Ministry of National Development Planning/Bappenas Republic of Indonesia

LOW CARBON DEVELOPMENT INDONESIA

UK International Development
Partnership | Progress | Prosperity

Oxford Policy Management

Term of Reference

Consultancy Service for Solar Photovoltaic Water Pumping System for Sustainable Agriculture, Samosir District, North Sumatra

Feasibility Study and System Design

Programme Overview

The Foreign, Commonwealth, and Development Office of the UK Government (FCDO), in collaboration with the Development and Planning Ministry (Bappenas) of the Government of Indonesia, have developed a partnership agreement for the Low Carbon Development Initiative (LCDI). The first phase of LCDI assistance was implemented from 2017 to 2021.

Currently, the programme has entered a new phase of assistance from 2023 to 2027. Oxford Policy Management Limited (OPML) has been contracted by FCDO to deliver and manage the implementation of LCDI in collaboration with the Government of Indonesia (GoI), primarily Bappenas, along with relevant line ministries and the pilot provinces of the programme. The assistance will support the implementation of LCDI at both the national and subnational level to enable the Government to meet its emissions reductions targets in Indonesia's medium term development plan. The programme will cover:

- Building political support for low-carbon development within and outside of government;
- Building knowledge and understanding of the LCDI approach among those who are responsible for implementing it within GoI;
- Supporting implementation of the LCDI approach, especially through provincial and national development plans; and
- Raising ambition to the highest levels set out in the LCDI report.

LCDI is planning to support the piloting of innovative technologies under Workstream 4, the "Innovation and Technology Fund." This initiative is designed to drive the adoption of innovative solutions that can accelerate the transition to low-carbon development. By leveraging this fund, LCDI aims to back pilot projects that integrate technological advancements with sustainable practices,

ultimately contributing to reducing greenhouse gas emissions and promoting cleaner technology alternatives.

Workstream 4 focuses on exploring and demonstrating the viability of these innovations in real-world settings. This allows for scalable, cost-effective solutions that can be replicated across sectors. This approach not only helps mitigate climate change but also fosters economic growth and job creation within the low-carbon technology space.

Project Overview

North Sumatra Government is focusing on improving rice productivity throughout the province. The target is to achieve national food self-sufficiency, especially in rice, and to improve the welfare of farmers in North Sumatra.

As a rice production centre in North Sumatra, Samosir District was chosen for an LCDI pilot project focusing on increasing rice production using low carbon technologies. Diverse regional conditions cause the level of rice productivity throughout North Sumatra to vary. Based on the data from the National Bureau of Statistics on average, Samosir District produces around 3-6 tons/ha per year, in-line with the national the national rice productivity level, which is approximately 4-5 tons/ha. However, in the target area of Samosir Island, due to the lack of irrigation, farmers are only able to harvest once per year, therefore production is falling short of the regional and national average.

In terms of infrastructure, most rice fields in Samosir District are irrigated. However, there remain areas in Samosir District that have problems with the availability of water for agricultural land. The areas experiencing water problems are in the **northern part of Samosir Island**, **located on the shorelines of Lake Toba**. In this northern region, most rice fields are still in the rain-fed category, harvesting rice only once annually - in March of each year. After the post-harvest period, some people use their abandoned rice fields to plant secondary crops such as corn which can grow in limited water conditions. After the secondary crop planting season ends, the rice fields are usually abandoned due to the dry soil conditions. This condition is paradoxical, considering that Lake Toba surrounds Samosir District.

One effort to increase rice productivity is to build agricultural infrastructure such as irrigation channels so that the target of harvesting twice a year can be achieved. However, irrigating agricultural land with fossil-fuel based water pumping systems can generate considerable greenhouse gas emissions. This could be avoided by using renewable energy.

Field surveys conducted in August 2024 by Bappenas, FCDO, and LCDI have revealed considerable potential for developing solar-photovoltaic water pumping systems in the region. Candidates for these systems include areas near Lake Toba, as well as inland locations with groundwater potential. The approximate area of the identified locations are 75 Hectares. Furthermore, regions that currently depend on traditional water pumping systems and incur high fuel costs can greatly benefit from adopting solar-powered solutions. By leveraging renewable energy for irrigation, the agricultural sector in Samosir District can boost rice productivity and simultaneously foster sustainable practices that reduce environmental impacts. This approach will ultimately enhance the economic conditions of local farmers while contributing to the province's food security goals.

Objective

The objective of the contract is to assess the social and environmental feasibility and to design a solar-photovoltaic water pumping system to meet irrigation water needs in at least one of the two (2) proposed locations in Samosir District, North Sumatra (Desa Pakpahan Kecamatan Onan Runggu, and

Desa Sibonor Ompu Ratus Kecamatan Nainggolan) that have been identified by the provincial government. The awarded contractor will:

1. Assess the environmental and social suitability and readiness of the target locations, and identify potential risks along with corresponding mitigation strategies to address any environmental or social challenges that may arise; and
2. Prepare appropriate plans and designs for the physical construction of the solar-photovoltaic water pumping system.

Scope of Work/Activities

The feasibility study and system design activity should encompass, but is not limited to, the following desk based (review of relevant documentation and literature) and field work activities:

Phase 1: Feasibility Study and System Design

1. Project Preparation and Feasibility Study
- 1.1. Site Assessment and Selection
- 1.2. Water Resource Evaluation
- 1.3. Solar Energy Potential Analysis
- 1.4. Regulatory & Permitting Analysis
- 1.5. Social/Community and Environmental Impact Assessment
- 1.6. Risk Assessment and Mitigation Planning

2. System Design and Engineering
- 2.1. Pump and System Design
- 2.2. Solar Panel Design
- 2.3. System Layout Design
- 2.4. Component Sizing & Equipment Specification Finalisation
- 2.5. Budget Plan & Bill of Quantity Development
- 2.6. “Instruction to Bidders" Document Development
- 2.7. Drafting of Contract Document

1. Project Preparation and Feasibility Study

1.1 Site Assessment and Selection: Identifying and evaluating potential sites for the solar photovoltaic water pumping system. Factors such as proximity to water sources, accessibility, land use, and environmental conditions are considered to determine the most suitable locations for implementation (*desk based and one (1) site visit to each proposed location*).

1.2 Water Resource Evaluation: Assessing the availability and sustainability of water resources in the selected area. It involves analysing existing water sources, understanding seasonal variations, and ensuring that the proposed system meets agricultural water demands throughout the year.

1.3 Solar Energy Potential Analysis: Evaluating the solar energy potential of the site using solar radiation data and geographical information. This analysis helps determine the feasibility of harnessing solar power for the water pumping system, including energy generation and system efficiency estimates.

1.4 Regulatory & Permitting Analysis: Identifying the legal and regulatory requirements for installing the solar pumping system. This includes obtaining necessary permits and ensuring compliance with local, regional, and national regulations related to environmental protection, land use, and energy production.

1.5 Environmental and Social Impact Assessment: The study evaluates the potential impacts of the solar pumping project on local communities and the environment. Engaging with stakeholders, it examines social, economic, and ecological effects and proposes mitigation measures to address any identified negative impacts. Paying particular attention to Gender Equity, Disability and Social Inclusion (GEDSI) issues that could be leveraged into the way the water pump project is set up and managed.

1.6 Risk Assessment and Mitigation Planning: Identifying potential risks associated with the project, including technical, financial, and environmental risks. A comprehensive risk management plan is developed to mitigate these risks, ensuring the project's sustainability and success throughout its lifecycle.

STOP: Approval required from LCDI to proceed to system design and engineering.

2. System Design and Engineering

2.1 Pump and System Design: Generating the detailed design of the pumping system, including selecting appropriate pump types and specifications. It ensures that the system meets the required flow rates and pressures for effective water delivery.

2.2 Solar Panel Design: Designing the solar panel array, including selecting panel types, configuration, and orientation. Based on site conditions and solar potential, the design aims to maximize energy capture and efficiency.

2.3 System Layout Design: Developing the overall layout of the solar water pumping system. This includes arranging solar panels, pumps, and associated infrastructure to ensure optimal functionality and ease of maintenance.

2.4 Component Sizing & Equipment Specification Finalisation: Calculating the appropriate sizes for all system components, including pumps, solar panels, and other equipment. Finalising detailed specifications to ensure compatibility and performance standards.

2.5 Budget Plan & Bill of Quantity Development: Creating a comprehensive budget plan outlining all costs associated with the project, including materials, labour, and contingencies. A Bill of Quantities (BoQ) is developed to provide a detailed breakdown of the quantities and costs of materials needed for the project.

2.6 "Instruction to Bidders" Document Development: Creating documents that outline the requirements and expectations for potential contractors or bidders interested in the project. It includes specifications, timelines, and evaluation criteria to ensure a transparent and competitive bidding process.

2.7 Drafting of Contract Document: In this final step, a contract draft is prepared to formalise the agreement between the implementing agency and the selected contractor. The contract draft includes all terms, conditions, and deliverables, ensuring clarity and mutual understanding before the project begins.

This list serves as a preliminary framework to guide project scope and design, and it is important to note that it may be subject to review and modification should it be deemed necessary. Stakeholders are encouraged to provide feedback and suggestions to ensure that all relevant aspects of the project are addressed comprehensively.

Project Schedule/Deliverables

The project is anticipated to be completed within 12 weeks of contract start. This timeline is established to ensure that all contract phases are conducted thoroughly and efficiently, allowing for comprehensive evaluations and analyses to be completed within the stipulated period.

The project's execution will involve detailed planning and coordination among all stakeholders to meet critical milestones and deliverables. Regular weekly progress updates will be provided to ensure transparency and alignment with project objectives. It is essential that all necessary resources, including personnel and materials, are allocated effectively to adhere to this timeline while maintaining the highest standards of quality and safety.

Note that a minimum of one project STOP point has been mandated to allow for assessment of the outcomes from the feasibility study prior to proceeding. These have been included to ensure that all social and environmental safeguards as well as risks have been considered, and that the designs are fit for purpose.

Upon completion of the project, a final report will be submitted, summarising findings, recommendations, and any pertinent insights.

Deliverable	Description	Timing
Kick-off & Work plan	Agree roles and responsibilities, outline activities and agreed timelines	Week 1
Weekly progress updates	Update on progress, highlight risks and solutions, ensure ongoing alignment with project objectives.	Start week 2 – end of study
Presentation on the Draft Report on Project Preparation and Feasibility Study	Including: Site Assessment and Selection; Water Resource Evaluation; Solar Energy Potential Analysis; Regulatory & Permitting Analysis; Social/Community and Environmental Impact Assessment; Risk Assessment and Mitigation Planning	Week 7
Handover of the Final Project Preparation and Feasibility Study Report	Prepare and submit the final report, incorporating and addressing all stakeholder comments and feedback.	Week 9
Presentation on the Draft System Design & Engineering Report	Including: Pump and System Design; Solar Panel Design; System Layout Design; Component Sizing & Equipment Specification Finalisation; Budget Plan & Bill of Quantity Development	Week 10
Handover of the Final System Design & Engineering Report	Prepare and submit the final report, incorporating and addressing all stakeholder comments and feedback.	Week 12
“Instruction to Bidders" Document Development & Drafting of Contract Document	Prepare and finalise all documentation to support the tender and contracting process, ensuring compliance with project requirements and procurement standards.	Week 12

Required Personnel and Expertise

The selected contractor will provide the necessary qualified technical teams to fulfil the contract. To effectively carry out the required services, the team should include expertise in the following areas:

Environmental safeguards; social safeguards and community engagement; economic analysis; regulatory knowledge, land ownership legislation; renewable energy engineering; hydrology and water resource management; mechanical engineering; project management; and data analysis

General Requirements:

- All team members must possess relevant technical qualifications in their respective fields.
- **Team Leader**: At least 10 years of experience in delivering environmental and social feasibility studies and/or designing irrigation systems and water management.
- **Team Members**: 5 to 10 years of experience in their respective fields.
- Team members are expected to demonstrate cultural sensitivity, respecting and valuing the customs, traditions, and perspectives of the local community throughout the project.
- Strong writing and communication skills in both English and Bahasa Indonesia.
- Ability to work collaboratively in a team and willingness to conduct fieldwork for site assessments.

Team Composition:

The suggested team requirements and responsibilities have been outlined below; other team configurations will be considered if sufficient value is demonstrated by the contractor:

	Personnel	Qualification	Task/Responsibility
	Project Manager/ Team Leader	• Minimum Bachelor's degree in civil, environmental, or water resources engineering. • Minimum 10 years of experience in designing irrigation systems, water management, and sustainable practices. • Knowledge of solar-powered water pumping systems is advantageous. • Have good writing and communication skills in English and Bahasa Indonesia • Able to work in a team and willing to do field work for site assessment purposes.	• Perform an environmental analysis to assess the potential impacts of the solar-powered irrigation system on the local ecosystem. This will include evaluating effects on water quality, biodiversity, and soil health, as well as identifying any necessary mitigation measures to minimize negative impacts. • Conduct a permit analysis to determine all required local, regional, and national permits necessary for project implementation. This will involve reviewing regulatory requirements, preparing the necessary documentation, and engaging with relevant authorities to ensure compliance and facilitate the permitting process.

	Personnel	Qualification	Task/Responsibility
			• Oversee the engineering design process and ensure it aligns with project goals. • Coordinate between different engineering disciplines (solar, water resources, civil). • Monitor project timelines and budgets during the engineering phase. • Perform budget, environmental and permit analysis • Conduct a comprehensive budget analysis to estimate the total costs associated with the project, including materials, labour, equipment, and ongoing operational expenses. This analysis will help identify funding sources and ensure the project remains within financial constraints. • Monitor project timelines and budgets during the engineering phase.
	Environmental Safeguard Specialist	• At least 10 years' experience in socio-environmental impact management/social environmental impact assessment • Experience of preparing environmental assessments and environmental management plans • Knowledge of solar-powered water pumping systems is advantageous. • Have good writing and communication skills in English and Bahasa Indonesia • Able to work in a team and willing to do field work for site assessment purposes.	• Identify and analyse relevant environmental laws and regulations that apply to the project. This includes understanding the approval processes and requirements specific to the project's location and sector. • Conduct fieldwork to gather data on the existing environmental conditions. This may involve sampling soil, water, and air, as well as assessing local flora and fauna. • Prepare a comprehensive EIA report that evaluates the potential environmental impacts of the project. This includes both direct and indirect effects,

	Personnel	Qualification	Task/Responsibility
			as well as short-term and long-term consequences. • Engage with stakeholders, including local communities, government agencies, and other interested parties, to gather input and address concerns regarding the project. • Develop and evaluate various project alternatives to minimise environmental impacts. This may include considering different project designs, locations, or technologies. • Propose measures to mitigate identified environmental impacts, ensuring compliance with regulatory requirements and promoting sustainability. • Develop plans for ongoing monitoring of environmental impacts during and after project implementation to ensure compliance and effectiveness of mitigation measures.
	Social Safeguards Specialist	• At least 10 years' experience in socio-environmental impact management/social environmental impact assessment • Knowledge of solar-powered water pumping systems is advantageous. • Have good writing and communication skills in English and Bahasa Indonesia • Able to work in a team and willing to do field work for site assessment purposes.	• Identify and engage with stakeholders, including local communities, government agencies, and interest groups, to gather insights and concerns about the project. • Social Impact Assessment: analyse how the project may affect the social fabric of the community. This includes evaluating potential changes in demographics, community cohesion, and local economies. • Gather qualitative and quantitative data through surveys, interviews, and focus groups to understand

	Personnel	Qualification	Task/Responsibility
			community needs, perceptions, and potential impacts. • Review relevant social policies and regulations to ensure the project aligns with legal requirements and community standards. • Explore and assess alternative project designs or approaches that could minimize negative social impacts while maximizing benefits. • Develop strategies to address and mitigate any identified adverse social impacts, ensuring that the project supports community well-being. • Compile findings into a comprehensive report that outlines the social implications of the project, including recommendations for stakeholders and decision-makers. • Propose plans for ongoing monitoring of social impacts during and after project implementation to ensure that mitigation measures are effective and to adapt strategies as needed.
	Agricultural Specialist/ Agronomist	• Minimum bachelor's degree in agriculture or related field • Knowledge of solar-powered water pumping systems is advantageous. • Strong understanding of soil science, crop physiology, and agricultural practices. • Have good writing and communication skills in English and Bahasa Indonesia	• Assess the irrigation needs based on crop types, soil characteristics, and local climate conditions. • Collaborate with the project manager and water resource engineer to determine optimal water requirements and distribution methods. • Provide insights on sustainable farming practices that can be

	Personnel	Qualification	Task/Responsibility
		• Able to work in a team and willing to do field work for site assessment purposes.	integrated with the solar irrigation system. • Engage with local farmers to gather input on their irrigation needs and challenges.
	Water Resource Engineer	• Minimum bachelor's degree in water resources or mechanical engineering • Minimum 5 years of experience in designing irrigation systems, water management, and sustainable practices. • Knowledge of solar-powered water pumping systems. • Have good writing and communication skills in English and Bahasa Indonesia • Able to work in a team and willing to do field work for site assessment purposes. •	• Design the solar-powered irrigation system, including pump sizing, layout, and integration with local water resources. • Conduct site assessments to evaluate water availability and determine the most effective pumping solutions. • Work with the agronomist to ensure the system meets the agricultural water needs efficiently. • Analyse potential environmental impacts of the irrigation system and recommend mitigation strategies. •
	Electrical Engineer	• Minimum bachelor's degree in electrical, or renewable energy engineering. • Minimum 5 years of experience in designing solar powered projects • Knowledge of solar-powered water pumping systems. • Have good writing and communication skills in English and Bahasa Indonesia • Able to work in a team and willing to do field work for site assessment purposes.	• Design the solar power system, including solar panel layout, inverter specifications, and other necessary engineering work. • Conduct simulations to assess the system's performance under various conditions. • Ensure compliance with local regulations and standards for solar installations. • Prepare a detailed budget for the electrical/solar power system component of the solar-powered irrigation system by conducting a thorough analysis of all associated costs

	Personnel	Qualification	Task/Responsibility
	Mechanical Engineer	• Minimum bachelor's degree in mechanical or water resources engineering. • Minimum of 5 years of experience in preferably in irrigation systems. • Knowledge of solar-powered water pumping systems. • Have good writing and communication skills in English and Bahasa Indonesia • Able to work in a team and willing to do field work for site assessment purposes. •	• Design the components of the solar-powered water pump system, including pump sizing, flow rate calculations, and the layout of distribution networks for efficient water delivery to the irrigation areas. • Conduct water availability assessments and analyse groundwater or surface water sources. • Collaborate with the solar energy engineer to ensure the system meets irrigation needs effectively. • Prepare a detailed budget for the water pump component of the solar-powered irrigation system by conducting a thorough analysis of all associated costs
	Civil Engineer	• Minimum Bachelor's degree in civil, environmental, or water resources engineering. • Minimum 5 years of experience in designing civil work to support irrigation systems • Knowledge of solar-powered water pumping systems. • Have good writing and communication skills in English and Bahasa Indonesia • Able to work in a team and willing to do field work for site assessment purposes.	• Design civil structures required for the project. • Conduct site assessments for structural stability and environmental considerations. • Prepare detailed construction plans and specifications. • Prepare a detailed budget for the civil work component of the solar-powered irrigation system by conducting a thorough analysis of all associated costs

Disclaimer

This project <u>does not</u> constitute an endorsement of any candidate in the regional elections that will take place on 27 November 2024.

Proyek ini bukan merupakan bentuk dukungan pada salah satu kandidat yang akan berkompetisi pada Pemilihan Kepala Daerah pada tanggal 27 November 2024