**Table 1: Environmental Management Plan for Preconstruction Phase**

| **Sl. No.** | **Environmental Issues** | **Mitigation Measures** | **Parameter / Indicator for Compliance** | **Responsible for Implementation** | **Responsible for Supervision** | **Frequency for Monitoring** | **Fund Sources for Implementing Mitigation Measure** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | Lack of sufficient planning to assure long-term sustainability of the improvements and ensure protection of the assets created | * Design has included provisions for ensuring effective maintenance and protection of the assets to be created to ensure their long-term sustainability. The long-term sustainability has been ensured by taking into consideration the appropriate Bureau of Indian Standards Codes for design, Seismic Zone V coefficient, appropriate wind load factor (corresponding to 39 m/s wind speed), and detailed design after carrying geotechnical investigations and topographic survey. | Verification of design parameters | PWD | PWD | Review after completion of detailed project report | Project cost |
| **2** | Layout of components to avoid impacts on the aesthetics of the site | * The project components sighting will avoid impacts on the aesthetics of the site and surroundings, and the Polytechnic Buildings will blend well with local building. | Polytechnic building exterior | PWD | PWD | Review after completion of detailed project report | Project cost |
| **3** | Slope stability related issues | * The plot area for the Polytechnic campus is flat, however, during construction any exposed slopes at excavated areas will be covered and slope protection measures will be provided specially at side slopes of internal roads. | Slope protection measures on side slopes of access path, internal road, etc. | PWD | PWD | Review of recommended slope protection measures | Project cost |
| **4** | Increased storm water runoff from alterations of the site’s natural drainage patterns due to landscaping, excavation works, construction of parking lot, and addition of paved surfaces | * Design of proposed Polytechnic buildings enables efficient drainage of the plot and maintains natural drainage patterns. The storm water generated will be diverted to local drains through a properly constructed drainage system. | Arrangement for proper diversion of storm water runoff | PWD | PWD | After mobilization of contractor at site and during establishment of construction camp | Incidental to construction cost |
| **5** | Integration of energy efficiency and energy conservation programs in design of subproject components | * The detailed designs for the subproject have ensured that environmental sustainability principles, including energy efficiency, resource recycling, waste minimization, etc. The design considers the following energy efficiency measures: * Usage of recyclable materials like wood substitutes. * Installation of Bureau of Energy Efficiency-certified equipment * Usage of energy efficient lighting fixtures (LED) * Provision of photovoltaic cells on roofs for solar power. * Rain water harvesting structures planned for ground water recharge and rain water collection. | Specifications of rain water harvesting structures, electrical fixtures, details of water heating system | PWD | PWD | During finalization of detailed designs of Polytechnic buildings | Project cost |
| **6** | Consents, permits, clearances, NOC, etc. | * Obtain all necessary consents, permits, clearance, NOCs, etc. prior to start of civil works. * Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc. | Consents, permits, clearance, and NOCs’  records and communications | PWD | PWD | Check consent for establishment of construction camp and approval from civic authorities, DOTE, AICTE, for Women Polytechnic construction | Project cost |
| **7** | Establishment of baseline environmental conditions prior to start of civil works | * Conduct documentation of location of components, areas for construction zone (camp, staging, storage, stockpiling, etc.) and surroundings (within direct impact zones). Include photos and GPS coordinates. * Conduct base line monitoring in respect of ambient air quality, water quality, and noise levels as per monitoring plan | Records and photographs | Contractor | PWD | Once prior to construction | Contractor |
| **8** | Utilities | * The locations and operators of utilities to be impacted should be identified and documented in detailed project design documents to prevent unnecessary disruption of services during the construction phase. * Require contractor to prepare a contingency plan to include actions to be done in case of unintentional interruption of services. * Obtain from the PIU and/or PWD the list of affected utilities and operators. * If relocations are necessary, contractor will coordinate with the providers to relocate the utility. | * List and maps showing utilities to be shifted * Contingency plan for services disruption | * PWD will prepare preliminary list and maps of utilities to be shifted * During detailed design phase, contractor to (i) prepare list and operators of utilities to be shifted; and (ii) contingency plan | PWD | Preconstruction Phase | Contractor |
| **9** | Social and Cultural Resources | * Consult Archaeological Survey of India or Himachal Pradesh State Archaeology Department to obtain an expert assessment of the archaeological potential of Women Polytechnic site. * Consider alternatives if the site is found to be of medium or high risk. * Include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available. * Develop a protocol for use by the construction contractor in conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved. | Chance find protocol | PWD | PWD | Prior to start of construction activities | Project cost |
| **10** | Construction camp—location, selection, design and layout | * Sitting of the construction camp shall be as per the guidelines below and details of layout to be approved by PWD. * Potential sites, within the Polytechnic plot, for the labor camp will be lined up to be visited by the environmental expert of PMU Safeguards Cell. The one having least impacts on the environment will be approved by the PWD and Safeguards Cell. The intention of establishing construction camp within Polytechnic plot is avoid impacts on surrounding land. * The storage location of construction materials shall be at the Polytechnic site or any building close to the Polytechnic site. * Construction camp sanitation facilities shall be adequately planned. | Construction camp site, and locations of material storage areas, sanitation facilities | Contractor | PWD | At the time of construction camp establishment and finalization of storage areas | Contractor |
| **11** | Sources of construction materials | * Use quarry sites and sources licensed by the Government of Himachal Pradesh. If materials are procured from market, ensure supplier source is from licensed quarries. * Verify suitability of all material sources and obtain approval from PIU. * If additional quarries are required after construction has started, obtain written approval from PIU. * Submit monthly to PWD a documentation of sources of materials. | Permits issued to quarries or sources of materials | Contractor  PWD to verify sources (including permits) if additional is requested by contractor | PWD | Upon submission by contractor | Project cost |
| **12** | Access for construction material transportation | * Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of site. * Schedule transport and hauling activities during nonpeak hours. * Locate entry and exit points in areas where there is low potential for traffic congestion. * Keep the site free from all unnecessary obstructions. * Drive vehicles in a considerate manner. * Coordinate with the Traffic Police Department for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours. | Traffic management plan | Contractor | PWD | During delivery of construction materials | Contractor |
| **13** | Occupational health and safety | * Comply with International Finance Corporation Environmental, Health, and Safety Guidelines on Occupational Health and Safety in developing comprehensive site-specific health and safety plan. The overall objective is to provide guidance to contractors on establishing a management strategy and applying practices that are intended to eliminate, or reduce, fatalities, injuries, and illnesses for workers performing activities and tasks associated with the project. * Include in the health and safety plan measures such as (i) type of hazards in the construction of the Polytechnic buildings, (ii) corresponding personal protective equipment for each identified hazard, (iii) health and safety training for all site personnel, (iv) procedures to be followed for all site activities, and (v) documentation of work-related accidents. * Provide medical insurance coverage for workers. | Health and safety plan | Contractor | PWD | During construction phase | Contractor |
| **14** | Public consultations | * Continue information dissemination, consultations, and involvement or participation of stakeholders during project implementation. | Disclosure records; consultations | PWD | PWD | * During update of IEE report * During preparation of site- and activity-specific plans as per environmental management plan * Prior to start of construction * During construction | Project cost |

AICTE= All India Council of Technical Education, DOTE= Department of Technical Education, Vocational and Industrial Training, IEE = initial environmental examination, NOC = no objection certificate, PIU = project implementation unit, PWD = Public Works Department.

Source: Asian Development Bank.

**Table 2: Environmental Management Plan for Construction Phase**

| **Sl. No.** | **Environmental Issues** | **Mitigation Measures** | **Parameter / Indicator for Compliance** | **Responsible Implementation** | **Responsible Supervision** | **Frequency for Monitoring** | **Sources of Fund for Implementing Mitigation Measure** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | Sanitation facilities at construction camp | * The contractor shall provide sanitation facilities at the camp site. These facilities will include dust bins in adequate numbers for solid waste collection, and separate toilets for male and females. * Toilet facilities shall be maintained and septic tanks or soak pits shall be provided. The dust bins shall be regularly emptied and waste from camp site shall be disposed of at designated locations. | Construction camp sanitation facilities | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **2** | Traffic circulation plan during construction | * Prior to commencement of site activities and mobilization on ground, the contractor will prepare and get approval from the engineer (PWD) for a circulation plan during construction for safe passage of public vehicles so that locals are not inconvenienced. * The contractor with support of PIU will disseminate these information and circulation plan at the site and at key access roads to the Polytechnic site. | Safe movement of traffic | Contractor | PWD | Every day during construction phase | Contractor fee |
| **3** | Site clearance activities, including delineation of construction areas | * Only ground cover or shrubs and trees that directly affect the permanent works or necessary temporary works shall be removed with prior approval from the environmental expert of the PMU Safeguards Cell. * All areas used for temporary construction operations will be subjected to complete restoration to their former condition with appropriate rehabilitation procedures. * Photographic records shall be maintained for the temporary sites used for construction. These will help in proper restoration. | Preconstruction records of sites and vegetation in area of construction | Contractor | PWD | Duration of site preparation | Contractor fee |
| **4** | Drinking water availability at construction camp and construction site | * Sufficient supply of cold potable water to be provided and maintained. The drinking water will be obtained from the market. No public supply source in the vicinity of sub-project will be used for drinking or construction purposes. The drinking water will be stored in a suitable size storage tank to ensure uninterrupted availability. * Contractor will submit his plan on how availability of drinking water shall be assured. The original source of the water supplied by the tankers will be recorded. | Water supply source and availability of water, source of water used by the tankers | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **5** | Waste disposal | * The pre-identified disposal location shall be part of the comprehensive waste disposal plan. * A solid waste management plan will be prepared by the contractor in consultation with local civic authorities. * The environmental specialist of PWD shall approve these disposal sites after conducting a joint inspection on the site with the contractor. * Contractor shall ensure that waste shall not be disposed off near storm water natural drain in the surrounding of the site and along the access path. | Waste disposal sites, waste management plan | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **6** | Stockpiling of construction materials | * Stockpiling of construction materials will be done in such a way that it does not impact and obstruct the drainage. * Stockpiles will be covered to protect from dust and erosion. | Subproject stockpiling sites | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **7** | Arrangement for construction water | * The contractor shall provide a list of locations and type of sources from where water for construction shall be acquired.      * To avoid disruption or disturbance to other water users, the contractor shall arrange water from the market through authorized tanker suppliers or from the local municipality and consult PWD before finalizing the source. | Source of water used by the tankers | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **8** | Soil erosion and water ponding on account of excavation | * Slope protection measures will be undertaken as per design to control soil erosion especially on side slopes of access and internal roads. * The excavation works will be avoided during monsoon months to avoid soil erosion, stagnation of water, and vector - borne diseases. | Locations of slope protection | Contractor | PWD |  | Contractor fee |
| **9** | Water pollution from construction wastes | * The contractor shall take all precautionary measures to prevent entry of waste water into any local stream during construction. | Women Polytechnic site | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **10** | Water pollution from fuel and lubricants | * The contractor shall ensure that all construction vehicle parking locations; fuel and lubricants storage sites; vehicle, machinery, and equipment maintenance and refueling sites shall be located at least 500 m away from the natural streams. * Contractor shall ensure that all vehicles and machinery, as well as equipment operation, maintenance, and refueling shall be carried out in such a manner that spillage of fuels and lubricants does not contaminate the ground. * Waste water from vehicle parking, fuel storage areas, workshops, wash down, and refueling areas shall be treated in an oil interceptor before discharging it on land, or into surface water bodies, or into other treatment system. The waste oil skimmed from oil interceptor will be stored in leak proof drums and will be sold to authorize recyclers only. | Vehicle parking, refueling sites, oil interceptor functioning | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **11** | Soil pollution due to fuel and lubricants, construction wastes | * The fuel storage and vehicle cleaning area will be stationed such that spillage of fuels and lubricants does not contaminate the ground. * Soil and pollution parameters will be monitored as per monitoring plan. | Vehicle maintenance and parking area, soil quality monitoring results | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **12** | Siltation of water bodies due to spillage of construction wastes | * No disposal of construction wastes will be carried out into the surface water bodies. * Extraneous construction wastes will be transported to the pre-identified disposal sites for safe disposal. | Water bodies especially natural springs near subproject site | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **13** | Generation of dust | * The contractor will take every precaution to reduce the levels of dust at construction sites. Water will be sprayed as required, on locations of excavations, internal unfinished roads/walkways and locations of sand and sub grade storages. The water for spraying will be used from the water stored for construction. The water spray records will be maintained at site. * All filling works are to be protected or covered in a manner to minimize dust generation. In order to minimize dust impacts on the neighboring private polytechnic, the construction site will be protected through prefabricated Mild Steel sheets of adequate height. * The air quality monitoring will be conducted as per monitoring plan | Subproject site, air quality monitoring results, water spray records | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **14** | Emission from construction vehicles, equipment and machinery | * All vehicles, equipment, and machinery used for construction shall conform to the Government of India vehicle emission norms. For equipment emission norms as specified in Environmental Protection Rules 2000 will be followed. * The discharge standards promulgated under the Environment Protection Act, 1986 shall be strictly adhered to. The silent or quiet equipment available in the market shall be used in the subproject. * The Contractor shall maintain a record of pollution under control for all vehicles and machinery used during the contract period, which shall be produced for verification whenever required. | Pollution under control certificates (Vehicle emission norms specified by GOI) of vehicles and machinery | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **15** | Noise pollution | * The contractor shall confirm that all construction equipment shall strictly conform to the Ministry of Environment, Forests and Climate Change and Central Pollution Control Board noise standards. * Contractor must ensure that all vehicles and equipment used in construction shall be fitted with exhaust silencers. * At the construction sites, noisy construction work such as crushing, operation of diesel generator sets, use of high noise generation equipment shall be stopped during the night time between 10:00 p.m. to 6:00 a.m. * Noise limits for construction equipment used in this project will not exceed 75 dB (A) at 1 m distance. However, noise levels as specified in ambient noise standards (55 dB(A) during day time and 45 dB(A) during night time) will be adhered to during the construction phase. * Noise level monitoring will be carried out as per monitoring plan. * The construction site will be properly barricaded through Mild Steel sheets of adequate height to avoid noise impacts in the surroundings of Women's Polytechnic site. | Certificates of vehicles conforming noise standards, noise monitoring results | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **16** | Impacts on flora and fauna | * Conduct site induction and environmental awareness. * Limit activities within the work area. * Plant trees and shrubs in the area/space marked for plantation in the layout. A minimum of 60 trees will be planted to compensate for 6 Eucalyptus trees to be cut. Out of these 60 trees to be planted as a compensatory plantation, at least 20 Eucalyptus trees will be planted belonging to same variety as existing at site. This compensatory plantation will be taken up along boundary wall. Total area available for plantation is 984.41 m2. There will be plantation of about 50 shrubs also as shown in drawing (Figure-10). The landscaping works will be taken up in 2268.38 m2 area ear marked in the drawing. | Record  barricades along excavation works. Note trees and shrubs planted by the project. | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **17** | Material handling at site | * Workers employed on mixing cement, lime mortars, concrete, etc., will be provided with protective footwear and protective goggles. * Workers engaged in welding works will be provided with welder’s protective eye shields. * The use of any toxic chemical will be strictly in accordance with the manufacturer’s instructions. The PWD will be given at least 6 working days’ notice of the proposed use of any chemical. A register of all toxic chemicals delivered to the site will be kept and maintained up to date by the contractor. | Data on available personal protective equipment | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **18** | Disposal of construction waste, debris, cut material | * The contractor shall confirm that safe disposal of the construction waste will be ensured in the pre-identified disposal locations. * In no case will any construction waste will be disposed of around the project site indiscriminately. | Disposal site | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **19** | Safety measures during construction | * Adequate safety measures for workers during handling of materials at site will be taken up. * The contractor has to comply with all regulations for the safety of workers. Precaution will be taken to prevent danger to workers from accidental injuries, fire, etc. First aid treatment will be made available for all injuries likely to be sustained during work. * The contractor will conform to all anti-malaria instructions given to him by the engineer. | Records of availability of personal protective equipment, availability of first aid kits | Contractor | PWD | Regularly during construction phase | Contractor fee |
| **20** | Onsite emergency plan for minor accidents and mishaps and Disaster Management Plan for Natural Calamities | * 1-The onsite emergency plan will be prepared by the contractor in consultation with PWD and PMC/PMU. * 2- For natural calamities, disaster management plan prepared by the PWD under the provisions of Disaster Management Act 2005 will be followed. | * Onsite emergency plan document and Disaster Management Plan document of PWD | Contractor | PWD | Mock Drill every quarter | Contractor |
| **21** | Clearing of construction of camp and restoration | * Contractor to prepare site restoration plans for approval by the engineer (PWD). The plan is to be implemented by the contractor prior to demobilization. * On completion of the works, all temporary structures will be cleared away, all rubbish burned, excreta or other disposal pits or trenches filled in and effectively sealed off, and the site left clean and tidy, at the contractor’s expense, to the entire satisfaction of the PWD. | Restoration plan, and records of preconstruction of temporary sites | Contractor | PWD | End of construction phase | Contractor fee |

NOC = no objection certificate, PIU = project implementation unit, PWD = Public Works Department, PMU= Project Management Unit, PMC= Project Management Consultant.

Source: Asian Development Bank.

**Table 3: Environmental Management Plan for Defect Liability Period**

| **Sl. No.** | **Environmental Issues** | **Mitigation Measures** | **Parameter / Indicator for Compliance** | **Responsible Implementation** | **Responsible Supervision** | **Frequency for Monitoring** | **Sources of Fund for Implementing Mitigation Measure** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | Environmental conditions | * Periodic monitoring of the ambient air quality, noise level, surface water quality, soil quality in the subproject area as suggested in the monitoring plan through an approved monitoring agency. | Monitoring results and relevant standards | DOTE through Pollution Monitoring Agency | HPKVN | As per monitoring plan | DOTE |
| **2** | Unhygienic conditions due to poor maintenance of sanitation facilities and irregular solid waste collection | * DOTE through Principal Women's Polytechnic will maintain toilets, and carry out the regular collection and disposal of wastes to a designated waste treatment site. * Solid waste disposal will be integrated with Rehan waste disposal. Septic tanks will be regularly emptied and maintained. | Maintenance schedule of Polytechnic building and facilities drawn up | DOTE | HPKVN | As per monitoring plan | DOTE |
| **3** | Natural disasters | * Necessary procedures to be followed by the visitors and Polytechnic students, and teaching staff during the natural disasters shall be written at prominent locations. | Warnings of disasters by the Meteorological Department | District administration | HPKVN | During disasters | Government of Himachal Pradesh |
| **4** | Waste Generation on account of maintenance and operations of solar water heating system | * The solar water heating system will be maintained and operated by the supplier. Any waste generated will be taken by the supplier for possible reuse and recycle. For this, necessary agreement will be made at the time of supply. | Waste generated from the operation and maintenance of solar PV cells | DOTE and supplier of solar Water heating system | HPKVN | During entire Defect Liability Period | DOTE |
| **5** | Onsite emergency plan for minor accidents and mishaps and Disaster Management Plan for Natural Calamities | The Principal of Women Polytechnic will prepare onsite emergency plan for possible minor accidents and mishaps for operational phase. For natural calamities, the disaster management plan prepared by DOTE will be followed. | Onsite Emergency plan document and Disaster Management Plan document | Principal Women's Polytechnic Rehan | DOTE | Mock Drills every quarter | Polytechnic functioning and operation cost |
| **6** | Maintenance of plantation and Landscape area in the polytechnic campus | The principal of Women Polytechnic through appropriate support staff will be responsible for maintenance of shrubs, tree plantation and landscape areas. Minimum 90 % survival of plants and shrubs will be maintained. Any shortfall will be made up before onset of monsoon every year. | Survival of planted trees, shrubs, and grass in landscape area. | Principal Women's Polytechnic Rehan | DOTE | During Defect Liability Period, before onset of monsoon | Polytechnic functioning and operation cost |

DOTE = Department of Technical Education, Vocational and Industrial Training, HPKVN = Himachal Pradesh Kaushal Vikas Nigam, PIU = project implementation unit, PWD = Public Works Department.

Source: Asian Development Bank.

**Table 4: Monitoring Plan for Women's Polytechnic Subproject for Preconstruction, Construction, and Defect Liability Period**

| **Sl. No.** | **Field** (environmental attribute) | **Phase** | **Parameters to be Monitored** | **Locations** | **Frequency** | **Responsibility** |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | Air Quality | During preconstruction phase | Nitrogen oxide, sulfur dioxide, carbon monoxide, particulate matter (both 10 micrometers and 2.5 micrometers or less in diameter) | Polytechnic construction site at Rehan | Once in the preconstruction phase to establish baseline | Contractor through approved monitoring agency |
| During construction phase | Once in every 3 months (except monsoon season) during construction phase (24 months construction phase) |
| Defect Liability Period | Once every season except during monsoon season during Defect Liability Period |
| **2** | Water quality | During preconstruction phase | Total dissolved solids, total suspended solids , pH, hardness, biochemical oxygen demand, fecal coliform | Polytechnic construction site groundwater | Once in preconstruction phase to establish baseline | Contractor through approved monitoring agency |
| During construction phase | Once in every 3 months (except monsoon season) during construction phase |
| Defect Liability Period | Once every season except during monsoon season during Defect Liability Period |
| **3** | Noise levels | During preconstruction phase | Noise quality as per National Ambient Noise Standards on dB(A) scale | Polytechnic construction site | Once in preconstruction phase to establish baseline | Contractor through approved monitoring agency |
| During construction phase | Once every 3 months (except monsoon season) during construction phase |
| Defect Liability Period | Once every season except monsoon season during defect liability period |

Source: Asian Development Bank.