

TERMS OF REFERENCE FOR CONSULTING FIRM TO PREPARE DETAILED ENGINEERING DESIGNS FOR RURAL ROADS AND IRRIGATION INFRASTRUCTURE AND CONSTRUCTION SUPERVISION OF THE WORKS

A. BACKGROUND

The Asian Development Bank (ADB) has provided loan and grant support to the Royal Government of Cambodia (RGC) for the implementation of the Smallholder Resilient Economic Development Sector Project (SREDSP).

The project aims to improve the income, food security, climate and disaster resilience of smallholder farmers, with a dedicated focus on women's empowerment building on lessons learned from past ADB projects. The project will target seven provinces that are vulnerable to climate hazards including heatwaves, droughts and flooding and where poverty incidence remains high: Pursat, Battambang, Banteay Meanchey, Siem Reap, Kampong Thom, Kampong Cham and Prey Veng. The Executing Agency (EA) for the project is the National Committee for Sub-national Democratic Development (NCDD) working in partnership with the provincial governments in the seven targeted provinces. A total of 186 communes across the seven target provinces have been identified and selected for targeted interventions, based on climate risk assessments and local development priorities. These selected communes are distributed across key districts that demonstrate varying degrees of vulnerability, exposure, and connectivity to essential services and value chains.

The project outputs will include the following scope of activities: (i) Output 1: Roll-out of inclusive technical services and green investment for nature-positive smallholder agriculture in targeted communes, (ii) Output 2: Rehabilitation or construction of small-scale climate resilient infrastructure for improved productivity and better market access, (iii) Output 3: Strengthening the long-term resilience of poorer communities through disaster risk reduction (DRR), climate-risk management for selected cropping systems, insurance and financing; and (iv) Output 4: Promoting women's empowerment in agriculture and food consumption. The project is aligned with the following impact: rural economy expanded and made resilient. Its outcome is income, nutrition and resilience of smallholders improved in target provinces with enhanced women's empowerment.

Under Output 2 the project is developing small-scale climate resilient infrastructure, with the specific aim of increasing productivity and/or access to markets. The project supports the rehabilitation or construction of small-scale irrigation infrastructure and where possible, nature-based solutions are integrated. The project also supports the rehabilitation of rural access roads connecting farmers with markets, explicitly incorporating women's safety and accessibility considerations, facilitating women's equitable access to markets. The project specifically aims at linking smallholder farmers to newly constructed road networks or irrigation schemes. There are estimated to be approximately 100 small-scale rural infrastructure subprojects to be selected for rehabilitation or upgrading across the seven target provinces, which include a mixture of the rehabilitation of existing rural roads and the rehabilitation of existing irrigation systems.

The purpose of the assignment is to support the Royal Government of Cambodia (RGC) in the design (through feasibility studies) and due diligence for each subproject, to inform decisions (through mandatory reports required by the government and ADB) for the approval of all subprojects. The Design and Construction Supervision Team, hereinafter referred to as the Consultant, will be responsible for the conduct of preliminary feasibility studies and preparation of the detailed designs for all small-scale rural infrastructure subprojects over a period of at least five years, and for the provision of construction supervision during the construction phase for all these subprojects. The consultant will also be responsible for the procurement of additional equipment for the topographical surveys as well as the acquisition of the commune level climate change forecasts/flood maps, and for other field data collection, and for the funding consultation meetings that are required.

The sequence of activities will be as follows:

- (i) Selection of subprojects that are included in the Commune Investment Plans (CIPs) through a participatory approach and in consultation with smallholders and community leaders with clear selection criteria.
- (ii) Conduct of feasibility studies followed by the development of detailed designs for the selected rural infrastructure subprojects.
- (iii) Conduct of due diligence for environmental and social safeguards in compliance with the ADB SPS (2009)..
- (iv) Finalization of technical designs and preparation of bidding documents.
- (v) Monitoring and supervision of construction to ensure quality of civil work.
- (vi) Facilitating the hand-over of completed civil works with effective O&M systems in place.

Gender actions under this output will include ensuring equal representation of women in subproject selection, planning, and design through inclusive and meaningful consultation processes, as well as involvement in any training relating to O&M of the infrastructure. In addition, there will be creating a fund for small-scale community-based infrastructure could enhance the benefits of rural infrastructure investments, in particular for women (e.g. village pathways connecting to roads, small ponds in addition to irrigation infrastructure).

B. OBJECTIVES

The scope of the assignment will be as follows:

a. SUBPROJECT DESIGN

Rural Roads

Feasibility Studies for the selected rural roads including the initial environmental and social risks and impacts screening to confirm their suitability and the presence of only minor impacts that can be mitigated against. The tasks will include (i) conducting rapid reconnaissance surveys of the existing alignment for each subproject; (ii) identifying existing road condition and present proposals for improvement and rehabilitation; (iii) conducting preliminary and detailed survey including all topographic, geological, geotechnical, hydrological and other surveys; (iv) identifying the soil types along the road and determine their engineering classification or equivalent strengthening values; (v) conducting topographic surveys showing horizontal and vertical alignment of the proposed roads; (vi) collecting information about hydrology for all cross drainage works and bridges; (vii) identifying the environmental and social risks and impacts, including gender aspects, for each subproject, (viii) conducting climate vulnerability and risk assessment; and (ix) undertaking economic cost-benefit analysis (CBA) for each subproject.

Preparation of Detailed Engineering Designs (DEDs), using the best practices and innovative solutions, when applicable. The detailed designs are to be prepared using prevailing practices, manuals, codes and other technical documents that have been developed for use in Cambodia as well as incorporating best practices and lessons learned from other externally funded projects. The tasks will include (i) conducting satisfactory environmental and social safeguard due diligence to identify potential impacts for each of the proposed works to rehabilitate the roads; (ii) preparing the DEDs for each of the proposed rural roads rehabilitation subprojects; (iii) preparing Technical Specifications, Bills of Quantities and cost estimates, and (v) producing the bidding documents. Assistance will also be provided during the initial procurement process.

Irrigation:

Feasibility Studies for selected irrigation rehabilitation subprojects including initial environmental and social risks and impacts screening to confirm their suitability and the presence of only minor impacts that can be mitigated against. The tasks will include (i)

conducting preliminary and detailed surveys including all topographic, geological, geotechnical, hydrological, water quality and other surveys; (ii) conducting detailed consultations with local farmers to analyze the water needs required to enable their preferred crops to be grown during the dry season for each subproject; (iii) identifying water sources that can supply the water required during the dry season; (iv) identifying the environmental and social risks and impacts, including gender aspects, for each subproject, (v) conducting climate vulnerability and risk assessment; and (vi) undertaking economic cost-benefit analysis (CBA) for each subproject.

Preparation of Detailed Engineering Designs (DEDs) for the selected irrigation subprojects, using the best practices and innovative solutions, when applicable. The detailed designs are to be prepared using prevailing practices, manuals, codes and other technical documents that have been developed for use in Cambodia as well as incorporating best practices and lessons learned from other externally funded projects. The tasks will include (i) conducting satisfactory environmental and social safeguard due diligence to identify potential impacts for each of the proposed irrigation system rehabilitation subprojects; (ii) preparing the DEDs for each of the proposed irrigation system rehabilitation subprojects; (iii) preparing Technical Specifications, Bills of Quantities and cost estimates, and (v) producing the bidding documents. Assistance will also be provided during the initial procurement process.

b. CONSTRUCTION SUPERVISION

Provision of construction supervision during the execution of the civil work contracts for all selected subprojects. The Consultant is expected to ensure timely delivery of the works according to the prescribed detailed designs and technical specifications, ensuring good design and construction quality standards, and addressing social and environmental issues, avoiding time and cost overruns, carefully avoiding disputes and underperformance, and providing professional advice and support the employer to effectively manage the civil works.

This will include (i) professionally managing the contracts to ensure high quality of works complying with the technical drawings and specifications and conditions of the contracts including management of social and environmental issues; (ii) supporting the Contractor in using the latest construction technology, providing best practice contract management and construction management procedures during the works implementation; (iii) preparing and maintaining all relevant construction stage documentation as detailed in the Specifications and General Conditions of Contract (GCC) and providing the same to the relevant authorities; (iv) building the capacity and knowledge base of the local contractors, PWG and PMU staff through the delivery of capacity building trainings; and (v) carefully avoiding risks to the employer such as cost over-runs, time extensions and any additional liabilities.

C. SCOPE OF CONSULTANCY SERVICES - SUBPROJECT DESIGN

The Consultant will provide support to the NCDDS for the design and implementation of approximately 100 small-scale rural infrastructure subprojects that will comprise upgrading of rural roads with sealed pavement, either Double Bitumen Standard Treatment (DBST) or Reinforced Concrete (RC), and rehabilitation of secondary and tertiary irrigation canals. The screening and selection of the subprojects will be an on-going process during project implementation, led by the NCDDS, based on subprojects that are identified and prioritized by the commune councils within target communes in the seven provinces. The subprojects will be small-scale with a median value of approximately \$500,000.

1. FEASIBILITY STUDIES

Rural Road subprojects

The following tasks will be undertaken during feasibility study for each rural road subproject:

Desk studies - covering all relevant documents relating to the subproject areas including existing road inventories, traffic counts, climate data, and economic activities in the project area.

Reconnaissance surveys and confirmation of horizontal alignment – site visits to each subproject to undertake reconnaissance survey of the existing horizontal alignment including a road inventory and existing condition survey for each sub-project. Consultant will make use of available open-source remote sensing imagery and where necessary modify the draft road inventory and condition surveys in consultation with the PMU.

Surveys and investigations for proposed subprojects - conduct preliminary and detailed surveys including all topographical, geological, hydrological and other surveys that will be required to carry out the detailed designs of rural road infrastructure including, but not limited to the following:

- **Soils and materials:** Soil type along the alignment and its engineering classification and measurement of representative California Bearing Ratio (CBRs) or equivalent strength values required for the detailed design. Details of the location(s) of the materials, borrow pit areas details, assessment of quantities available at each location, details of test results to establish their material properties to ensure their suitability for road construction. The design should maximize the use of local materials to optimize cost efficiency.
- **Topographical surveys:** for all roads subproject locations showing horizontal and vertical alignment of the proposed rural roads including strip plans at 1:5,000 scale and longitudinal sections and cross-sections at 50 meters intervals. Strip plans showing existing right-of-way, trees, topographical features, utility poles, properties, buildings, fences, walls, way-side facilities, etc.
- **Hydrological investigations:** Collect information about hydrology, e.g. catchment characteristics, rainfall, stream/channel characteristics, design discharge, linear waterway, scour depth, etc., for all cross drainage works and bridges. Examine scouring, erosion, drainage and flood characteristics along the road and ensure that the survey covers all aspects related to design, environmental, climate change and hydrological issues for the proposed works.
- **Initial environmental and social impacts screening:** Study of proposed road and canal alignments and proposed rehabilitation measures to determine the potential environmental risks and impacts (including health and safety, and impacts to priority biodiversity values) and conduct a preliminary assessment of the expected social risks and impacts (land acquisition, determine whether indigenous peoples (IP) safeguards are triggered and assess any impacts on livelihoods, customs and traditions and cultural heritage, gender impacts, social exclusion, community health and safety and others). The risks and impacts identification process should apply a mitigation hierarchy, focusing on measures to prevent these from occurring in the first place, as opposed to minimization, mitigation, or compensation. The risks and impacts identification process should apply a mitigation hierarchy, focusing on measures to prevent these from occurring in the first place, as opposed to minimization, mitigation, or compensation. This is not always possible, and mitigation measures should be drawn from options that are technically and financially feasible will follow the procedures set out in the project Environmental Assessment and Review Framework (EARF) including the following essential steps: (i) screening; (ii) categorization; (iii) impact assessment and mitigation; (iv) Environmental Management Plan (EMP) or Environmental Code of Conduct (ECC) preparation.
- **Climate Risk and Vulnerability Assessment:** Undertake a review of the existing climate risk and vulnerability assessment¹, validating the priority risks such as flooding, heat stress, or drought affecting road segments and proposing enhancements, as/if needed. This should inform both design criteria and climate-proofing measures.
- **Traffic surveys:** Implement traffic counts, whenever such data is not available. Data will also be collected for available statistics on road accidents and incidents, as well as identifying the gender transport patterns of different groups, including vulnerable households and identification of potential impacts on women and men including vulnerable households in relation to their differing transport needs and priorities.

Economic analysis: Preparation, review and finalization of the economic analysis for each road subproject, which will include the following activities:

- Collection of socio-economic and traffic data for all proposed rural road subprojects

¹ A preliminary Climate Risk and Vulnerability Assessment has been prepared for the project.

- Conduct of a broad assessment of the project beneficiaries and likely socio economic impacts of the proposed roads.
- Conduct economic analysis and sensitivity tests for each rural road subproject.

Review and finalization of the preliminary designs in consultation with the PMU.

Preparation of feasibility study report - based on the road inventory and condition data, highlighting existing road conditions and present improvement and rehabilitation proposals, including construction of new and/or improvement of existing bridges and culverts and surface water drainage systems, an estimate of preliminary costs, address land and anticipated social and environmental risks and impacts, finalize preliminary design and economic analysis.

Irrigation subprojects:

The following tasks will be undertaken during feasibility study for each irrigation subproject:

Desk studies - covering all relevant documents relating to the subproject areas including existing irrigation canal (or other irrigation methods used), all existing flow control structures inventories and condition assessments, analysis of existing year-round agricultural production practices in the subproject area, review of climate data, and main economic activities in the subproject area.

Reconnaissance surveys – site visits to each irrigation subproject to undertake reconnaissance survey of the existing canal alignment including all existing flow control structures and condition survey for each structure. Undertake detailed consultations with local farmers groups and growers to understand their year-round agricultural production activities, their crop production preferences, their required irrigation needs to maximize crop yields in the future and how to organize irrigation to maximize dry season crop yields. Assess the ability of farmers to operate and maintain flood control structures (i.e. do they have the capacity and resources to operate and maintain water gates with mechanical mechanisms for raising/lowering the water gate)

Surveys and investigations for each irrigation subproject - conduct preliminary and detailed surveys including all topographical, geological, hydrological and other surveys that will be required to carry out the preliminary and detailed designs of the irrigation infrastructure for each subproject including the following:

- **Soils and materials:** Determination of the soil type along the alignment of existing canals and undertaking soil type analysis and permeability tests on representative soil samples from the canals.
- **Topographical surveys:** for all irrigation subproject locations, showing horizontal and vertical alignment of the existing irrigation canal system (main, secondary and tertiary canal network, as may be required) and all existing flow control structures, culverts and drainage structures. Survey to also show all rivers, streams, ponds and reservoirs in the subproject areas. Other details to be included are existing right-of-way, trees, topographical features, properties, bridges, culverts, utility poles, etc.
- **Hydrological investigations:** Collect information about hydrology in the areas of the subproject locations, as may be required to inform the design of the proposed rehabilitation works for the subproject irrigation systems.
- **Initial environmental and social impacts screening:** Study of proposed rehabilitation measures to determine the potential environmental risks and impacts (including health and safety, and impacts to priority biodiversity values) and conduct a preliminary assessment of the expected social risks and impacts (land acquisition, determine whether indigenous peoples (IP) safeguards are triggered and assess any impacts on livelihoods, customs and traditions and cultural heritage, gender impacts, social exclusion, community health and safety and others). The risks and impacts identification process should apply a mitigation hierarchy, focusing on measures to prevent these from occurring in the first place, as opposed to minimization, mitigation, or compensation. The risks and impacts identification process should apply a mitigation hierarchy, focusing on measures to prevent these from occurring in the first place, as opposed to minimization, mitigation, or compensation. This is not always possible, and

mitigation measures should be drawn from options that are technically and financially feasible will follow the procedures set out in the project Environmental Assessment and Review Framework (EARF) including the following essential steps: (i) screening; (ii) categorization; (iii) impact assessment and mitigation; (iv) Environmental Management Plan (EMP) or Environmental Code of Conduct (ECC) preparation.

- **Climate Risk and Vulnerability Assessment:** Undertake a review of the existing climate risk and vulnerability assessment, validating the priority risks such as flooding, or drought affecting the irrigation canal systems and proposing enhancements, as/if needed. This should inform both design criteria and climate-proofing measures.²

Economic analysis: Preparation, review and finalization of the economic analysis for each irrigation subproject, which will include the following activities:

- Collection of socio-economic for all proposed irrigation subprojects
- Conduct of a broad assessment of the project beneficiaries and likely social economic impacts of the proposed roads.
- Conduct economic analysis and sensitivity tests for each irrigation subproject.

Review and finalization of the preliminary designs in consultation with the PMU.

Preparation of feasibility study report - based on the canal system inventory and condition data, highlight existing canal and flow control structure conditions and present improvement and rehabilitation proposals, including construction of new and improvement of existing canals, flow control structures and culverts, estimate associated costs, address land and anticipated social and environmental risks and impacts, finalize preliminary design and economic analysis.

2. SAFEGUARD DUE DILIGENCE

For all subprojects, the initial Environmental and Social (ES) risks and impacts screening in the FS will be applied, and due diligence continued and done in parallel with the DED to influence the design finalization. This will include holding technical discussions with relevant agencies to gain additional and beneficial insights and discuss the approach to this study. This includes assessing any planned and potential developments in the vicinity of the project area to identify key stakeholders, including government agencies and private sector investment and evaluate their potential contributions and/or conflicts to the project.

Rural road subprojects:

The following procedures apply for safeguard due diligence for the rural road subprojects:

- Conduct meaningful public consultations within the affected communities for each selected rural road to inform them on the proposed design, get their feedback on project's potential environmental and social risks and impacts during construction and operation, including their proposed mitigation measures.
- Identify the Affected Households who have secondary assets (such as fences, small sheds) within Corridor of Impact (COI) and the official Right of Way (ROW), which may need to be removed during construction, and seek their voluntary agreement for removal and reinstatement by the civil works contractor and assist PMU/PWGs to documentation of voluntary agreements and No Objection for reclamation of strips of ROW and for secondary asset reinstatement.
- For any land acquisition and resettlement impacts within and/or out of the official ROW, if agreement on voluntary donation is not reached with affected household following the principles set out in the Updated Resettlement Framework, support the General Department of Resettlement (GDR), under MEF, to prepare the detailed resettlement plan for the rural road for implementation.

² A preliminary Climate Risk and Vulnerability Assessment has been prepared by an international Climate Change Consultant.

- In the overall ES risks and impacts assessment, integrate the ES findings together with the hydrological, geological, relevant climate risk (for safety of workers and communities) and stakeholder consultations to prepare the Environmental and Social Safeguard Management Plans (ESMPs) for the rural roads in the target provinces.
- If ethnic minority group(s) that trigger the ADB IP safeguard conditions are identified residing in the rural road area and/or would be affected by the rural road improvement (positive and/or negative, temporary and/or permanently), prepare the Indigenous Peoples' Development Plan for the rural road for implementation.
- Review and propose measures to improve the existing Grievance Redress Mechanism (GRM).
- Identify capacity building needs for skill enhancement on environment and social aspects for the PMU and PWG and assist in the delivery of on-the-job training on the environmental and social safeguard requirements and procedures.

Irrigation subprojects:

The following procedures will apply for safeguard due diligence for the irrigation subprojects:

- Conduct meaningful public consultations within the affected communities for each proposed irrigation subproject to inform them about the proposed design, get their feedback on project's potential environmental and social risks and impacts during construction and operation, including their proposed mitigation measures.
- Identify the Affected Households who have secondary assets (such as fences, small sheds) within Corridor of Impact (COI) and the official Right of Way (ROW), which may need to be removed during construction, and seek their voluntary agreement for removal and reinstatement by the civil works contractor and assist PMU/PWGs to documentation of voluntary agreements and No Objection for reclamation of strips of ROW and for secondary asset reinstatement.
- For any land acquisition and resettlement impacts within and/or out of the official ROW, if agreement on voluntary donation is not reached with affected household following the principles set out in the Updated Resettlement Framework, support the General Department of Resettlement (GDR), under MEF, to prepare the detailed resettlement plan for each irrigation subproject for implementation.
- In the overall ES risks and impacts assessment, integrate the ES findings together with the hydrological, geological, relevant climate risk (for safety of workers and communities) and stakeholder consultations to prepare the Environmental and Social Safeguard Management Plans (ESMPs) for the proposed irrigation subprojects in the target provinces.
- If ethnic minority group(s) that trigger the ADB IP safeguard conditions are identified residing in the irrigation subproject and/or would be affected by the irrigation improvement (positive and/or negative, temporary and/or permanently), prepare the Indigenous Peoples' Development Plan for the rural road for implementation.
- Review and propose measures to improve the existing Grievance Redress Mechanism (GRM).
- Identify capacity building needs for skill enhancement on environment and social aspects for the PMU and PWGs and assist in the delivery of on-the-job training on the environmental and social safeguard requirements and procedures especially in operating and managing the GRM and the Grievance Review Committee (GRC).

3. DETAILED ENGINEERING DESIGN PREPARATION

Rural roads

The preparation of the DEDs for each selected rural road subproject will include the following considerations:

Pavements: Divide the road into homogenous sections for either DBST or reinforced concrete based on traffic, subgrade strength, and environmental parameters. Estimate design traffic for a 20-year design life, and pavement width of at least 8 meters, and work out the most cost-effective pavement thickness and composition by making the best use of the existing pavement layers, local, marginal materials, industrial by-products (as appropriate). Make special provision for flood-affected sections and built-up village areas.

Climate resilience, green and nature-based solutions. Identify key climate related risks in the project areas through desk studies of relevant documents, data/model analysis, and climate vulnerability assessment of the road technical design. Integrate climate smart and nature-based solutions in the detailed designs of irrigation structures based upon local and international standards including for flood-prone sections, erosion protection, and raised embankments, resilient drainage and bioengineering. Identify options for green and low-carbon design solutions such as recycled and sustainable materials and opportunities to reduce embodied carbon and operational emissions. Promote the use of bio-engineering measures for erosion control, side slopes, and canal-side plantations.

Road safety: Identify potential road safety issues and hazards through a quick road safety inspection of the full length of the rural roads from a traffic safety perspective to identify appropriate accident mitigation measures for specific locations including existing alignments and discussions with rural communities and road users and incorporate these into the designs. Make provisions of the required road safety engineering measures emphasizing improvement of sharp and blind curves, poorly designed junctions, unsuitable alignments, narrow bridges, culverts, and narrow road sections, road signs, parking spaces, traffic calming measures in built-up village areas, and other measures for the safety of motorcyclists and pedestrians, including persons with disabilities, elderly persons, women and children. Design appropriate road safety and awareness training programs.

Horizontal and vertical alignment: Design the road to have adequate lane width and geometry including horizontal and vertical alignment meeting the prescribed standards and taking into account geometry, side drains, culverts, bridges and drainage. The design standards must emphasize road safety and optimal use of existing roadways and other facilities while minimizing the requirement for any additional land acquisition and all proposed horizontal and vertical alignment details will be shown in the layout plans for each subproject.

Way-side facilities: Covering bus stops, parking places, and small rest areas for road users.

Bridges, culverts and other structures: Design of all the roads and bridges based on sound hydrological, geotechnical, and topographical investigations with emphasis on making best use of existing bridges and culverts, if required, through suitable improvements. Wherever required, design the bridges and culverts to operate with increased flow capacities and higher flow velocities due to higher water volumes in rivers as a result of climate change impacts.

Drainage: Ensure adequate drainage through suitable provisions for embankments, side-drains, balancing culverts and drainage layers in pavement.

Irrigation subprojects:

The preparation of the DEDs for each irrigation subproject will include the following considerations:

Canals: Optimize the design of the final horizontal and vertical alignment & cross sections for all main, secondary & tertiary irrigation canals. Produce optimal canal cross sections at 25-meter intervals based on the data obtained in the Feasibility Study phase. Complete all drawings required to produce the detailed engineering designs for the canal related rehabilitation works.

Flow Control Structures: Finalize the locations, type and dimensions and all associated design details (foundations, erosion protection, etc.) for all proposed flow control structures (i.e. simple water gates using stop logs, steel water gates using manually operated geared mechanisms or steel water gates using electric motor operated mechanism). Finalize all design details for any smaller flow control structures including inlet/outlet pipes, flap gates, etc., to also include all foundation and stone rip rap (or other proposed method) anti-erosion details. Complete all drawings required to produce the detailed engineering designs for all the new or rehabilitated flow control structures.

Climate resilience, green, and nature-based solutions. Identify key climate-related risks in the project areas through desk studies of relevant documents, data/model analysis, and climate vulnerability assessment of the irrigation technical design. Identify options for green and low-carbon design solutions such as recycled and sustainable materials and opportunities to reduce embodied carbon and operational emissions. Promote the use of bio-engineering measures for erosion control, side slopes, bridge approaches, and canal-side plantations.

Bridges, culverts and other structures: Design of all required bridges over canals based on sound hydrological, foundation, and topographical investigations with emphasis on making best use of existing bridges and culverts, if required, through suitable improvements. Wherever required, design the bridges and culverts to operate with increased flow capacities and higher flow velocities due to higher water volumes in rivers as a result of climate change impacts.

Drainage: Ensure adequate drainage channels are provided for the disposal of excess water that may be generated during the irrigation process.

4. COST ESTIMATES AND ECONOMIC ANALYSIS

All subprojects

Undertake rate analysis and prepare cost estimates and BOQs for each individual road and irrigation subproject.

Based on the updated CAPEX estimates, refine the economic analysis and CBA.

Conduct sensitivity tests on traffic and CAPEX for each individual road and irrigation subproject.

5. DRAFT DESIGN REPORTS

Rural road subprojects

Preparation of Draft Design Reports: Prepare the draft design reports covering the above information including improvements in existing alignments, drainage, road geometry, type of pavements, improvement of existing cross-drainage works, and other aspects based upon a format to be agreed with the PMU.

Finalization of Detailed Engineering Design: Finalize the detailed engineering design document package (Drawings, Technical Specifications and BoQs) based on the Draft DED review comments received from PMU, NCDDDS and ADB.

Irrigation subprojects:

Preparation of Draft Design Reports: Prepare the draft design reports covering the above information including improvements in existing canal alignments, canal lining works (if required), all proposed major and minor flow control structures, and other aspects based upon a format to be agreed with the PMU.

Finalization of Detailed Engineering Design: Finalize the detailed engineering design document package (Drawings, Technical Specifications and BoQs) based on the Draft DED review comments received from PMU, NCDDDS and ADB.

6. PROCUREMENT

The subprojects will be grouped by NCDDDS into procurement batches, normally comprising approximately five subprojects per batch. Each batch may be tendered as one procurement package with separate lots, or as separate contracts, depending on the nature, location, and readiness of the subprojects. The tendering process will be managed by the NCDDDS PMU in accordance with RGC SOP and applicable ADB requirements. The Consultant shall support the PMU in preparing bidding documents, responding to technical clarifications, supporting bid evaluation, preparing contract documents, and establishing a contract tracking system for monitoring implementation.

For all subprojects:

Prepare a complete set of bidding documents for each proposed rural road and irrigation subproject.

Ensure that the bidding announcements and the evaluation of the bids is completed in a timely manner in accordance with RGC SOP.

Support the NCDDS PMU in the preparation of **bid evaluation reports**.

Provide guidance to the NCDDS PMU on the preparation of the civil work contract documents.

Develop a **contract tracking system** for all civil works.

Develop templates for progress reporting, quality control, and inspection systems during the construction period.

D. SCOPE OF CONSULTANCY SERVICES - CONSTRUCTION SUPERVISION

The Consultant will be required to provide construction supervision services for all civil works for the subprojects that are designed. The work will encompass the following tasks:

1. ACTIVITIES AND SITE READINESS PRE-CONSTRUCTION

- Ensure completion of all pre-construction activities like community relocation, acquisition of the required land, site readiness, and receipt of all statutory permissions from the concerned authorities before the start of the construction.

2. DRAWINGS

- Issue "Good for Construction" (GFC) drawings and provide additional detailed drawings wherever required, for all subproject works including roads and irrigation works.

3. MOBILIZATION AND CONTRACTOR'S WORK PLAN

- Check, verify and recommend for approval the Contractor's work program, contractor's staff and equipment, site safety and environmental protection, temporary land use plan (for areas such as site camps, borrow pits, etc.) and other arrangements necessary for compliance with contract conditions before commencement of works.
- Ensure timely updates of contractors' work plan and delivery of civil works as per the approved work plan developed using a suitable project management software and show monthly progress targets for major work to accomplish milestones.
- Advise the affected village authorities of proposed work schedules and communities aware of disruptions.

4. COMMENCEMENT OF CIVIL WORKS

- Develop a checklist containing various requirements to be complied with by the contractor before commencement of the civil works.
- Ensure compliance with the requirements of the checklist before allowing the contractor to commence with the work.
- Review compliance with the documentation and advance actions requirements, including securing all statutory clearances and permits or handing over the site, and advise on issuing the notice to set the Commencement Date.

5. ENVIRONMENTAL AND SOCIAL ASPECTS

- Ensure compliance with the environmental and social management aspects of sub-projects and ensure Contractors' ESMPs are implemented effectively.
- Establish a system to monitor environmental and social safeguards of the sub-projects regularly via site visits etc., including monitoring the indicators set out in the monitoring plan of the Contractors' ESMPs.
- Ensure that the contractors prepare the Contractors' ESMP and implement it properly.

- Ensure that conditions and mitigation actions contained in any resettlement and compensation plans or Due Diligence Report actions required are implemented; this includes reinstatement of any secondary assets moved away from the COI during construction. Any resettlement and/or compensation to be affected prior to the start of civil works.
- Ensure the construction contractors implement the worker's GRM properly and effectively.
- Ensure the project specific GRM is in place and effectively managed in the project area and by PMU/PWG.
- Ensure the IPPs, if applicable, are implemented and monitored compliantly.
- Check and verify that voluntary donation is planned, implemented, and monitored properly following the principles and procedure set-out in the Updated Resettlement Planning Framework.

6. LAYOUT OF WORKS

- Supervise laying-out of works as per the GFC drawings including center line, horizontal and vertical curves, bridges and culverts, and other geometric features. Scrutinize and verify setting-out data.

7. WORK SUPERVISION

The supervision of all roads and irrigation subproject works, which include the following tasks:

- Undertake supervision of all works as per approved Contractor's method statements and the technical specifications for various items of work.
- Monitor achievement of milestones by the contractor and advise the NCDDs on the imposition of liquidated damages where justified under the contract for non-achievement of milestones.
- Revise milestone and seek revised work-programs from the contractors as required during execution.
- Maintain a diary for day-to-day recording of all relevant events of the works in the format approved by the employer.
- Maintain and regularly update accurate site records.
- Review and formally approve the work zone safety plan submitted by the contractor including environmental, health and safety of the construction workers at the active construction site and, also, the safety of traffic and pedestrians during construction in the work zone.
- Prepare financial statements of work under the contracts.
- Follow up on any issues arising during construction and recommend appropriate actions to the Project Manager.
- Review the securities submitted by the contractor and ensure that they are in acceptable formats and valid for the period stipulated in the contract. Ensure submission of insurance by the contractor.
- Ensure that the contractor submits construction methodology on time.
- Scrutinize and approve the construction methodology submitted by the contractor for carrying out the works and ensure that it meets the technical specifications, work program; environmental management plan; safety of works, and personnel deployment.
- Review and recommend approval of the contractors' Quality Assurance Plans (QAPs), approved by the employer, to the contractors and ensure that the formats and provisions in the QAPs are strictly followed by each contractor.
- Monitor deployment of key personnel as per the works contracts and approved work program and issue necessary instructions for corrective actions to be taken by the contractor.
- Ensure that the contractor's mobilization of plants and equipment is as per the specifications in the contract as well as the approved work program.
- The Consultant shall ensure that necessary permits for setting up of plant and machinery and obtained and renewed as required in a timely manner.

- Supervision must ensure implementation of green and climate-resilient design measures.

8. VARIATIONS DURING CONTRACT EXECUTION

- Review and recommend for the approval of the employer all variations/change orders including extra items, urgent unforeseen works, design changes including the associated costs, time extensions, revision of milestones, permissions for sub-letting of works, if required, all in accordance with the relevant clauses of the GCCs.
- Suggest alternate mechanism for implementation in the event of Contractors' delay/unwillingness/inability after conducting detailed cost assessment

9. QUALITY MONITORING

- Ensure implementation of the Quality Assurance Plan (QAP) of the contractor.
- Ensure all the works meet the prescribed quality criteria under QAP. Review and witness the test results of the quality control tests undertaken by the contractor during construction.
- Ensure that the Contractor undertakes all required materials and equipment testing requirements and reporting as detailed in the Technical Specifications.
- Review and certify test results of various construction materials and quarries and request additional tests if considered necessary.
- Undertake independent sample quality tests, maintain records of all the test results, review and approve all mix designs and use of various construction materials.
- Maintain a permanent record of all tests carried out to monitor the quality of work.

10. FIELD INSPECTIONS

- Undertake regular inspections of the work site to ensure execution of the civil works as per the prescribed contract conditions. This will include physical and financial progress, mobilization of contractors, deployment of equipment and key personnel, work-zone safety, use of prescribed work methods and technical specifications, quality assurance, management of social and environment issues, and other compliances.
- The consultant shall develop a checklist to be used for field inspections that are to be used by his team. Advise the contractor about corrective measures and agree with an action plan to address the issues raised during the field inspections.

11. ROAD SAFETY AUDITS

- For the rural roads subprojects undertake road safety inspections during construction and before opening the road to identify road safety hazards, if any, and recommend remedial measures to rectify the same.

12. REVIEW AND RECOMMEND PAYMENT OF CONTRACT BILLS

- Verify the contractors' bills through actual field inspections, joint measurements with the contractor and PMU, and ensure correctness of quantities, quality assurance, and other compliances in accordance with the relevant clauses of the GCCs.
- Recommend payment of contractor's bills for payment after the thorough scrutiny, ensuring that at no stage over-payment is made or any substandard work is paid for. Consultant will certify a minimum of 1/3rd of the measurement of works.
- Consultant will ensure that payments are processed in a timely manner within the prescribed time under the contract.
- Review and recommend to the Employer any request for advances by the contractors and monitor their utilization.

13. DISPUTE RESOLUTIONS

- Assist the Employer in handling various contractual disputes and contractors' claims, and other legal matters in accordance with the relevant clauses of the GCCs; collate, and prepare factual documentation, and if required attend the legal hearings.

14. COMPLETION OF WORKS

- Review and approve 'as-built' drawings prepared by the contractor in accordance with the relevant clauses of the GCCs. Issue the certificate of completion of works/Operational Acceptance Certificate upon request from contractors after ensuring that no work remains to be executed and acceptance of the contract completion report.
- Inspect the completed work during the defect liability/notification period and ensure that any defects noticed are rectified by the contractor promptly in accordance with the relevant clauses of the GCCs.

15. PROGRESS REPORTING

- Prepare monthly and quarterly progress reports (and other required reports) as per agreed formats with the employer on the actual progress vis-à-vis the planned targets, issues affecting implementation progress, and proposed solutions to address them, in accordance with the relevant clauses of the GCCs. Also prepare progress reports for submission to ADB as required.

16. PROGRESS REVIEW/MANAGEMENT MEETINGS

- Organize regular management meetings with the contractors (monthly/quarterly) with participation of the Employer representative to review implementation progress and issues affecting Project implementation and suggest solutions to resolve the issues to ensure smooth implementation of the civil works, in accordance with the relevant clauses of the GCCs.
- Attend progress review meetings called by Client NCDD/PMU and submit updates if required on project progress and issues.

17. TRAINING AND CAPACITY BUILDING

- Organize training and capacity building activities for the NCDD/PMU including training workshops, and field demonstrations, field units and contractors on regular basis in areas such as quality assurance, contract management, dispute resolution, management of social and environmental aspects, road safety, climate resilience and green construction.
- Prepare a training and capacity building plan in consultation with NCDD/PMU and implement the same. Contract includes a provisional sum to be used, after the approval of these activities, to cover inviting external experts and to meet other expenditures not covered through the consultancy contract.
- Consultant will also provide counterpart training to some staff of NCDD who shall take over the construction supervision task after the demobilization of the consultant/during the defect liability period.
- The Consultant's Safeguard specialist will coordinate with and assist the PMU ISC Safeguard Specialists in ensuring that NCDD, provincial and district team staff are nominated for Grievance Review Committees (GRC) and that the GRC and commune and village officials are aware of their roles and responsibilities in managing the GRM.

18. COMMUNICATIONS WITH CONTRACTORS

- Maintain effective communication with the contractors including timely notifications to contractors using standardized formats, timely response to various requests and communications from the contractors avoiding any liability on the part of the employer.
- Establish and use a computerized documentation control system to record/receive/issue/approve/reject/monitor all contractual correspondences.
- Handover all the project records and correspondences to the Employer in an organized, month-wise filing structure.

19. STAKEHOLDER ENGAGEMENT

- Maintain good communication and liaison with stakeholders including local authorities and beneficiary representatives. Mobilize their support for work execution and collect their feedback to effectively implement civil works.

20. RISK MANAGEMENT

- Identify the risks that may affect contract implementation including time and cost-over runs, financial, legal, or other liabilities.
- Keep the Employer fully informed about the risks through early warning and suggest the remedial measures required to avoid and mitigate the risks.

21. PRIOR APPROVALS AND OTHER SERVICES

- Seek prior approval of the Employer for the following: commencement of civil works, issue variation orders and time extensions, design changes, sanctioning extra items, accepting contractors' claims, and other matters that would cause additional liabilities to the employer.
- Provide any other services related to the assignment as requested by NCDD/PMU. In case the services could not be accommodated within the existing resources of the Consultant, employers will consider providing additional resources on the mutually agreed terms.
- Consultant will prepare contract management guidelines containing operating procedures to supervise the civil works through the above tasks including responsibilities at various levels. The guidelines are to be approved by the Employer and to be used by consultants at various levels as well as by NCDD/PMU, and field staff.

C. DURATION AND INPUTS

The total duration of the services is 58 months. The task of preparing the detailed designs is expected to take up to 36 months and the construction supervision that will commence after the first 12 months will extend for a period of 46 months. A total input of 1,594 person-months (p-m) will be required over the duration of the contract. The breakdown of consultant inputs is as follows:

Position (all national)	No of Position	Person-months
Key experts		
Senior Climate Resilience Design Engineer/Team Leader	1	51.0
Senior Civil Engineer & Contract Manager/Deputy Team Leader	1	51.0
Civil Engineer (Roads)	1	31.0
Civil Engineer (Irrigation)	1	31.0
Hydrologist	1	31.0
Climate Resilience/NbS Engineer	1	31.0
Structural Engineers	2	54.0
Environmental Safeguards Specialist	1	31.0
Social Safeguards Specialist	1	31.0
Procurement Specialist	1	31.0
Quantity/Cost Estimators	2	62.0
Resident Engineers	7	200.0
Non-key experts		
Junior Safeguard Specialists	7	252.0
Topographical surveyors	4	120.0
Surveyors Assistants	7	210.0
CAD Operators	2	62.0
Site Inspectors	7	315.0
Total		1,594.0

D. DETAILED TERMS OF REFERENCE - KEY EXPERTS

Senior Climate Resilient Design Engineer/Team Leader (51 p-m): Minimum qualifications are a Master's degree in civil engineering or a related field with a minimum of ten years' experience in the design and implementation of climate resilient rural roads or highway projects and irrigation projects, including substantial project management experience out of

which five previous project involvements shall be in the SE Asian region. S/he should have experience in leading teams on design of roads or highways, and/or irrigation projects with experience in implementing at least two projects funded by multilateral funding institutions or development banks or other development partners in the region. S/he must have a demonstrated ability to lead national teams and create a strong working relationship with the executing agencies. Excellent communication skills English, both written and oral, and strong interpersonal skills and some knowledge of Khmer language will be considered an important asset. The Team Leader will have the following responsibilities:

- Have overall responsibility for leading the team by providing technical advice and leadership during the design stage, including preparation of work plans.
- Provide day-to-day advice and support to the team on the study as required by the executing agency (NCDDS).
- Maintain liaison with NCDDS, including advising on key decisions relating to subproject selection as the assignment moves forward.
- Provide guidance to the team to ensure that the work meets the required standards.
- Conduct field visits with the team at regular and appropriate times during the study.
- Ensure reports are delivered to the required quality and on time.
- Ensure adherence to project quality assurance plan.
- Assist NCDDS with the updating as necessary and implementing use of its manuals and guidelines for project planning and procurement and ensuring these are all in line with existing SOP guidelines on these subjects.
- Assist the engineering team to prepare tender documents.
- Coordinate the work of the construction supervision team and ensure full compliance with all design specifications.
- Write monthly reports, quarterly reports, and final design reports.

Senior Civil Engineer/Deputy Team Leader (51 p-m): Minimum qualifications are a Master's degree in civil engineering, rural engineer or other relevant field with a minimum of eight years of national experience in the design of rural roads, highways, irrigation schemes or other value chain infrastructure facilities and wide experience in designs using alternative and local materials, and in use of materials in pavement structures. In addition, the candidate should have successfully implemented at least two (2) projects funded by multilateral development banks, international financial institutions, or other development partners in Cambodia. S/he must have experience and knowledge of the local and international standards for construction or rehabilitation of rural roads, highways, or other infrastructure facilities. The Deputy Team Leader will have the following responsibilities:

- Investigate conditions of existing rural roads and irrigation schemes. Identify and advise on alternative design options.
- Interpret survey results into design concepts.
- Ensure that all road and irrigation design parameters are well defined; ensure that road, and irrigation design calculations, location and layout of hydraulic structures and other features are included in FSS and DEDs.
- Conduct the preliminary and detailed design of sub-projects.
- Design pavement of roads such as DBST and reinforced concrete pavement.
- Sketch technical drawings for CAD operators.
- Identify road safety hazards and prepare for Road Safety Plans.
- Draft technical sections of the reports as needed.
- Prepare technical specifications of work.

- Ensure that all subproject construction is well supervised and completed safely and with minimal environmental impacts within the approved budget and performance period and in accordance with the approved designs, specifications and conditions.
- Conduct regular field visits to all sites during the civil works to provide guidance to the resident engineers and site inspectors on the supervision of the construction.
- Provide guidance to the PWGs in reviewing and examining claims arising from contractor requests for time extensions for completion, additional payments and any other matters that arise during the construction.
- Monitor the introduction of the O&M responsibilities for each subproject prior to the completion of the construction and assist in the delivery of capacity building training for user groups.
- Supervise the other team members to ensure that the work meets the required standards.
- Prepare all progress reports and ensure that they are submitted with the required quality and on schedule.

Civil Engineer (Roads) (31 p-m): Minimum qualifications are a master's degree in civil engineering, water resources engineering, or other relevant field with a minimum of eight years' experience in climate resilient design of rural roads, highway or other value chain infrastructure facilities. In addition, the candidate should have successfully implemented at least two (2) projects funded by multilateral development banks, international financial institutions, or other development partners in Cambodia. The Civil Engineer (Roads) will have the following responsibilities:

- Work with technical team to ensure that all subprojects addressing climate proofing are well integrated into the detailed design.
- Design types of pavements such as DBST and Reinforced Concrete.
- Identify climate-resilient design options and associated costs for the project.
- Work closely with the team to ensure that the work meets the required standards.
- Closely discuss and cooperate with technical team by identifying areas subject to extreme weather and climate change, such as frequent floods, waterlogging, submergence, high temperature, erosion, and extreme climatic events.
- Develop technical specifications with climate-resilient considerations.
- Assist in identifying all benefits of climate resilient design options from an engineering perspective.
- Conduct climate vulnerability and risk assessment for the project, including documents review, data analysis and modelling, identifying climate vulnerabilities and risks
- Integrate climate-smart and nature-based solutions in the detailed designs of rural road infrastructure
- Identify green and low-carbon design solutions and opportunities to reduce embodied carbon and operational emissions of rural road infrastructure.
- Ensure that all green, low-carbon, and climate-resilient solutions and measures are well integrated into the DEDs.
- Draft technical sections of the reports as needed.

Civil Engineer (Irrigation) (31 p-m): Minimum qualifications are a master's degree in civil engineering, water resources engineering, or other relevant field with a minimum of eight years' experience in climate resilient design of irrigation schemes or other value chain infrastructure facilities. In addition, the candidate should have successfully implemented at least two (2) projects funded by multilateral development banks, international financial institutions, or other development partners in Cambodia. The Civil Engineer (Irrigation) will have the following responsibilities:

- Work with the technical team to ensure that all subprojects addressing climate proofing are well integrated into the detailed design.

- Undertake Flood Risk Assessment Studies for the relevant subprojects with technical support from the Hydrologist.
- Identify climate resilient design options and associated costs for the project and ensure that irrigation system designs are in accordance with local farmers' preferred crop production schedule and maximization of dry season yields.
- Work closely with the team to ensure that the work meets the required standards.
- Closely discuss and cooperate with technical team by identifying areas subject to extreme weather and climate change, such as frequent floods, waterlogging, submergence, high temperature, erosion, and extreme climatic events.
- Develop technical specifications with climate-resilient considerations.
- Assist in identifying all benefits of climate resilient design options from an engineering perspective.
- Conduct climate vulnerability and risk assessment for the project, including documents review, data analysis and modelling, identifying climate vulnerabilities and risks
- Identify green and low-carbon design solutions and opportunities to reduce embodied carbon and operational emissions of the canal infrastructure.
- Ensure that all green, low-carbon, and climate-resilient solutions and measures are well integrated into the DEDs.
- Draft technical sections of the reports as needed.

Hydrologist (31 p-m): Minimum qualifications are a master's degree in water resource engineering/ hydrology or a related field with a minimum of eight years of experience in surface water hydrological studies and hydraulic design for cross drainage structures of roads, including rural roads. In addition, the candidate should have successfully implemented at least two (2) projects funded by multilateral development banks, international financial institutions, or other development partners in Cambodia. S/he will have the following responsibilities:

- Conduct desk studies of the available hydro-meteorological data and relevant reports on water resources and climate information in Cambodia for the project target provinces and sites of the rural road subprojects for use in the design of hydraulic structures.
- Conduct an analysis of the rainfall, stream flow, and surface water flow and river morphology at each rural road subproject location, as required.
- Preparation of hydraulic designs for cross drainage structures for each rural road subproject. Preparation of hydraulic designs for the irrigation subprojects, as may be required.
- Undertake Flood Risk Assessment Studies for the relevant subprojects with technical support from the Civil Engineers (Roads and Irrigation).
- Assist in the preparation of the detailed design report.

Climate Resilience/NbS Engineer (31 p-m): Minimum qualifications are a master's degree in civil engineering, water resources engineering, or other relevant field with a minimum of eight years' experience in climate resilient design of irrigation systems, roads, or other value chain infrastructure facilities. In addition, the candidate should have successfully implemented at least two (2) projects funded by multilateral development banks, international financial institutions, or other development partners in Cambodia. The Climate Resilience/NbS Engineer will have the following responsibilities:

- Reviewing the preliminary and detailed engineering designs and associated documents for all roads and irrigation subprojects to ensure that they have sufficient climate resilience and NbS features incorporated.
- Advising the design engineers on how to modify the designs to improve climate resilience and the application of NbS.
- Draft technical sections of the reports as needed.

Structural Engineers (2 x 27 p-m each): Minimum qualifications are a Bachelor's degree in civil engineering or structural engineering field with Certificate of Registered Engineer with the

Cambodian Board of Engineers, with a minimum of seven years of experience in structural analysis for road construction and irrigation flow control structures design including cross drainage structures. In addition, the candidate should have successfully implemented at least two (2) projects funded by multilateral development banks, international financial institutions, or other development partners in Cambodia. S/he will have the following responsibilities:

- Inspection of existing structures and confirmation of those that require replacement, and any repairs required on structures.
- Work closely with the Hydrologist to determine the adequacy of all foundation designs and structural design for culverts, flow control structures (steel and concrete) and erosion protection systems for riverbanks, canals and bridges.
- Preparation of detailed designs for the repair or replacement of existing structures as required.
- Preparation of the detailed design documentation suitable for bidding documents.
- Assist in the preparation of the detailed design report.

Environmental Safeguard Specialist (31 p-m): Minimum qualifications are a master's degree in environmental engineering, environmental science, natural resources or other relevant fields with a minimum of seven (7) years of experience in the conduct of environmental and social impact assessments (ESIA) including preparation of environmental management and monitoring plans for infrastructure projects preferably with experience in one or more of the following sectors: rural roads and irrigation projects in Southeast Asia. S/he must have knowledge and experience on the application of environmental safeguard standards (ADB Environmental and Social Standards or World Bank Environmental and Social Standards or ADB Safeguards Policy Statement or similar standards) and other good international practice. In addition, the candidate should have successfully implemented at least two (2) projects funded by multilateral development banks, international financial institutions, or other development partners in Cambodia. The Environmental Safeguards Specialist will have the following responsibilities:

- Work closely with the Hydrologist, Climate Resilience Engineer, Social Safeguards Specialist, as well as other members of the team in the identification and application effective environment (including health and safety) and social safeguards for each subproject to avoid or mitigate against unfavorable environmental impacts in compliance with the ADB Safeguard Policy Statement (SPS. 2009).
- Visit all subproject sites to conduct screening for potential unfavorable environmental impacts and identify appropriate mitigation measures and complete the environmental screening assessment for each subproject to confirm potential direct and indirect impacts and risks to physical, biological, socioeconomic, physical and cultural resources in the context of the project's area of influence, ensuring close integration of environment sustainability and climate resilient in infrastructure designs.
- Support the conduct of dialogue and meaningful consultations with the affected communities and in ensuring incorporation and implementation of environmental concerns and suggestions from such interactions on environmental mitigations, good practices, consultation, information dissemination, environmental grievances handling/ management.
- Assist in the compilation of the documentation for the Environmental and Social Management Plans (ESMP) for each subproject in cooperation with the Social Safeguard Specialist and working under the technical guidance of the PMU E & S Safeguard Specialist.
- Identify capacity building needs for skill enhancement on environment aspects for the PMU and PWG to be integrated in the project's institutional and capacity strengthening plan and in collaboration with the PMU E & S Safeguard Specialist, assist in the delivery of on-the-job training on the environmental safeguard requirements and procedures for PWG Safeguard Teams.

Social Safeguard Specialist (31 p-m): Minimum qualifications are a Master's degree in sociology, social science, or other relevant fields with a minimum of ten years of experience in conducting social impact assessments for infrastructure projects, preferably including one

or more of the following sectors: rural roads schemes and irrigation schemes and due diligence for social impacts. S/he must have knowledge of and experience in implementing, the social safeguard standards and protocols under ADB Safeguard Policy Statement (SPS, 2009), relevant RGC procedures, and other applicable safeguard requirements for externally financed projects. Previous experience in the application of Multilateral Development Bank's Environmental and Social Standards (ESS) such as the World Bank's ESF (2018) would be an advantage. In addition, the candidate should have successfully implemented at least two (2) projects funded by multilateral development banks, international financial institutions, or other development partners in Cambodia. The Social Safeguards Specialist will have the following responsibilities:

- Work closely with Environmental Specialist and the Climate Resilience Engineer as well as other members of the team in the identification and application of effective social safeguards for each subproject to avoid or mitigate against social impacts in compliance with the ADB SPS (2009) and including verification that there are no resettlement impacts. Work with the detailed design team on all possible options to avoid social impacts of the road subprojects, especially land acquisition and resettlement impacts.
- Visit all subproject sites to conduct screening for potential social risks and impacts and engage with stakeholders to ensure that social risks and impacts are correctly identified and that risk/impacts management measures adopted are appropriate to the needs of affected communities, with the identification of households that are affected by the loss of assets within the ROW of each rural road and irrigation subproject to seek voluntary agreements for the removal of these assets during the construction. Assist PMU/PWGs to document the agreement on voluntary donations.
- Support dialogue and meaningful consultations with the affected communities and ensure acceptance and implementation of measures to minimize social impacts as well as improvement and establishment of a Grievance Redress Mechanism (GRM) at each site to provide a mechanism for the community as well as construction workers to lodge suggestions or complaints.
- Assist in the compilation of the documentation for the social safeguard due diligence reports for each subproject in cooperation and with guidance from the Social Safeguard Specialist in the Provincial Working group (PWG).
- If ethnic minority group(s) triggering ADB IP safeguards are identified residing in the subproject area and/or would be affected by the subproject (positive and/or negative, temporary and/or permanently), assist the ISC Safeguard Specialists to prepare the Indigenous People Plan for the rural road for implementation.
- For any land acquisition and resettlement impacts within and/or out of the official ROW, if agreement on voluntary donation is not reached with affected household following the principles set out in the Updated Resettlement Framework, support the ISC Safeguard Specialists and GDR to prepare the detailed resettlement plan for the rural road for implementation.
- Assist the ISC to identify capacity building needs for skill enhancement on environment aspects for the PMU Safeguard Focal Point and PWGs to be integrated in the project's institutional and capacity strengthening plan and in collaboration with the PMU E & S Safeguard Specialist, assist in the delivery of on-the-job training on the environmental safeguard requirements and procedures for PWG Safeguard Focal Point.
- Provide inputs on social safeguards for the ES sections of the Inception Report, FS Report, and DEDs Report.

Procurement Specialist (31 p-m): Minimum qualifications are a bachelor's degree in law, business administration, engineering or other relevant fields and have at least seven years' experience in procurement of works and goods, preparation of tender and contract documents, evaluation of bids, and contract management of projects. S/he must be fully conversant with the RGC Standard Operating Procedures (SOP) for procurement. S/he must have proven track record of working in a similar capacity on at least three externally funded road construction projects funded by MDBs and past experience of working with Cambodian Government Agencies would be an asset. S/he must have good computer skills, be a good

administrator and proficient in English and able to write structured reports. The Procurement Specialist will have the following responsibilities:

- Work closely with the Climate Resilience Engineer in the team on the development of all bidding documents that are required for each subproject based upon the technical specifications and BOQs that are prepared and including all provisions defined within the ESMP and incorporating other requirements relating to gender and equal opportunity.
- In cooperation with the PMU procurement team, ensure that the bidding announcements are and the evaluation of the bids is completed in a timely manner and support the preparation of bid evaluation reports to ensure that there are no delays on the award of the contracts.
- Provide guidance to the PMU procurement team on the preparation of the civil work contract documents.
- Develop a contract tracking system for all civil works that can be used by the PMU procurement team to effectively monitor the execution of the contracts and to ensure that the need for contract variations for both cost and duration are processed in a timely manner within the timeframe of existing contracts.
- Develop the templates to be used by the PMU procurement team for progress reporting, quality control and inspection systems during the construction period.

Quantity/Cost Estimators (2 x 31 p-m each): Minimum qualifications are a Bachelor's degree in civil engineering or another relevant field with at least three and preferably five years of experience in cost estimation for road and/or other civil engineering projects in Cambodia. In addition, the candidate should have successfully implemented at least two (2) projects funded by multilateral development banks, international financial institutions, or other development partners in Cambodia. S/he will have the following responsibilities:

- Preparation of the engineering cost estimates for all selected rural road and irrigation subprojects.
- Calculation of all materials for civil works based on technical drawings.
- Ensure that the estimated rates are in accordance with the current market rates.
- Ensure that the estimated values coincide with the sketch drawings.

Resident Engineers (4 positions: 200 p-m total): Minimum qualifications are a bachelor's degree in civil engineering or other relevant fields with a minimum of eight years of experience in the design and implementation of one or more of the following sectors: rural road projects and irrigation systems. They should have experience of working as a resident engineer for rural road works, including the construction of DBST and Reinforced Concrete roads with at least two projects funded by MDBs. They will be based in each of the target provinces and will work in close cooperation with the respective PWG teams in the province and have the following responsibilities:

- Conduct weekly field visits to all sites during the civil works to liaise with the site inspectors and the contractors and monitor the progress of work.
- Supervise all civil works at each site and ensure that quality of works are constructed according to contract, technical specifications of works and technical drawings.
- Provide oversight to the Site Inspectors for the application of the testing procedures for all structures as per regulatory and contractual requirements and specifications.
- Prepare a list of defects with an indication of how to correct and the date of expected completion, to be signed by the contractors and verified by the PWG teams.
- Prepare Interim Payment Certificates based on measured quantities of works for endorsement by the PWG.

E. DETAILED TERMS OF REFERENCE - NON-KEY EXPERTS

Topographical surveyors (4 positions: 120 p-m total). Minimum qualifications are at least a diploma or bachelor's degree in land surveying, geomatics, civil engineering, construction

engineering, or another relevant technical field. Each surveyor should have a minimum of five years of practical experience in topographical surveying for rural roads, irrigation systems, drainage works, canals, bridges, culverts, or other civil infrastructure projects. The surveyors should be fully competent in the use of modern surveying equipment, including total stations, GPS/GNSS instruments, automatic or digital levels, and related data processing software. They should also be able to prepare survey data suitable for use by design engineers and CAD operators in preparing feasibility studies, detailed engineering designs, drawings, longitudinal sections, cross-sections, and construction setting-out data. There will be four positions in the team that are assigned to Pursat/Battambang, Banteay Meanchey/Siem Reap, Kampong Thom/Kampong Cham, and Prey Veng provinces respectively. They will have the following responsibilities:

- Conduct topographical surveys for selected rural road and irrigation subprojects in accordance with the requirements of the feasibility studies and detailed engineering designs.
- Establish survey control points, benchmarks, reference points, and survey stations required for accurate field measurement and subsequent design work.
- Survey existing rural road alignments, including horizontal and vertical alignment, road width, shoulders, embankments, side drains, culverts, bridges, intersections, built-up areas, and other relevant features.
- Prepare survey data for strip plans, longitudinal sections, and cross-sections for rural road subprojects, including cross-sections at the intervals required by the design team.
- Survey existing irrigation canal systems, including main, secondary, and tertiary canals, embankments, flow control structures, culverts, bridges, drainage structures, ponds, reservoirs, streams, and other water-related features.
- Record existing right-of-way, boundaries, utilities, trees, buildings, fences, walls, access points, way-side facilities, and other physical features that may affect design, safeguards, quantities, or construction.
- Support the identification of areas requiring design attention, including low-lying sections, erosion-prone areas, flood-prone locations, drainage constraints, damaged canal sections, and locations of existing or proposed structures.
- Process and check field survey data and provide accurate survey outputs to the road engineers, irrigation engineers, hydrologist, structural engineers, quantity/cost estimators, and CAD operators.
- Support the preparation of drawings, plans, profiles, cross-sections, quantity calculations, and other technical documentation required for feasibility studies, detailed design reports, and bidding documents.
- Undertake additional surveys or verification surveys where required during design review, safeguard due diligence, community consultation, or finalization of detailed engineering designs.
- Ensure that all survey work is carried out safely, accurately, and in coordination with local authorities, communities, land users, and project field teams.

Surveyors Assistants (7 positions: 210 p-m total). Minimum qualifications are a secondary school certificate, technical certificate, or vocational training in surveying, civil works, construction, rural infrastructure, or another relevant field. They should have a minimum of two years of practical experience supporting topographical surveys, construction surveys, road surveys, irrigation surveys, or civil works measurement activities. They should be familiar with basic surveying procedures, field measurement, levelling, use of ranging rods, prisms, measuring tapes, staffs, GPS devices, and field recording formats. They should be physically able to work in rural field conditions and should be able to communicate effectively with local communities and project field teams. There are seven positions with one Surveyors Assistant based in each target province. They will have the following responsibilities:

- Assist the Topographical Surveyors in carrying out field surveys for rural road and irrigation subprojects.

- Support the establishment of benchmarks, control points, survey stations, temporary reference points, and alignment markers.
- Carry survey equipment, set up tripods, prisms, staffs, rods, tapes, pegs, markers, and other equipment required for field survey work.
- Assist in measuring distances, levels, offsets, cross-sections, canal dimensions, road widths, drainage lines, embankments, and other physical features.
- Support the collection of field data on existing roads, canals, culverts, bridges, flow control structures, utilities, trees, buildings, fences, walls, and other topographical features.
- Help mark road centerlines, canal alignments, structure locations, cross-section points, and other survey reference locations under the direction of the Topographical Surveyor.
- Record basic field observations, assist with field sketches, and help maintain survey notebooks and measurement records.
- Support verification of survey data by assisting with repeat measurements, level checks, and field confirmation of features where required.
- Assist surveyors, engineers, CAD operators, and quantity/cost estimators by providing field clarification and supporting additional checks during preparation of designs and drawings.

Junior Safeguard Officers (7 positions - 252 p-m total). Minimum qualifications are a Bachelor degree in sociology, social science, or other relevant fields with a minimum of two years of experience in conducting social impact assessments for infrastructure projects, preferably including one or more of the following sectors: rural roads, flood protection schemes and irrigation schemes and due diligence for social impacts. They should have knowledge of the social safeguard standards and protocols that are required for externally financed projects and experience in the application of the safeguard procedures as defined in the ADB SPS (2009) as well as Environmental and Social Standards (ESS) procedures that are in use for other externally funded projects. In addition, the candidate should have successfully implemented at least one (1) project funded by multilateral development banks, international financial institutions, or other development partners in Cambodia.

The Junior Safeguard Officers will have the following responsibilities:

- Work closely with the other Environment and Social Safeguard Specialists and the other members of the design team on all possible options to avoid social impacts of the road subprojects, especially land acquisition and resettlement impacts.
- Support the identification of the impacts for each subproject, specifically relating to the identification of affected households and the negotiation for the voluntary donations of land or assets within the official ROW, as well as the identification of measures to avoid or mitigate against these impacts in compliance with the ADB SPS (2009) and verification that there are no resettlement impacts.
- Facilitate dialogue and meaningful consultations with the affected communities and ensure acceptance and implementation of measures to minimize social impacts as well as the establishment of a Grievance Redress Mechanism (GRM) at each site to provide a mechanism for the community as well as construction workers to lodge suggestions or complaints.
- Work closely with the commune councils in respect of the above tasks including the facilitation of the signing and verification of the voluntary donation forms for incorporation into the social safeguard due diligence report for each subproject.
- If ethnic minority group(s) are identified residing in a subproject area and/or would be affected by the rural road or canal improvement (positive and/or negative, temporary and/or permanently), ensure that all recommendations and provisions of the Indigenous People Plan are implemented.

CAD Operators (2 positions: 62 p-m total): Minimum qualifications are a bachelor's degree in civil engineering or relevant field with at least three and preferably five years of experience in computer aided design (CAD) for rural roads and irrigation subprojects or other related infrastructure investments. The CAD Operators must have advanced knowledge and demonstrated skills in the use of the AutoCAD program. In addition, the candidate should have

successfully implemented at least two (2) projects funded by multilateral development banks, international financial institutions, or other development partners in Cambodia. S/he will have the following responsibilities:

- Create accurate CAD drawings from hand sketches, verbal instructions, and site visits.
- Deliver creative and critical thinking to support the team during the design process, to ensure the preparation of technical drawings that accurately reflect the proposed road designs.
- Update the technical drawings as needed to reflect any design modifications or additions that are made to the design.

Site Inspectors (7 positions: 315 p-m total): Minimum qualifications are a Bachelor's degree in civil engineering or other relevant fields and at least five years of experience in the supervision and construction management of rural road rehabilitation or irrigation systems and other infrastructures facilities to ensure that quality of works is in line with the design standard within estimated cost and schedule. They must have experience with at least two projects funded by MDBs. In addition, the candidate should have successfully implemented at least one project funded by ADB or another development partner. They will be based in each of the seven target provinces and will work in close cooperation with the respective PWG team in the province and have the following responsibilities:

The Site Inspectors will have the following responsibilities:

- Conduct weekly field visits to all sites during the civil works to liaise with the Resident Engineer and the contractors and monitor the progress of work.
- Work closely with Resident Engineer to ensure that the work meets the required standards and report on the daily activities of civil works at each site to the Resident Engineer.
- Ensure the correct application of the testing procedures for all structures as per regulatory and contractual requirements and specifications.
- Supervise all activities of civil works on sites to ensure the quality of the civil works including the correct use of plant and equipment and adherence to the bill of quantities and specifications for the civil works.
- Manage and maintain accurate field notes such as request for inspection, notice for construction and prepare report progress of work.
- Monitor the Contractor's implementation of traffic signing, barriers, and other traffic control measures.

F. DELIVERABLES (REPORTING)

Inception Report: submitted within one month of the mobilization and will include a detailed description of the approach to the assignment, objectives, detailed methodologies, and updated work plans for the assignment. It must also detail the related tasks, activities, schedule of activities, detailed time-tasks/schedule listing all tasks, mobilization plan, anticipated difficulties including resource gaps that have become apparent including weaknesses in PWG support. The Inception Report will be approved by the PMU prior to the implementation of the work.

Feasibility study reports for each Batch of rural infrastructure subprojects presenting the subproject rationale, location and baseline conditions, beneficiary and demand assessment, technical options and preferred solution, climate-risk and disaster-resilience assessment, environmental and social safeguard screening and due diligence, stakeholder consultation findings, preliminary O&M arrangements, cost estimates, economic analysis, risks, and recommendations on readiness for detailed design and approval.

Detailed Design Reports for each Batch of rural infrastructure subprojects presenting the final technical design basis, design calculations, drawings, specifications, bills of quantities, engineer's cost estimate, updated safeguard and climate-resilience measures, construction

methodology considerations, O&M requirements, and complete bidding documents suitable for procurement and implementation.

Progress reports: The consultant is required to submit the following progress reports to NCDDS/PMU:

- Monthly progress reports for construction supervision within one week of the end of every calendar month.
- Quarterly progress reports that document the overall progress of the work.

Final report: The final report will be submitted about one month before the end of the assignment. The final report will include the details of all contract changes and variations, assessment of contractor's performance, construction records for each site, contractor's environmental monitoring reports, implementation of social safeguard provisions including operation of the grievance redress mechanism with details of complaints received and their resolution. The report should also document the lessons learned and recommendations for future similar projects.
