor will prepare a labor influx management plan in line with AIB's guidelines, covering measures or strategies to (i) raise awareness and engage all stakeholders (e.g., project management, contractors, consultants, community groups/leaders, local NGOs) in responding to the social and cultural risks to local communities; (ii) inter-cultural understanding with a view to minimize the risks; (iii) better management of construction and labor camps; (iv) development and implementation of code of conduct for locals and in-migrant workers (for instance, respect to local values and cultures; workers strictly forbidden to establish contacts and relationship with local women; workers must not leave camps without prior permission from the supervisors; and workers or local resident must report any suspicious contact or activities to the camp officers); and (v) improvement in local law and order to ensure positive environment and build a community of mutual trust and respect for project construction.

10.10.3 Chance Find Procedure

The purpose of these guidelines is to address the possibility of archaeological deposits, finds and features becoming exposed during earth removing and ground altering activities associated with the construction and to provide procedures to follow in the event of a chance archaeological find. The chance find procedure of archaeological deposits is attached as **Annex 1** of the ESMPF.

10.10.4 Skill Development Plan for Employment with the Contractor

Due to the high unemployment rate in the country, communities who are affected by the Project due to the resettlement for project implementation will come to the Contractors and implementing agency with the demand to be employed in the Project, this was echoed during community consultation as well. Most of them are unskilled and has no experience in infrastructure project. Therefore, Contractor will be reluctant to employ them at the beginning in the construction activities. This can cause protest and agitations in the project area and often lead to Contractors' work stoppages and extreme delay in project implementation. It is recommended that one-week job specific skill development training should be provided with pay to the community members prior to their employment. Some training can be outsourced to the recognized national or provincial institutions. Certificates should be provided to the participants after completion of the training. The training should be hands-on and specific to the job, e.g., Truck and car driver, Catering staff, Cement finisher, Scaffolder, Security staff, Electrician, asphalt sprayer, etc. This will bring two prong benefits, one in the development of skills in the country and the second one in quick project implementation. The skill development will cost about \$150,000 and will be included in the Contractor's contract.

In addition to the job specific training, the Contractor will provide training in the following areas:

(a) Communication Skills

Communication forms the backbone of almost any construction project. Whether it is to present an idea to the supervisor or foreman, discuss an alternate plan when construction hits a snag, or even just request new supplies, communication is important to making sure the

project stays on track. The Contractor will always prefer construction workers who already have this soft skill; therefore, a good communicator will pay off the construction site by this skill.

(b) Teamwork Skills

Construction workers have to work in teams. Teamwork skills help get the job done. Much like good communication skills keep everyone on the same page, good teamwork skills allow everyone to work together in a harmonious way. The job stays on track and will likely be finished sooner if everyone works together.

(c) Time Management Skills

Time management skills are incredibly important for construction workers in any number of roles. Construction work has deadlines to meet. Some tasks are time-sensitive (e.g., concrete creeping). Delays are very common on the sites of construction projects. Contractor needs workers who can manage their time effectively. Contractor needs workers who know how to prioritize and reorganize their schedules when faced with unexpected delays.

(d) Technical Skills

Specific construction skills include manual and mechanical excavation, stone-laying, pouring cement, erecting and installing specific types of equipment. Contractors typically appreciate versatile workers who can take on additional tasks as needed. Construction tasks may include:

(i) Electrical	(vii) OSHA safety requirements
(ii) Framing	(viii) Erecting
(iii) Concrete	(ix) Crane and Rigging
(iv) Panel assembly work	(x) Operation of Construction equipment
(v) Environmental codes	(xi) Use of Power tools
(vi) Reading and interpreting drawings	

(e) Occupational Health and Safety at Worksite

Construction industry comes next to agriculture and cotton industry in providing jobs in Pakistan; though it is the third largest source of livelihood, it is highly informal and unorganized, with unskilled and semi-skilled workers. These workers, mostly migrants, fall into the trap of contractors and middlemen and lose their jobs and a decent life. The only way to reconstruct their lives is by training them in functional skills and equipping them with safety and health information at the earliest. In fact, such intervention can be effectively carried out on the construction premises itself with bare minimum infrastructure.

The classroom training apart from technical aspects also has soft skill trainings focusing on the social and behavioral habits of the trainees, including health, sanitation and safety to bring significant improvements in their worldview and way of life. Such skill trainings will help construction worker to gain self-confidence. Once they undergo the trainings, raw/unskilled workers look forward to handling semi-skilled jobs and semi-skilled workers to jobs requiring

skilled manpower. As a result, Wage Enhancement is almost assured for all of those undergoing such trainings. These trained workers can then pursue semi-skilled jobs in the middle-east.

10.11 Environmental and Social Monitoring

Environmental and Social 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 E&S preparation, pre-construction, construction and O&M. It helps in timely identification / analysis and removal of the bottlenecks and expedites actions. Certain environmental parameters (physical, ecological and social) are selected and quantitative analysis is carried out. The results of analysis will be compared with the guidelines; standards and pre-Project condition to investigate whether the ESIA/EIA, ESMP/EMP and its implementation are effective for the mitigation of impacts or not. The objectives of environmental and social monitoring plan during the pre-construction, construction and O&M phases will be as follows:

- Monitor the actual Project impacts on physical, ecological and socio-economic receptors;
- Recommend mitigation measures for any unforeseen impact or where the impact level exceeds the anticipated level in the ESIA/ESMP;
- Ensure compliance with legal and community obligations including safety during construction and O&M phases;
- Ensure the safe disposal of excess construction materials, solid waste, water and wastewater and gaseous emissions;
- Appraise the adequacy of the ESIA/ESMP with respect to the Project’s predicted long-term impacts on the area’s physical, ecological and socio-economic environment;
- Evaluate the effectiveness of the mitigation measures proposed in the ESIA/ESMP and recommend improvements in ESIA/ESMP, if required; and
- Compile periodic incidents / accidents data to support analyses that will help to minimize future risks.

PIU-HQ and RIU of NHA will be responsible for all the monitoring activities (compliance monitoring and effect monitoring). All the findings and results in the form of monitoring report will be finally shared with respective EPA as well as AIIB as per the reporting mechanism.

10.11.1 Compliance Monitoring

The compliance monitoring of the proposed Project activities is principally a tool to ensure that the environmental and social control measures identified are strictly adhered to during the Project execution. The compliance monitoring will be conducted by the E&S Staff of SC. Various aspects of the ESIA/ESMP compliance monitoring will be to:

- Systematically observe the activities undertaken by the contractor(s) or any other persons associated with the proposed Project;
- Verify that the activities are undertaken in compliance with the ESIA/ESMP;

- Document and communicate the observations to the CSC and E&S staff of RIUs, so that any corrective measures, if required, can be taken in a timely manner;
- Maintain a record of all incidents of environmental and social significance and related actions and corrective measures;
- Maintain contact with the communities, solicit their views and concerns, and discuss them during the monthly meetings; and
- Prepare periodic reports of the environmental and social performance of proposed Project.

10.11.2 Effect Monitoring Strategy

The ESIA/ESMP anticipates the impacts of the proposed Project on the basis of information available at the time of conducting the assessment and the natural processes that link various environmental and social parameters. Based on assessment, mitigation measures are introduced such that the predicted residual effects do not exceed acceptable levels. Consequently, it is possible that even if the mitigation measures are implemented fully, the negative impacts of the Project could exceed predicted levels or acceptable limits. In order to address the above concerns, effects monitoring will be undertaken during the Project activities, with the overall objective of proper management of environmental and social risks and uncertainties. Broadly, effects monitoring has the following objectives:

- To verify that the impacts of the proposed Project are within acceptable limits, thus establishing credibility (public assurance);
- To immediately warn the PIU-HQ and RIU of unanticipated adverse impact or sudden changes in impact trends so that corrective actions can be undertaken, which may include modifications in the proposed activities, or the inclusion of modified or additional mitigation measures;
- To provide information to plan and control the timing, location, and level of certain Project activities so that the effects are minimized; and
- To facilitate research and development by documenting the effects of the proposed Project that can be used to validate impact-prediction techniques and provide a basis for more accurate predictions of future projects.

The contractor(s) is mainly responsible for effect monitoring, which is being supervised by the CSC and monitored by RIUs at each site, and for the entire Project. The effect monitoring program has been designed carefully considering the identified impacts 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 10-3** provides environmental and social effect monitoring schedule for pre-construction, construction and operations stages of the proposed Project.

Table 10-3: Monitoring Plan as per ESSs

Sr. No.	Parameters / Receptor	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Responsibility	
						Implementation	Monitoring
1.	Water Resources/ Water Quality	Monitoring of all parameters of effluent from construction sites as per stringent environmental quality standards.	Proposed Project routes. - Major receptor, i.e., residential areas etc. within the RoW/AoI. However, estimated sampling points will be verified at construction stage. Other proposed effluent discharge points are: - Contractors camps - Concrete preparation plants - Fuel (Petrol. Oil and Grease) products storages. - Vehicle and machines repairing and servicing yards.	Visual checks of laboratory activities Discrete grab sampling and laboratory testing of water samples by Concerned EPA approved Laboratory for monitoring.	- Once before the start of construction by activity monitors and reported; and - On quarterly basis during the construction. - Bi annual during O&M Phase	- Contractor during Pre-Construction and Construction Phase - NHA during O&M Phase	- Compliance monitoring lies with CSC and RIU during Construction Phase - NHA during O&M Phase

Sr. No.	Parameters / Receptor	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Responsibility	
						Implementation	Monitoring
2.	Drinking Water	Monitoring of all parameters of drinking water as per stringent environmental quality standards.	Proposed Project routes. Major receptor i.e. construction site, camps area and nearby residential areas within the RoW/AoI. However, estimated sampling points will be verified at construction stage.	Visual checks and monitoring of laboratory activities Discrete grab sampling and laboratory testing of drinking water samples by Concerned EPA Laboratory for monitoring.	- Once before the start of construction by activity monitors and reported; and - On quarterly basis during the construction. - Bi annual during O&M Phase	- Contractor during Pre-Construction and Construction Phase - NHA during O&M Phase	- Compliance monitoring lies with CSC and RIU during Construction Phase - NHA during O&M Phase
3.	Soil Contamination	Soil contamination, uncontrolled solid waste disposal activities at sites.	Proposed Project routes. - Sites with severe contamination. Other proposed sampling sites are: - Construction Camp. - Equipment washing yards. - Spillage points of fuel,	Visual observations and checks of laboratory activities Sampling and laboratory testing for soil samples.	- Once before the start of construction by activity monitors and reported; and - On quarterly basis during the construction. - Bi annual during O&M Phase	- Contractor during Pre-Construction and Construction Phase - NHA during O&M Phase	- Compliance monitoring lies with CSC and RIU during Construction Phase - NHA during O&M Phase

Sr. No.	Parameters / Receptor	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Responsibility	
						Implementation	Monitoring
			chemicals and lubricants.				
4.	Land Resources	Land use change.	Proposed Project routes. • Sites with significant land use change.	Random visits and visual observations of land use change.	- Once before the start of construction by activity monitors and reported; and - On quarterly basis during the construction. - Bi annual during O&M Phase	- Contractor during Pre-Construction and Construction Phase - NHA during O&M Phase	- Compliance monitoring lies with CSC and RIU during Construction Phase - NHA during O&M Phase
5.	Dust Emissions	Monitoring of PM ₁₀ PM _{2.5} as per stringent environmental quality standards	Proposed Project routes. • Sensitive receptors within the RoW/AoI, construction site, camps area. Estimated sampling points will be verified during construction stage.	Visual checks and monitoring of laboratory activities Onsite Ambient Air Monitoring equipment	- Once before the start of construction by activity monitors and reported; and - On quarterly basis during the construction. - Bi annual during O&M Phase	- Contractor during Pre-Construction and Construction Phase - NHA during O&M Phase	- Compliance monitoring lies with CSC and RIU during Construction Phase - NHA during O&M Phase

Sr. No.	Parameters / Receptor	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Responsibility	
						Implementation	Monitoring
6.	Noise Pollution	Day and night time noise monitoring in dBA Leq. as per stringent environmental quality standards	Proposed Project routes. - Sensitive receptors within the RoW/AoI. Estimated sampling points will be verified during construction stage. Other proposed sampling sites are: - Construction camps. - Equipment yards.	Visual checks and monitoring of laboratory activities Monitoring of noise level at site.	- Once before the start of construction by activity monitors and reported; and - On Monthly basis during the construction (spot measurement regular daily basis keeping in view the day to day application of different heavy noise causing equipment by the contractor). - Bi annual during O&M Phase	- Contractor during Pre-Construction and Construction Phase - NHA during O&M Phase	- Compliance monitoring lies with CSC and RIU during Construction Phase - NHA during O&M Phase
7.	Fumes and gases	Monitoring of CO, CO ₂ , SO _x , NO _x , HC and PM _{2.5} PM ₁₀ and compliance with stringent	Proposed Project routes. Major receptors within the RoW/AoI. Estimated sampling points	Visual checks and monitoring of laboratory activities Onsite monitoring of ambient air	Once before the start of construction by activity monitors and reported; and	Contractor during Pre-Construction and Construction Phase	Compliance monitoring lies with CSC and RIU during Construction Phase

Sr. No.	Parameters / Receptor	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Responsibility	
						Implementation	Monitoring
		environmental quality standards Vehicular emissions as per stringent environmental quality standards.	will be verified during construction stage. • Emissions from the silencers of heavy machinery, trucks and other vehicles.	quality will be preferred.	• On quarterly basis during the construction. • Bi annual during O&M Phase	• NHA during O&M Phase	• NHA during O&M Phase
8.	Ecological Resources	Disturbance to natural habitat and fauna, uncontrolled floral cutting which can be avoidable.	Proposed Project routes along the RoW/AoI.	Visual checks to ensure that only marked trees are cut within the Project corridor. Monitoring of Wildlife / birds hunting. Inventory of existing trees, cut trees, and planted trees.	• Once before the start of construction by activity monitors and reported; and • On quarterly basis during the construction. • Bi annual during O&M Phase	• Contractor during Pre-Construction and Construction Phase • NHA during O&M Phase	• Compliance monitoring lies with CSC and RIU during Construction Phase • NHA during O&M Phase
9.	Public Infrastructure	Disturbance or damage to public infrastructure	Proposed Project routes. • Public infrastructures within the RoW/AoI. These	Random visits and consultations with vulnerable.	Prior to the start of construction. Reporting will be done on the basis of RAP recommendation.	• Contractor during Pre-Construction and Construction Phase	• Compliance monitoring lies with CSC and RIU during Construction Phase

Sr. No.	Parameters / Receptor	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Responsibility	
						Implementation	Monitoring
			structures will be verified prior to the start of construction.			NHA during O&M Phase	NHA during O&M Phase
10.	Community around the Project corridor	Use of common resources. Hindrance to mobility. CHS	Communities within the RoW/AoI.	Community consultations.	Prior to the start of construction and during the construction stage. Reporting will be done on the basis of RAP recommendation.	- Contractor during Pre-Construction and Construction Phase - NHA during O&M Phase	- Compliance monitoring lies with CSC and RIU during Construction Phase - NHA during O&M Phase
11.	Waste Management	Inspection of waste and spoil disposal in accordance with Waste Management Plan	- Main Project area (RoW) - Construction camps and Offices. - Equipment yards. - Other Project allied facilities	Visual Observations, Monitoring and Audits	- Review the waste management stream before start of the Project; - Monitoring and reporting on monthly basis during the construction stage; - Bi annual during O&M Phase	- Contractor during Pre-Construction and Construction Phase - NHA during O&M Phase	- Compliance monitoring lies with CSC and RIU during Construction Phase - NHA during O&M Phase

Sr. No.	Parameters / Receptor	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Responsibility	
						Implementation	Monitoring
12.	Labor Management and Working Conditions	As per the LMP of which include but not limited to OHS, hygiene facilities, appropriate camps area, etc.	- Main Project area (RoW) - Construction camps and Offices. - Equipment yards. - Other Project allied facilities	Visual Observations, Incident/accident register Monitoring and Audits	- Monitoring and reporting on monthly basis during the construction stage; - Bi annual during O&M Phase	- Contractor during Pre-Construction and Construction Phase - NHA during O&M Phase	- Compliance monitoring lies with CSC and RIU during Construction Phase - NHA during O&M Phase
13.	Traffic Safety and Management	As per the TMP of ESIA / ESMP which include but not limited to the observation of traffic congestion at bottleneck areas, provision of signs and signal, vehicular inspection, driving safety protocols, etc.	- Main Project area (RoW and Aol) - Construction camps and Offices. - Equipment yards. - Other Project allied facilities	Visual Observations, Vehicle Log Books, Monitoring and Audits	- Monitoring and reporting on monthly basis during the construction stage. - Bi annual during O&M Phase	- Contractor during Pre-Construction and Construction Phase - NHA during O&M Phase	- Compliance monitoring lies with CSC and RIU during Construction Phase - NHA during O&M Phase
14.	Social aspects including GBV and other Grievances	Social and cultural conflicts, SEA/SH complaints, grievances related to livelihood	- Main Project area (RoW and Aol) - Construction camps and Offices.	Visual Observations and consultations, Grievance Redress/Social Complaint Register,	Monitoring and reporting on monthly basis during the construction stage;	Contractor during Pre-Construction and Construction Phase	Compliance monitoring lies with CSC and RIU during Construction Phase

Sr. No.	Parameters / Receptor	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Responsibility	
						Implementation	Monitoring
		impacts, child abuse, etc.	- Equipment yards. - Other Project allied facilities	Monitoring and Audits	Bi annual during O&M Phase	NHA during O&M Phase	NHA during O&M Phase
15.	OHS, CHS, accidents and incidents	As per Chapter 9 OCHS which include but not limited to the unsafe acts and conditions, work permits, provision and availability of mandatory PPEs, Community complaints on OCHS, incidents and injuries, illnesses, trainings, TBTs, walk-through-inspections, etc.	- Main Project area (RoW and AoI) - Construction camps and Offices. - Equipment yards. - Other Project allied facilities	Visual Observations and consultations, Grievance Redress/Social Complaint Register, Incident/accident register, Monitoring and Audits	- Monitoring and reporting on monthly basis during the construction stage - Bi annual during O&M Phase	- Contractor during Pre-Construction and Construction Phase - NHA during O&M Phase	- Compliance monitoring lies with CSC and RIU during Construction Phase - NHA during O&M Phase
16.	Chemical Storage and Handling	Safety Data Sheets, Leakage and spills, Segregated handling and storage of chemicals,	- Main Project area (RoW and AoI) - Construction camps - Equipment yards.	Visual Observations, Chemical Storage inventory, Incident/accident register, Monitoring and Audits	Monitoring and reporting on monthly basis during the construction stage	- Contractor during Pre-Construction and Construction Phase - NHA during O&M Phase	Compliance monitoring lies with CSC and RIU during Construction Phase

Sr. No.	Parameters / Receptor	Monitoring Parameters / Performance Indicator	Location	Monitoring Mechanism	Monitoring and Reporting Frequency	Responsibility	
						Implementation	Monitoring
		availability of fire extinguishers.	Other Project allied facilities		Bi annual during O&M Phase		NHA during O&M Phase
17.	Land Acquisition and Resettlement	As per Entitlement Matrix of RPF and RAP	Within the proposed project construction limits	As per RAP	As defined in RAP	NHA	TPV (External Monitor)

10.12 Grievance Redress Mechanism

NHA will establish a Grievance Redress Mechanism (GRM) to effectively address community complaints and grievances. The GRM for this project will follow a three-tiered structure:

- Community/Local Level Grievance Redress Committee (GRC)
- Regional Implementation Unit (RIU) Level GRC
- Project Management Unit (PIU-HQ-NHA) Level GRC

In addition to these GRCs, Gender-Based Violence (GBV) Committees will be established and formally notified within the PIU-HQ/RIU to handle issues related to GBV, Sexual Exploitation and Abuse, and Sexual Harassment (SEA&SH). These committees will be gender-sensitive, ensuring that women can safely register grievances related to compensation, movement restrictions during construction, privacy concerns, GBV, or other project-related issues. The committee will facilitate and support affected women in lodging complaints and ensuring resolution.

For project workers, the PIU-HQ-NHA, supervision consultants, and contractors will establish a separate GRM (or integrate provisions into the overall GRM) to address labor and workplace-related concerns in compliance with national and provincial laws and Asian Infrastructure Investment Bank (AIIB) Environmental and Social Framework (ESF) requirements before the project becomes effective.

Detailed functions and responsibilities of each GRC, GBV Committee, and Worker GRM are outlined in the Stakeholder Engagement Plan (SEP) of this project.

10.13 ESMP Trainings

It is proposed that training programs be implemented during the Project life cycle to ensure all staff receive the required training in both general and job-specific issues. Trainings should be provided to all new recruits and continual refresher courses should be established for the existing staff. The implementation of the E&S training would help ensure that the requirements of the ESIA and ESMP are transparent to all project personnel and they are followed accordingly throughout the project lifespan. Moreover, the training programs would also ensure that all site personnel are well aware of their work responsibilities for instance, the environmental and social requirements of the Project and how they will be implemented and monitored on site. They will also be introduced to the potential impacts and risks of the Project, including the mitigation and control measures that have adopted to address those impacts and risks as well as where to implement the appropriate measures. Additionally, the trainings would lead the staffs to be well aware about the roles of NHA, the Engineer and the Contractor when it comes to environmental and social issues. Each organization will be responsible to provide training to their own staffs before the start of the Project and also during the execution of the Project. Training will cover all staff levels, including management, supervisory personnel as well as both skilled and unskilled workforces. A budget of USD 250,000 is allocated for capacity building and training.

Training program will consist of the following:

- General E&S awareness or toolbox talks, induction, and community interaction.
- Discussion regarding the ESMP, E&S sensitivity of the project area and key findings of the ESIA.
- Awareness of transmissible diseases and will be scheduled before the start of any field activities.
- The trainings conducted by the Contractor for the construction staff would educate them about the ESMP and waste disposal and would similarly start before any construction activities.
- The drivers would be trained prior to and during the field operations regarding road safety, defensive driving, waste disposal and cultural values and social sensitivity.
- All site personnel would be educated about camp operation, waste disposal, natural resource conservation and housekeeping through trainings and they would commence prior to any field operations and would be continued throughout.
- Special training will be organized for the Contractors' staff on near and over water construction.
- Contractor staffs will be trained on job-specific work prior to commence the task, proper use of personal protective equipment.
- Employees working under the Contractor would be trained about restoration requirements and waste disposal and the training program would commence before any restoration activities.
- PIU-HQ will engage a third party to train NHA operation staff on how to clean the panels.

10.14 Reporting and Documentation

Contractor will prepare two separate monthly reports, one for Environmental and Social Management and the second one for OHS Management. The ESHS Section with assistance from CSC and contractors will also produce quarterly reports.

Incident Report: Contractors should present all incident information in the monthly report including property and environmental damages. For fatal and high potential incidents, a flash report must be submitted within 24 hours to the PIU-HQ and a detail investigation report within 7 days of the incident. All fatal incidents and high potential incidents require a root-cause analysis conducted by either ICAM or TAPROOT™.

Contractor and CSC Monthly Report: Implementation schedule of the mitigation plans and safety inspections and preventive controls suggested in the ESMP (**Table 10-2**) should be reported in all monthly reports. The outcome of the field inspections and audits should be reported in all monthly report. Contractors should present the implementation schedule of mitigation measures and preventive actions in all monthly report along with monitoring and auditing and CSC should confirm the status of mitigation and preventive measures claimed by the Contractor.

Quarterly Progress Reports on Environment, Health and Safety: The environmental, Social, Health and Safety monitoring reports will include environmental and social mitigation measures and preventive actions undertaken, environmental and social monitoring activities conducted, details of monitoring data collected, analysis of monitoring results particularly the non-compliances, recommended mitigation and corrective measures, GRM data, ESHS

training conducted, and environmental and OHS regulatory violations observed. The monitoring reports will be prepared by CSC and submitted quarterly during the construction period and annually for three years after completion of construction to EPA by ESHS Section/PIU-HQ.

Project Completion Environmental, Health and Safety Monitoring Report: One year after completion of construction, the ESHS Section will submit a Project Completion Environmental Monitoring Report which will summarize the overall environmental and social impacts and risks from the project.

10.15 ESMP Implementation Costs

Detailed cost estimates for implementation of mitigation measures, preventive actions, and monitoring are presented in **Table 10-4**. Total cost of ESMP implementation is \$ 18,701,211. The budget for Civil Works with the Contractor is \$ 5,982,300 (approx.. \$ 650,000 for ICT section) and the PIU-HQ cost is \$ 12,718,911.

Table 10-4: ESMP Implementation Cost

Sl.	Items	Unit	Site	Quantity	Unit Rate (\$)	Amount (\$)
1	Civil Works (will be part of Contract)					
(a)	Camp Construction and Management	year	4	1	100,000.00	400,000
(b)	Preparation and Submission of C-ESMP	No	3	1	20,000.00	60,000
(c)	Revision of C-ESMP	No	3	2	3,250.00	19,500
(d)	Preparation and Submission of OCHS Management Plan	No	3	1	30,000.00	90,000
(e)	Revision of OCHS Management Plan	No	3	2	5,000.00	30,000
(f)	Preparation and Submission of LMP	No	1	1	20,000.00	20,000
(g)	Revision of LMP	No	1	2	3,250.00	6,500
(h)	Dust management by Water Spraying	veh-d	3	360	200.00	216,000
(i)	Top Soil Stripping, Storage and Reuse	m3	4	399000	1.00	1,596,000
(j)	EHS Staffs of Contractors	No				2,799,500
(k)	Environmental Quality Monitoring	No	3	8	10,200.00	244,800
(l)	Periodic Maintenance of Access Road	No	2	4	125,000.00	500,000
					<i>Subtotal</i>	<i>5,982,300</i>
2	PIU Cost					
(a)	NOC of ESIA by KP, Sindh, and Punjab EPAs	No		3		6,589
(b)	RAP Implementation Cost					8,030,000
(c)	Construction Supervision Consultant (E&S)					3,060,000
(d)	Third-party Validation Consultant					240,000
(e)	Capacity Building and Training of NHA					250,000
(f)	Skill Development Training for Community	No	1	3	45,000.00	135,000
(g)	Plantation Program					647,321
(h)	Stakeholder Engagement Plan					100,000
(i)	Project Level Emergency Response					150,000
(j)	Additional Studies					100,000
					<i>Subtotal</i>	<i>12,718,911</i>
					Total	18,701,211

11 CONCLUSION AND RECOMMENDATIONS

11.1 General

The EIA report has been prepared in accordance with the AIB E&S requirements as per the AIB's Environmental and Social Framework (ESF) 2016 (as amended 2024) and National/provincial environmental legislative requirements.

11.2 Conclusion

After rehabilitation of Project road along with improved facilities, it will provide an efficient transport corridor in the Project area. Main objective of the proposed Project is to provide a safe, congestion free and high speed facility to the commuters of Project area. The corridor will largely contribute to the economic and social development of the Project area and it's near vicinity.

Significant efforts were made to identify the main physical, ecological, social, cultural and environmental issues related to the construction and operation of the proposed Project. Various stakeholders including government departments and agencies were also contacted for obtaining salient information in this regard along with that from area residents.

During the pre-construction, construction and operational phases, following are the main issues and concerns:

1. Resettlement, livelihood and temporary land acquisition related issues;
2. Disturbance to the public movement and cultural norms during construction;
3. Reduction in the daily routine activities of local residents during construction;
4. Noise and air pollution due to the working of construction machinery during construction and traffic operation phases of the Project;
5. Solid waste and wastewater generation during construction phase;
6. Oil spillages from construction machinery, resulting in soil and groundwater contamination;
7. Cutting of trees/bushes/crops falling within the proposed COI;
8. Occupational and community health and safety issues; and
9. Solid waste handling and disposal and waste water generation and treatment during operation phase.

Results of the EIA Study have shown that there are no critical environmental impacts associated with the proposed Project. However, several concerns / impacts with regard to physical, ecological and social environment have been identified in report which needs to be mitigated by strict implementation of EMP. These impacts could also be reduced by proper and well planned meticulous design of the facility and by implementing an appropriate tree plantation plan. In fact, in times of diminishing economic and natural resources, using sustainable approaches in an urban infrastructure will help us to enhance quality of life and serve the needs of the present leaving provision for future generations to meet their needs.

11.3 Recommendations

An EMP for both phases (construction and operation) has been developed as part of the report which provides a detailed mitigation matrix that covers impacts, mitigation measures, roles and responsibilities and timings to avoid, minimize or mitigate the adverse impacts of the proposed Project.

Based on the field visit, environmental monitoring and analysis of primary and secondary data, following recommendations have been conferred so that the Proponent gets the necessary direction and clarity to ensure efficient environment friendly and compliant operation:

1. Proper location(s) for construction camps should be selected by contractor in close coordination with NHA that cause minimal/no damage to the prevailing environmental conditions of the Project area;
2. Formulation and implementation of a comprehensive HSE Management Plan by contractor before the start of the construction activities for the camps which should be comprised of a training manual, use of safety equipment, emergency preparedness and code of ethics;
3. Wearing of Personal Protective Equipment (PPEs) such as helmet, masks, adequate footwear for bituminous pavement works, protective goggles and gloves should be made compulsory during construction activities and formulation and implementation of HSE Management Plan for construction workers;
4. Preparation and implementation of Waste Management Plan during construction stage by contractor in close coordination with concerned authorities for collection, reuse, recycling and disposal of waste;
5. Employment opportunities should be provided to local people for skilled and unskilled works during construction stage;
6. A provision of adequate budget in the overall cost of the Project and on-site space for plantation as per guidelines of the concerned departments should be provided in the design of proposed Project to compensate tree cutting and to eradicate air pollution. Moreover, tree plantation must also be implemented;
7. Soil contamination should be controlled by proper storage of chemicals;
8. Surface runoff and wastewater generated during construction stage should be controlled and collected in septic tanks and soakage pits;
9. Dust and fugitive emissions should be controlled by maintenance of equipment, fine tuning of the vehicles and regular sprinkling of water on soil;
10. Noise and vibration should be controlled by equipment maintenance, by providing noise barrier and by scheduling the construction activities to avoid peak activity hours in the area;
11. Provision of waste water treatment plant to treat the sewerage during the operation phase;
12. A comprehensive solid waste management plan to cater the waste during operation phase; and
13. For effective implementation of suggested mitigation measures, the EMP and EMP cost must be the part of the bidding document of the Contractor.