UNDP China

Terminal Evaluation Report

China-Ethiopia-Sri Lanka Renewable Energy Technology Transfer Trilateral (RETT) Cooperation Project

October 2024

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Project and Evaluation Information

PROJECT INFORMATION		
Project title	China-Ethiopia-Sri Lanka Renewable Energy Technology Transfer Trilateral Cooperation Project	
Corporate outcome and output	**SP (2022-2025) Output 1.1** The 2030 Agenda, Paris Agreement and other intergovernmentally-agreed frameworks integrated in national and local development plans, measures to accelerate progress put in place, and budgets and progress assessed using data-driven solutions **Ethiopia CPD (2020-2025) Outcome 3** To sustain development gains and increase resilience, UNDP will promote leapfrogging to a green economy and faster adaptation to climate change. **Output 3.3** Solutions adopted to increase access to clean, affordable and sustainable energy. **Sri Lanka CPD (2022-2026) Outcome 2** By 2027, people and communities in Sri Lanka, especially the vulnerable and marginalized, are more resilient to climate change and disaster risks, have enhanced water and food security, and equitably benefit from ambitious climate action and increasingly sustainable management and protection of the environment and natural resources. **Output 2.1** Development, financing and implementation of pro-poor, inclusive green growth policies strengthened. **China CPD (2021-2025) Outcome 3** Through South-South cooperation and humanitarian cooperation, China makes greater contributions to SDG attainment and the principles of the 2030 Agenda, including leaving no one behind. **Output 3.1** China's collaboration and partnerships with United Nations and other international partners, including in South- South and triangular cooperation, strengthened.	
Country	China-Ethiopia-Sri Lanka	
Region	Asia-Pacific Region and Africa Region	
Date of signature	19 April 2019	
Project dates	**Start**	**Planned closure**
	May 2019	Dec 2024
Project budget	2,042,394 USD (Ethiopia); 2,000,000 USD (Sri Lanka)	
Funding source	Ministry of Commerce of the People's Republic of China (MOFCOM), Sri Lanka Sustainable Energy Authority (SLSEA), Ministry of Water and Energy of Ethiopia (MOWE), UNDP and UNOSSC	
Implementing partner	Sri Lanka segement: UNDP Sri Lanka (DIM); Ethiopia segement: MOWE supported by UNDP Ethiopia (NIM)	
Evaluation Manager	Qian Sun, Programme Management and Oversight Analyst, UNDP China	
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Abbreviations and Acronyms

ACCA21	Administrative Centre for China's Agenda 21	MOFEC	Ministry of Finance & Economic Commission
AWP	Annual Work Plan	MOPE	Ministry of Power and Energy Sri Lanka
BEASL	Bio-Energy Association of Sri Lanka	MOST	Ministry of Science and Technology Sri Lanka
BRI	Belt and Road Initiative	MOST	Ministry of Science and Technology of China
CAU	China Agricultural University	MOWE	Ministry of Water and Energy of Ethiopia
CCM	Climate Change Mitigation	MRV	Monitoring, Reporting and Verification
CCS	Climate Change Secretariat	MSMEs	Micro, Small and Medium Enterprises
CCSSC	China's Climate South-South Cooperation	MWh	Megawatt-hour (1000 kilowatt-hour)
CEB	Ceylon Electricity Board	N/A	Not Applicable
CIDCA	China International Development Cooperation Administration	NAMA	National Appropriated Mitigation Action
CPAP	Country Programme Action Plan	NEP	National Electrification Program
CPD	Country Programme Document	NGO	Non-governmental Organization
CPD	Country Partnership Document	NIM	Nationally Implemented Modality
CSO	Community Service Organization	NSC	National Steering Committee
DAC	Development Assistance Committee	NSSPSC	South-South Project Steering Committee
DIM	Direct Implementation Modality	NSSTF	National South-South Task Force
EE	Energy Efficiency	OECD	Organization for Economic Cooperation and Development
EnMAP	National Energy Management Plan	PC	Project Coordinator
EOI	Expression of Interest	PIF	Project Identification Form
EOP	End of Project	PIR	Project Implementation Review
EPC	Engineering, Procurement and Construction	PLHIV	People Living with HIV
ESCOs	Energy Service Companies	PMU	Project Management Unit
ESD	Energy Study and Development Follow-up Directorate	ProDoc	Project document
ESPs	Energy Service Providers	PSC	Project Steering Committee (= Project Board)
ExO	Executive Office	RBM	Result Based Management
FSPs	Financial Service Providers	REDTPD	Rural Energy Development and Technology Promotion Directorate
GD	Group Discussions	REF	Rural Electrification Fund
GEF	Global Environment Facility	REMP	Rural Electrification Master Plan
GHG	Greenhouse Gas	RETs	Renewable Energy Technologies
GHG	Green House Gas	RP	Responsible Party

GJ	Giga Joules	RRF	Results and Resources Framework
GNI	Growth National Index	SDGs	Sustainable Development Goals
GOC	Government of People's Republic of China	SFM	Sustainable Finance Mechanism
GOC	Government of the People's Republic of China	SHS	Solar Home System
GOE	Government of Ethiopia	SLEMA	Sri Lanka Energy Managers' Association
GOSL	Government of Sri Lanka	SLSEA	Sri Lanka Sustainable Energy Authority
GWh	Gigawatt-hour (1000 million watt-hours)	SME	Small and Medium enterprise
ha	Hectare	SMI	Small and Medium Industries
ISB	Industrial Services Bureau	SPV	Solar Photovoltaic
JREC	Joint Research and Extension Centre	SSC	South-South Cooperation
JTC	Joint Technical Committee	SSTC	South-South and Trilateral Cooperation
KII	Key Informant Interview	TE	Terminal Evaluation
kWh	Kilowatt-hour	TOC	Theory of Change
LGBT	Lesbian, gay, bisexual and transgender	TOR	Terms of Reference
LKR	Sri Lanka Rupee	TSSC	Tri-Lateral South-South Cooperation
M&E	Monitoring and Evaluation	TSSCO	Trilateral South –South Cooperation
MDGs	Millennium Development Goals	UN	United Nation
MJ	Megajoule (million of Joules)	UNDAF	United Nations Development Assistance Framework
MOA	Ministry of Agriculture Sri Lanka	UNDP	United Nations Development Programme
MOCOM	Ministry of Commerce, China	UNFCCC	UN Framework Convention on Climate Change
MOENR	Ministry of Environment and Natural Resources Sri Lanka	USD	United States Dollar
MOFCOM	Ministry of Commerce of the People's Republic of China		

1. Executive Summary

1.1. Project Overview

With the world's greenhouse gas emissions from energy reaching unprecedented levels in 2021, the impacts of climate change are increasingly severe. Inequalities are exacerbating, with sub-Saharan Africa bearing the brunt, as seventy-five percent of the 759 million people lacking access to electricity reside in this region. Both Ethiopia and Sri Lanka, as developing countries, face significant challenges in transitioning to low-carbon energy solutions, hindered by factors such as limited technology access, high energy costs, and inadequate infrastructure.

In response to these challenges, the UNDP, in collaboration with the governments of China, Ethiopia, and Sri Lanka, has been implementing the Biogas, Biomass, and Solar Trilateral Cooperation Project. The project aims to enhance local access to clean and renewable energy through knowledge and technology transfer. It aligns with the 2030 Agenda for Sustainable Development, particularly contributing to Goal 7 (Affordable and Clean Energy), Goal 13 (Climate Action), Goal 17 (Partnerships for the Goals), and Goal 5 (Gender Equality). Key partners in this initiative include the Ministry of Commerce of the People's Republic of China (MOFCOM), the Ministry of Science and Technology of China (MOST), the Administrative Center for China's Agenda 21 (ACCA21), Sri Lanka Sustainable Energy Authority (SLSEA), the Ministry of Water and Energy of Ethiopia (MOWE), and China Agricultural University (CAU). These partners provide crucial technical support and facilitate the exchange of expertise and technologies between China, Ethiopia, and Sri Lanka.

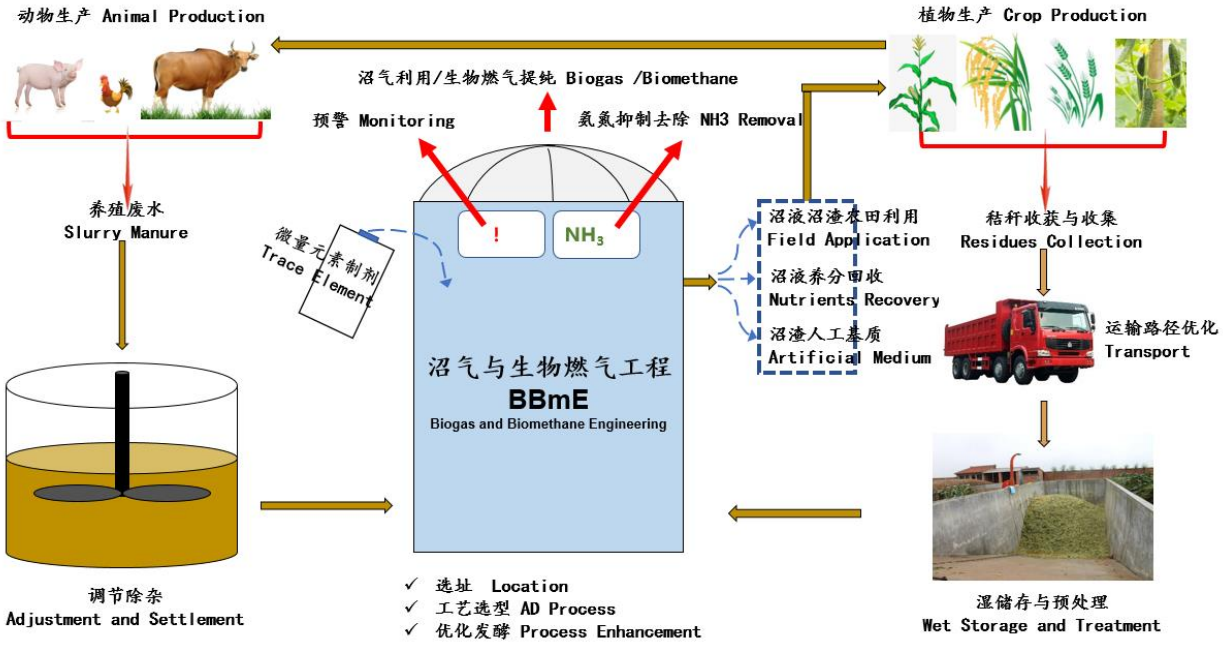

Figure 1 Biogas Engineering Technology

In Sri Lanka, the project (hereinafter the Sri Lanka Project), was launched in May 2019 and concluded in June 2024. Jointly implemented by UNDP Sri Lanka and UNDP China, with support from national implementing partners, this component of the project focuses on reducing greenhouse gas emissions from fossil fuels in the agro-industrial sector. The Terminal Evaluation for Sri Lanka was conducted from 13 February 2024 to 27 April 2024. It assessed the project's results, implementation strategies, progress, challenges, and lessons learned, utilizing a mixed-method approach to gather comprehensive data from reports, interviews, and on-site inspections.

In Ethiopia, the project (hereinafter the Ethiopia Project), was managed by UNDP Ethiopia with support from a range of stakeholders including MOFCOM, MOST, ACCA21, MOWE, SLSEA, and CAU. The Terminal Evaluation for this component was conducted from May 2024 to July 2024. The evaluation focused on the project's impact on rural communities, particularly in improving access to modern energy sources and empowering local female stakeholders. The project aimed to address the country's energy access issues, which have impeded sustainable development and economic growth.

1.2. Evaluation Overview

The Terminal Evaluation aims to examine the project's successes, lessons learned, and to provide recommendations for future initiatives. It will evaluate key achievements and contributions to building the capacity of partners and institutions involved. The evaluation will serve both accountability and learning objectives, assessing project performance and results, identifying the reasons behind successes or failures, and drawing lessons to provide evidence-based findings. These findings will help participating institutions in China, Ethiopia, and Sri Lanka, as well as UNDP, make informed strategic decisions for future cooperation projects.

The evaluation, led and coordinated by UNDP China, employed a mixed-methods approach, integrating both qualitative and quantitative data collection techniques. Field visits were conducted in strategically selected locations within Ethiopia and Sri Lanka, which provided direct insights into the project's local impact. Throughout the evaluation process, over 200 stakeholders were consulted, including government officials, project beneficiaries, and technical experts. These interactions ensured a comprehensive understanding of the project dynamics and outcomes. The evaluation was structured around clearly defined questions and criteria, aligned with the OECD/DAC standards, which guided the assessment of the project's relevance, effectiveness, efficiency, and sustainability.

The terminal evaluation employed a collaborative and participatory approach, engaging key stakeholders such as donors, implementers, and beneficiaries, in alignment with UNDP evaluation guidelines and DAC standards. The methodology focused on reviewing the project's results against the Theory of Change and the planned results framework. This included desk reviews of relevant documents, progress briefings with trilateral partners, and key informant interviews (KII) and group discussions (GD) to gather primary data from project stakeholders, ensuring gender balance. Field visits were conducted to validate tangible results on the ground, facilitated by the Evaluation Reference Group.

Data collection was guided by UNDP evaluation standards, using structured and semi-structured questionnaires tailored to various stakeholder groups, including local governments, beneficiaries, and funding partners. Both qualitative and quantitative data were analyzed to ensure accuracy and relevance to the evaluation criteria. Outcomes were rated on a scale from "Highly Satisfactory" to "Highly Unsatisfactory," with an additional scale to assess sustainability risks.

1.3. Evaluation Findings and Conclusion Overview

Overall, the evaluation identified a set of key findings and areas for improvement, which informed the development of targeted recommendations. High-level conclusions highlighted the project's strong alignment with national priorities and its significant contribution to capacity building in renewable energy technologies across participating countries. However, challenges such as the need for enhanced private sector engagement and more robust project sustainability measures were also noted.

Projects Results Framework, TOC and M&E Arrangement

Both the Ethiopia and Sri Lanka projects demonstrated a strong alignment with their respective Results Frameworks despite significant operational challenges. In both cases, the frameworks proved adaptable, allowing for necessary modifications in response to external shocks such as the COVID-19 pandemic and economic crises. This adaptability ensured that the core project outcomes remained relevant, though adjustments in the implementation timelines and output indicators were required. Across both projects, the commitment to capacity building, especially in provincial-level engagement, was a common strength. Capacity-building initiatives, while facing logistical challenges, succeeded in enhancing local expertise and stakeholder involvement.

Relevance

The terminal evaluation of both the Sri Lanka and Ethiopia projects highlights the high relevance of the interventions in their respective contexts. In both countries, the projects were aligned with national development priorities, particularly around renewable energy technology (RET) adoption, climate resilience, and greenhouse gas (GHG) emissions reduction. The projects were also consistent with UNDP program priorities and organizational policies, emphasizing South-South Cooperation (SSC) and capacity building.

In Sri Lanka, the project supported the national goal of reducing GHG emissions and achieving a 70% renewable energy share in electricity generation by 2030. It aligned with the government's "C Net Zero Roadmap" and contributed to raising awareness of RETs in agro-business, demonstrating technical and financial feasibility.

Similarly, the Ethiopia project addressed critical energy access and clean energy supply challenges, aligning with Ethiopia's "Pathway to Prosperity" development plan and the National Electrification Program. Both projects emphasized capacity building at the local level and engaged key stakeholders

through trial and demonstration approaches, facilitating knowledge transfer between China, Sri Lanka, and Ethiopia. This shared commitment to addressing local needs while building capacities for long-term sustainability underscores the strong relevance of both interventions.

Effectiveness

The assessment of effectiveness across both the Sri Lanka and Ethiopia components of the Trilateral South-South Cooperation Project demonstrated notable achievements despite external challenges, particularly those related to COVID-19 and economic instability.

In both countries, project outputs were generally aligned with the planned objectives, particularly regarding capacity building and the installation RETs Sri Lanka saw high levels of effectiveness in delivering capacity-building programs and successfully transferring RET equipment, with notable progress in solar-powered cooling systems and biogas technology demonstrations. Ethiopia similarly advanced the installation of biogas and solar energy systems, although some targets were only partially achieved. Both interventions were effective in raising awareness of renewable energy solutions and fostering South-South cooperation, but operational challenges—such as limited follow-up on small RETs in Sri Lanka and delayed mentorship exchanges with China in Ethiopia—highlighted areas for improvement.

As reflected by partners in China, Despite effective groundwork, promotional activities did not reach the high visibility levels of the first phase, which benefitted from endorsement by the United Nations Secretary-General, suggesting room for enhancement in communication and outreach strategies.

Overall, the projects contributed significantly to enhancing knowledge, technology transfer, and the adoption of RETs, particularly in agricultural applications, with a positive outlook for long-term sustainability and scaling.

Efficiency

Both the Sri Lanka and Ethiopia projects demonstrated varying degrees of efficiency in resource utilization, project management, and adaptation to challenges.

In Ethiopia, while the government played a pivotal role in advancing the project's progress and ownership, several efficiency barriers, including delays in procurement and budget limitations, hindered the full potential of the project. Nevertheless, the strong collaboration with UNDP and strategic adaptation to local conditions helped maintain moderate efficiency. Both projects, despite external shocks, demonstrated effective use of adaptive management to navigate complex implementation environments.

In Sri Lanka, the use of funds was highly strategic, with strong alignment to key activities and robust project management that leveraged UNDP's comparative advantage and adaptive planning amid economic crises and COVID-19. Efficient communication with provincial councils, flexible budget management, and contingency planning were key to maintaining operational efficiency.

Sustainability

The sustainability assessment of the Sri Lanka and Ethiopia projects highlights both shared strengths and challenges in maintaining long-term impacts. As indicated by partners and technical service provided in China, the project has demonstrated great sustainability by addressing critical technical needs and preparing the groundwork for subsequent phases. The ongoing demand for technical development underscores the importance of continuing these efforts.

In Ethiopia, the government's strong involvement and financial investment have bolstered the project's sustainability prospects, particularly through the institutionalization of renewable energy technologies. Yet, disparities in governance and financial support across regions have created uneven sustainability outcomes. Both projects exhibit a commitment to environmental and socio-economic sustainability, though there are risks related to technical maintenance and resource allocation that need addressing to ensure the enduring impact of their interventions.

In Sri Lanka, the project demonstrated a solid commitment to sustainability through effective institutional frameworks and governance, which included well-coordinated training and capacity-building efforts. The use of adaptive management strategies allowed for continued progress despite economic and pandemic-related disruptions. However, the sustainability of solar and biogas-biomass technologies is hampered by challenges such as insufficient technical knowledge among local stakeholders and the lack of comprehensive maintenance protocols.

Overall, while the institutional and financial frameworks offer a foundation for sustainability, the projects face ongoing challenges that could impact their long-term success.

Gender and Cross-cutting Issues

The evaluation of gender and cross-cutting issues in the Sri Lanka and Ethiopia projects reveals both accomplishments and areas for improvement in promoting gender equality and inclusion.

In Ethiopia, gender considerations were embedded in project design, with an emphasis on equitable service delivery. Despite significant gender disparities in expertise and project management roles, the project's benefits notably reached women and girls, particularly through solar energy and biogas installations. The initiatives demonstrated a positive impact on women's daily lives, such as reducing household drudgery and improving health conditions. Both projects show a commitment to addressing gender and disability issues, yet further efforts are needed to ensure more comprehensive and inclusive outcomes.

In Sri Lanka, the project successfully integrated gender considerations at the operational level, achieving a satisfactory level of gender inclusion in capacity-building and beneficiary selection. Efforts included proactive measures to involve women and the vulnerable in RET interventions, although opportunities for deeper gender equity analysis were missed due to time and resource constraints. While the project effectively employed women in operational roles and supported women beneficiaries, systemic issues,

such as the underrepresentation of women in decision-making roles and the lack of disability inclusion, highlight areas where further progress is needed.

Risk Management

The analysis of risk management in the Sri Lanka and Ethiopia projects highlights both effective strategies and areas requiring attention.

In Ethiopia, the project design incorporated a thorough risk assessment and mitigation strategy, addressing risks related to political instability, partner coordination, and technology transfer. The establishment of a comprehensive governance structure and coordination mechanisms, coupled with UNDP's close monitoring, mitigated many risks effectively. However, unforeseen challenges, including the COVID-19 pandemic, procurement system issues, and political instability, impacted project implementation. Despite these setbacks, the project demonstrated resilience through timely identification and management of risks, ensuring continued progress and effective execution.

In Sri Lanka, the project's risk management framework initially identified 13 risks, categorized into high, medium, and low levels. However, the pandemic and economic crisis necessitated a re-evaluation and updating of these risks. Despite implementing extensive training and mitigation measures, critical challenges such as insufficient beneficiary capacity and ongoing market disinterest in RETs persisted. These challenges underscore the need for more robust investment profiles and concessionary financing schemes to enhance the sustainability of RET interventions.

1.4. Lessons Learned Overview

The lessons learned from the Trilateral South-South Cooperation Project highlight several key insights:

1) Collaborative Multi-Stakeholder Engagement: The innovative approach of involving UNDP and South-South partner countries (China, Ethiopia, Sri Lanka) fostered joint co-financing, design, and implementation, enhancing collaboration, mutual understanding, and accountability. However, the involvement of multiple stakeholders led to inefficiencies in decision-making, emphasizing the need to clearly define roles during project development.
2) Capacity Building in Renewable Energy: The biogas system at Wolaita Sodo University served as a model for renewable energy innovation, promoting institutional-based power generation and encouraging public sector involvement. International knowledge exchange visits further strengthened country ownership and innovation in line with national priorities.
3) Flexible Project Management: The adaptability of the management team and stakeholders helped ensure resilience to external shocks, demonstrating the importance of flexible planning and adjustments to maintain community satisfaction and project success.
4) Long-Term Sustainability and Research Linkages: The Joint Research and Extension Centre (JREC), planned by Chinese and local academic institutions, is a key initiative for ongoing capacity-building and technical support, fostering long-term collaboration in research and higher education.

From the Sri Lankan context, additional lessons include:

1) Alignment with National Plans: Harmonizing project activities with national strategies during the design stage is crucial for broader support and sustainability, alongside deeper cooperation with external partners to integrate management and governance procedures.
2) Focus on Gender and Disability: Addressing gender and disability considerations early in the project design ensures more effective and inclusive interventions.
3) Promoting Renewable Energy Development: Strengthening capacity within government and the private sector, particularly through vocational training and job-oriented education programs in renewable energy technologies (RETs), is essential for sustainability. Catalyzing a national renewable energy program, with active public-private partnerships, is also key to long-term success.
4) Supporting Small and Medium Industries: Enhancing the capacity of local industries to supply and service renewable energy systems can widen the supply base and build sustainability for future projects.

1.5. Recommendations Overview

Gender recommendations (3)

1) Initiate Next Phase of the Project and Strengthen Integration of the Private Sector (linked to Finding#11, Finding#12, and Finding #13). As indicated by Chinese partners, given the substantial groundwork laid in the previous phases and the encouragement from Chinese partners, there is a compelling opportunity to initiate the next phase of the project. This next phase may focus on leveraging the UNDP's extensive network to deepen the engagement of the private sector, ensuring a robust and dynamic framework for sustainable project development.
2) Revitalization of Knowledge through Training Effectiveness Monitoring (linked to Finding#7 and Finding#8): It is critical to monitor the effectiveness of training outcomes, particularly for practical applications such as good practices in appliance management. Evaluating the real impact of the trainings on beneficiary institutions' management, workers, and user communities will help ensure lasting benefits. Efforts should be made to make this training course more practical and relevant.
3) Strategic Support for Women's Participation (linked to Finding#14 and Finding #15): Special strategic considerations are needed to deliberately foster the participation of women at both expert and management levels. This should be integrated into project design and implementation processes, with clear accountability for progress in this area.

Ethiopia Project segement-dedicated recommendations (3)

1) Strengthen Project Ownership (linked to Finding#7 and Finding#12): In Wolaita Zone, Boloso Sore District, it is essential to intensify and internalize project ownership by the implementing agency, specifically the district government's education sector office. Continuous support and follow-up from regional, zonal, and district government administrative structures are critical for sustained success.

2) Ensure Sustainable Management of the Wolaita Sodo University Biogas Project (linked to Finding#12): The biogas project at Wolaita Sodo University requires strong oversight to ensure timely completion and practical application. It is recommended that all stakeholders, including donors, UNDP, and the implementing agency, engage in discussions to define a sustainable management structure. Identifying accountable bodies for project operation is essential, along with treating institutional management as a business entity. An initial operational budget and a business feasibility study should be undertaken to ensure the project's long-term sustainability, expansion, and replication.
3) Enhance Project Utilization in the Harari Region (linked to Finding#7, Finding #9, and Finding#12): Special attention is needed for projects in the Harari Region, with the implementing agencies and government structures at the regional and district levels responsible for evaluating the project's short- and long-term programmatic impact. Alternative approaches, such as off-grid installations, should be explored to maximize the plant's utility and community benefits.

Sri Lanka Project segment-dedicated recommendations (3)

1) Facilitate RET Investment Models (linked to Finding#8, Finding#10, and Finding#17): Develop and disseminate scalable models for Renewable Energy Technology (RET) investments using technical and economic feasibility data from the project. These models will assist Financial Service Providers (FSPs) such as banks and financial institutions in offering commercial loans for RET ventures. This will foster investment and the expansion of RET projects.
2) Customize and Scale RET Systems (linked to Finding#5 and Finding#8): Based on project learnings, adjust RET systems to better suit user needs. Specifically:
    - Scale applications like solar insect traps for different farm sizes.
    - Improve designs for specific crops and farming systems, ensuring RET tools like solar sprayers are more accessible to women.
    - Expand the RET service network across regions, enhancing the supply base for effective technology servicing.
3) Engage Policymakers and Promote RET Awareness (linked to Finding#5 and Finding#13): Raise awareness among policymakers on the benefits of incorporating RETs into national climate strategies, including Climate Smart Agriculture (CSA) and mitigation efforts. Additionally, increase user awareness of RET technologies' environmental benefits, emphasizing their contributions to national climate goals. Consider hosting a terminal event to highlight the successes and lessons from the TSSC approach, engaging stakeholders such as donors, provincial departments, and the private sector.

2. Project Overview

2.1. Background

The China-Ethiopia-Sri Lanka Renewable Energy Technology Transfer South-South and Trilateral Cooperation Project was initiated as a collaboration between the Governments of the People's Republic of China (GOC), Sri Lanka (GOSL), Ethiopia (GOE), and the United Nations Development Programme (UNDP). The project aimed to promote the transfer of RET, with a focus on biogas and solar technologies, from China to Sri Lanka and Ethiopia, facilitating knowledge exchange and capacity development across these countries.

Figure 2 Project Objectives Overview

The Ethiopia project emphasized knowledge exchange between Chinese experts and local stakeholders, with an emphasis on supporting Ethiopia's climate-resilient growth. The project facilitated South-South cooperation, focusing on the trial and demonstration of biogas and solar energy systems for productive uses in Ethiopia's agro-industry and public service sectors. With a budget of approximately USD 2 million, the project aimed to address the significant energy access challenges faced by rural communities, where limited access to modern energy sources hampered socio-economic development and public service delivery.

The Ministry of Water and Energy of Ethiopia (MOWE) played a central role in implementing the project, supported by technical guidance from Chinese institutions, including the Administrative Center for China's Agenda 21 (ACCA21) and the China Agricultural University (CAU). The UNDP Ethiopia Country Office oversaw the project's progress, ensuring that renewable energy technologies were effectively integrated into Ethiopia's development priorities.

The project was designed to address key barriers to renewable energy adoption in Ethiopia, such as insufficient knowledge about the energy demands of the agro-industry sector, limited awareness of the potential of RETs, and a lack of financial incentives for private sector involvement. Through capacity-

building efforts and demonstration projects, the initiative sought to establish sustainable business models and enhance the ability of Ethiopian stakeholders to deploy RET solutions in rural areas.

The Sri Lanka Project focused on supporting the country's low-carbon development strategy, which aimed to mitigate GHG emissions and promote sustainable energy solutions. Aligned with national priorities, the project was integrated into the United Nations Development Assistance Framework (UNDAF) Outcome 4, which emphasizes environmental sustainability, climate change mitigation, and disaster risk reduction. Specifically, the project targeted improving energy efficiency in the agro-industry sector, a key contributor to GHG emissions that had not been prioritized in previous national plans.

The project received USD 2 million in funding, equally contributed by the Ministry of Commerce of China (MOFCOM) and the Sri Lanka Sustainable Energy Authority (SLSEA), with implementation planned from May 2019 to May 2022. However, the COVID-19 pandemic delayed the project's start, and extensive consultations were required to finalize the Joint Action Plan in May 2020. Subsequently, agreements were reached between the Chinese and Sri Lankan partners, including the formalization of a PMU under UNDP Sri Lanka, responsible for spearheading project activities. SLSEA provided strategic leadership, while UNDP ensured technical support and managed contracting for services.

2.2. Project Interventions and Changes

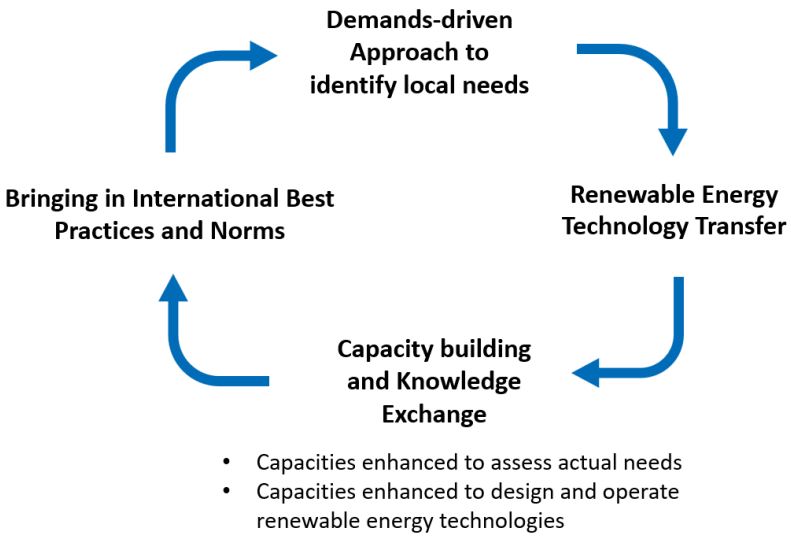

Figure 3 Project Intervention Approach

The China-Ethiopia-Sri Lanka Renewable Energy Technology Transfer South-South and Trilateral Cooperation Project was developed to address critical energy challenges in the agro-industrial sectors of Sri Lanka and Ethiopia. By leveraging China's expertise in renewable energy technologies (RETs), the project sought to facilitate the transfer of biogas and solar energy systems, build capacity for energy management, and promote South-South cooperation through knowledge exchange and partnerships between the three countries.

In Ethiopia, the project's focus was on improving access to modern energy solutions, particularly in rural areas where energy access remained limited. The Ethiopian component also aimed to support the country's climate-resilient growth by introducing biogas and solar technologies for productive uses in agriculture and public services. Key partners were identified early in the project, and a series of energy needs assessments were conducted at the selected demonstration sites. These assessments informed the installation of RET systems that were tailored to the specific needs of the communities. On-site training programs ensured that local technicians and service providers could effectively operate and maintain the systems, while training curricula were developed to support long-term capacity building.

The Ethiopian Project also emphasized the importance of knowledge exchange. Ethiopian stakeholders participated in training programs led by Chinese experts, focusing on system design, operation, and optimization of renewable energy technologies. The project facilitated business development by organizing a business forum and trade fair, which connected Ethiopian energy service providers with Chinese suppliers. Through these exchanges, stakeholders in both countries gained access to proven business models, best practices, and the technical knowledge necessary to overcome existing barriers to RET adoption.

In Sri Lanka, the project aimed to support national energy-saving targets and reduce GHG emissions in the agro-industry sector. The initiative focused on the demonstration and application of hybrid RET systems, which included biogas and solar technologies. Provincial Councils in Sri Lanka were equipped with the knowledge and tools to establish energy savings and GHG reduction targets for the agro-industrial sector. Extensive consultations with stakeholders led to the identification of suitable demonstration sites, and a comprehensive data collection framework was developed to monitor energy savings and GHG reductions. Demonstration projects were then implemented at the selected sites, where technologies such as solar-powered sprayers and insect traps were tested. Local stakeholders received practical, on-site training in the operation and maintenance of these systems to ensure their long-term viability.

In addition to the technical aspects, the project also placed a strong emphasis on facilitating knowledge exchange between China and Sri Lanka. Tailored mentorship programs allowed Sri Lankan energy stakeholders to benefit from the extensive experience of Chinese experts in renewable energy. Participants from Sri Lanka underwent training in system design, installation, and maintenance, ensuring that they could independently manage the RET systems. Business development efforts were also supported through the creation of a platform that enabled Sri Lankan stakeholders to connect with their Chinese counterparts. This platform encouraged collaboration, research projects, and the exchange of best business practices in renewable energy, further strengthening the project's sustainability.

The project encountered several significant challenges during implementation. The COVID-19 pandemic delayed many of the planned activities, requiring the project to shift its training and coordination efforts to virtual platforms. Political instability and economic challenges in Ethiopia further delayed the procurement of equipment and complicated the organization of in-person activities. Despite these

difficulties, the project adapted its approach and successfully continued its implementation across both countries.

Ultimately, the project achieved several key outcomes. In Sri Lanka, 30 demonstration sites were selected, with 15 sites implementing newly developed monitoring frameworks for energy savings and GHG reductions. In Ethiopia, 10 demonstration sites were identified, and RET systems were successfully installed, providing energy solutions tailored to local needs. Across both countries, more than 400 stakeholders received training in the installation, operation, and maintenance of RET systems, ensuring the sustainability of these technologies. The project also fostered strong partnerships between stakeholders in China, Sri Lanka, and Ethiopia, promoting long-term collaboration in renewable energy development and the wider adoption of sustainable energy solutions in the agro-industrial sector.

2.3. Project Resources

The China-Ethiopia-Sri Lanka Renewable Energy Technology Transfer South-South and Trilateral Cooperation Project required substantial financial resources to achieve its objectives of enhancing RET adoption in both Sri Lanka and Ethiopia. The project was funded through a combination of contributions from the Chinese government, the governments of Sri Lanka and Ethiopia, and UNDP.

In Ethiopia, the total estimated project budget was USD 2,042,394, which allowed the project to meet its objectives of supporting renewable energy adoption in rural areas and promoting South-South cooperation. The majority of the funding, USD 1,000,000, was provided by China's Ministry of Commerce (MoFCOM), while the Ethiopian Ministry of Water and Energy (MoWE), with co-financing from the Global Environment Facility (GEF), contributed USD 842,394. An additional USD 200,000 was provided by UNDP. By the time of the Terminal Evaluation, the total expenditure had reached USD 1,628,663.44. This included contributions from all key partners, with USD 7,400 from MoFCOM, and USD 8,840 from UNDP Ethiopia and MoWE. The Ministry of Finance and Economic Commission of Ethiopia, as a partner of the implementing agency, also played a role in the financial management and allocation of project resources, ensuring that the funds were utilized effectively to support the country's renewable energy goals.

In Sri Lanka, the total project budget was initially allocated for a three-year period, but due to various delays and the impacts of the COVID-19 pandemic, the project timeline was extended to five years with a no-cost extension. The revised budget covered a wide range of activities aimed at building capacity within Provincial Councils, formulating Provincial Energy Plans (PEPs), and supporting the demonstration of renewable energy technologies (RETs) across multiple sectors. The largest allocation was dedicated to the demonstration of RETs, amounting to USD 700,082, which covered site assessments, installations, and the provision of training for local stakeholders. Other significant portions of the budget were directed toward capacity-building activities for Provincial Councils, which received USD 245,179, and the tailored mentorship and knowledge exchange programs, which were allocated USD 291,200. In addition, the project set aside resources for exposing stakeholders to best business practices in renewable energy, a component that received USD 294,801. Overall project management costs totaled USD 382,032 over the

project's extended timeline, ensuring the smooth execution of project activities and coordination between the various stakeholders involved.

The financial contributions from all partners enabled the project to carry out its ambitious plans for renewable energy technology transfer, capacity building, and the fostering of South-South cooperation between China, Sri Lanka, and Ethiopia. The careful management of these resources ensured that the project remained on track despite challenges and that its objectives were achieved within the extended timeline.

2.4. Project Stakeholders and Expected Beneficiaries

The China-Ethiopia-Sri Lanka Renewable Energy Technology Transfer Project brought together multiple stakeholders from China, Sri Lanka, and Ethiopia to promote the adoption of renewable energy technologies, particularly biogas and solar. The project's collaborative nature involved government agencies, international organizations like UNDP, and local partners, each playing critical roles in knowledge exchange, capacity development, and implementation. These stakeholders ensured the project's alignment with national priorities, provided strategic leadership, and facilitated South-South cooperation. Their collective efforts aimed to address energy challenges in rural and agro-industrial sectors, ultimately supporting sustainable development and climate resilience across all participating countries.

Please refer to Annex 6 for comprehensive stakeholders mapping.

China Stakeholders

China played a central role in the China-Ethiopia-Sri Lanka Renewable Energy Technology Transfer Project, facilitating the transfer of renewable energy technologies, particularly biogas and solar, to Sri Lanka and Ethiopia. The Ministry of Commerce (MOFCOM) acted as the key coordinating agency, while UNDP China managed technical and financial inputs to ensure the project met its objectives. The Administrative Center for China's Agenda 21 (ACCA21) and China Agricultural University (CAU) were essential partners, offering expertise in sustainable development and renewable energy. ACCA21 supported innovation and promoted sustainable energy solutions as part of China's Agenda 21, while CAU contributed to capacity development, helping Sri Lanka and Ethiopia adapt biogas technologies for their respective agro-industries. These partnerships were crucial in advancing South-South cooperation and achieving the project's broader goals of climate resilience and energy transition.

Sri Lanka Stakeholders

Sri Lanka's involvement in the project aligned with its national low-carbon development strategy, focusing on mitigating greenhouse gas emissions and promoting renewable energy in the agro-industry sector. The Sri Lanka Sustainable Energy Authority (SLSEA) and the Ministry of Power and Energy (MOPRE) provided strategic leadership and technical oversight, while UNDP Sri Lanka coordinated local implementation. This included setting up the Project Management Unit (PMU), which was responsible for spearheading project activities. Key local partners, such as the Sri Lanka Energy Managers Association (SLEMA), provincial

councils, and service providers like Saw Engineering, contributed through capacity-building, consultancy services, and the installation of renewable energy technologies. NGOs such as Janathakshan and People in Need supported biogas development and trained local communities, facilitating the transfer of Chinese renewable energy technologies to Sri Lanka's agro-industry and energy sectors. This collaboration strengthened Sri Lanka's efforts toward climate change mitigation under the United Nations Development Assistance Framework (UNDAF).

Ethiopia Stakeholders

In Ethiopia, the project aimed to promote renewable energy adoption, particularly in rural areas, where energy access challenges hinder socio-economic development. The Ministry of Water and Energy (MoWE) acted as the primary implementing partner, overseeing the integration of biogas and solar energy technologies into the agro-industry and public service sectors. UNDP Ethiopia ensured project quality assurance and coordinated the technical assistance provided by Chinese partners, including ACCA21 and CAU, both of which played vital roles in capacity building and knowledge exchange. The project also involved the National South-South Task Force (NSSTF) and local entities such as the Energy Study and Development Follow-up Directorate (ESD) and the Rural Energy Development and Technology Promotion Directorate (REDTPD). These organizations were responsible for research, planning, and promoting renewable energy technologies across Ethiopia. Additionally, NGOs like SNV Ethiopia and the National Biogas Program contributed by organizing training workshops and sharing expertise on renewable energy applications in rural areas, facilitating sustainable business models for energy access.

2.5. Project Governance

The management of the China-Ethiopia-Sri Lanka Renewable Energy Technology Transfer South-South and Trilateral Cooperation Project was organized to ensure efficient coordination and execution across the three participating countries. Given the complexities of cross-country communication and the challenges posed by the COVID-19 pandemic, several project management arrangements were implemented to streamline operations and mitigate delays.

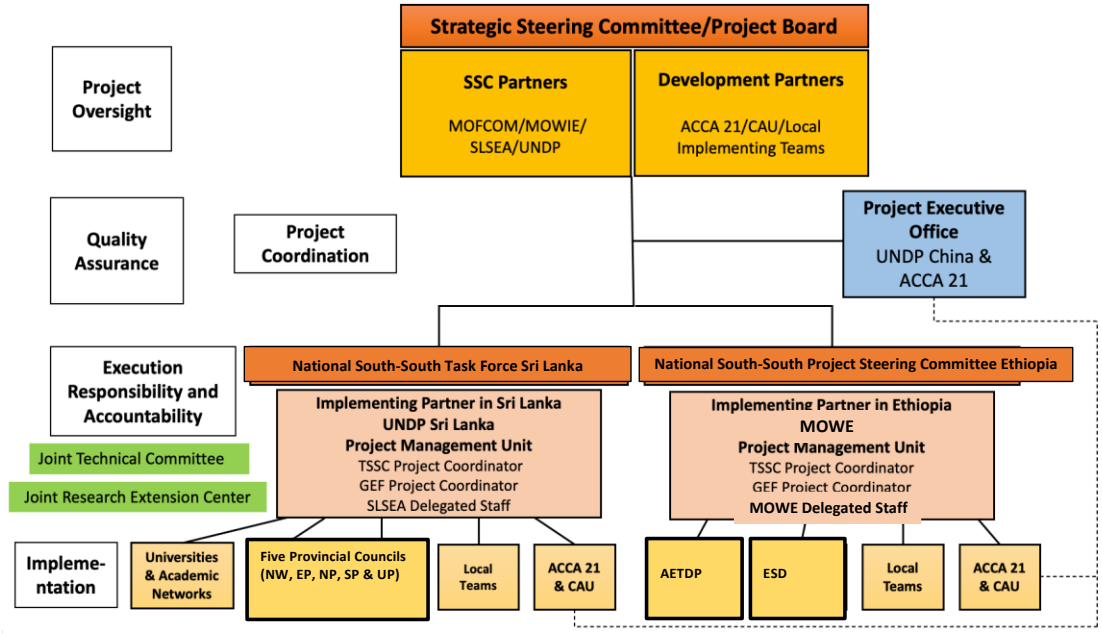

Figure 4 Project Governance Structure

In Ethiopia, the Ministry of Water and Energy (MoWE) served as the main implementing partner and beneficiary of the project, with the support of UNDP Ethiopia. The project was executed under UNDP's Nationally Implemented Modality (NIM), which ensured that the project was aligned with national priorities and promoted local ownership of project outcomes. The TSSCO Project was managed by the National South-South Task Force within MoWE, which included staff from both the GEF and TSSCO projects. This Task Force was responsible for the execution and accountability of all project activities, working in close collaboration with universities, academic networks, and other development partners.

UNDP China played a key role as the executing agency on behalf of China's Ministry of Commerce (MoFCOM), managing the technical and financial inputs provided by the Chinese partners, including the Administrative Center for China's Agenda 21 (ACCA21) and China Agricultural University (CAU). The project's management structure was overseen by a Project Board that included representatives from MoWE, UNDP China, MoFCOM, and other development partners. This board was responsible for providing oversight, coordinating project activities, and offering advisory services. Regular meetings were held to guide the direction of the project, and decisions regarding the project's quality and implementation were made by UNDP Ethiopia, with final authority resting with the Ethiopian office.

Table 1 Role and highlights of Project Executive Office (UNDP China and ACCA 21)

Convener: • Bring the parties together and improve the exchange of knowledge, experience and know-how among China-Ethiopia and Sri Lanka; • Provide Project Oversight and Reporting ***Knowledge Broker***: • Bridge knowledge gaps between Chinese counterparts and PMUs in Ethiopia and Sri Lanka through technical support;

- Ensure quality of training and capacity development activities;
- Identify, document and disseminate good practices

Partnership Builder:

- Strengthen South-South Partnerships by organizing joint forums, meeting and events;
- Mobilize resources

Throughout the implementation of the project, close collaboration between the various implementing partners ensured that the project remained on track despite the numerous challenges faced. Regular communication and coordination between UNDP China, UNDP Ethiopia, and MoWE, as well as the support of Chinese technical experts, played a key role in the successful delivery of project outcomes.

In Sri Lanka, the project was managed through a dedicated PMU established under the UNDP Sri Lanka Country Office. The PMU was responsible for overseeing all project activities and ensuring smooth coordination with local and international partners. The Sri Lanka Sustainable Energy Authority (SLSEA) played a crucial role in providing strategic leadership for Project Outcome 1 and its related outputs, while the UNDP CO provided technical support and guidance for the overall implementation of the project. The project followed UNDP's Nationally Implemented Modality (NIM), whereby UNDP directly contracted technical consultants, service providers, and trainers to carry out project activities, including feasibility studies, beneficiary screening, and the provision of RETs.

The PMU in Sri Lanka was staffed by a small but highly experienced team, including a Program Coordinator, Junior Program Officer, Technical Coordinator, and Project Assistant. This team worked closely with UNDP's Energy Sector Team and maintained regular communication with provincial staff across the five participating provinces. Despite the operational challenges posed by the pandemic and the economic crisis in Sri Lanka, the PMU adapted by conducting a comprehensive risk assessment and developing contingency plans. Virtual settings were used to hold meetings and training sessions, and communication devices were provided to government officers and provincial councils to facilitate remote collaboration. These efforts ensured that disruptions to the project's work program were minimized, and key project components, including needs assessments, feasibility studies, and training, were completed on schedule.

3. Evaluation Objectives & Methodologies

3.1. Evaluation Purpose

Overall Objective

According to UNDP evaluation guidelines, the Terminal Evaluation will assess the following primary dimensions of the project: relevance, effectiveness, efficiency, and sustainability. Additionally, the evaluation will address cross-cutting issues, particularly gender, LNOB, people living with disabilities (PLWD), and other marginalized groups.

Zooming in the Project per se, the terminal evaluation is to assess the Project's successes and lessons learned, and to produce recommendations for the future. The review will therefore assess the key achievements and contributions to building capacity of partner and institutions under the Project. The evaluation will serve the dual objectives of accountability and learning. Accordingly, the evaluation will assess and report on the performance and results of project activities; determine the reasons for observed success/failure, and draw lessons learned to produce evidence-based findings to allow the respective participating institutions in China, Ethiopia and Sri Lanka, as well as UNDP to make informed strategic decisions for future cooperation projects.

The broad objectives of the Terminal Evaluation are as follows:

1) Assess the level of ownership of the project by partners and the level of commitment from participating institutions to engage in activities such as capacity building. Assess the relevance and effectiveness of strategies and interventions applied to the project.
2) What have been the nature and quality of exchanges between the partners under the project, and which specific capacities have partners learned and adopted from each other?
3) What have national institutions in each country learned from the project? Is there any evidence of the project facilitating any change in ways of engaging in South-South cooperation, and if so, how?
4) As the project lays emphasis on RET transfer, capacity development and knowledge exchange, the terminal evaluation needs to assess 1) to what extent capacity development has taken place, and 2) the effectiveness and sustainability of the transferred RETs and demonstration sites; 3) the impact and potential of knowledge exchange.
5) Assess the contribution made - and its potential, by the project, to developing a successful model for South-South and trilateral cooperation on renewable energy technology transfer and capacity development.
6) An assessment or overview of the created enabling environment for future renewable energy technology investments in Ethiopia and Sri Lanka and other similar developing countries.
7) An assessment of the benefits and disadvantages of this type of development cooperation model, particularly in relation to the wider impact/inspiration for China's future development

cooperation engagements for demand-driven SSC partnerships drawn on international best practices, norms and standards.

8) Assessment of the sustainability of the project focusing on 1) the continuation of the on-ground developments in Ethiopia and Sri Lanka and 2) in a broader sense, on cooperation between UNDP and other Southern partner countries under South-South and Trilateral cooperation framework.
9) Assessment of 1) to what extent women energy needs were identified and addressed; 2) to what extent local female stakeholders in the agriculture sector from Sri Lanka and Ethiopia were benefited and empowered with more energy access, economic opportunities and trainings.

Special objective: Gender and cross-cutting issues

The evaluation intends to incorporate gender and cross-cutting issues in several key ways. Firstly, the evaluation will include a gender-responsive approach, ensuring that gender concerns are integrated throughout the evaluation process. This means that the evaluation will seek to understand and document how gender norms, roles, and relations have been taken into account in the project, and how these factors have influenced the project's outcomes.

Secondly, the evaluation will explicitly address gender and cross-cutting issues from perspectives of effectiveness, relevance, efficiency, impact, and sustainability. This will include assessing how gender equality and women's empowerment were promoted, and how gender disparities were reduced. Additionally, the evaluation will consider how the project has addressed other cross-cutting issues such as PLHIV, disabilities, LGBT, etc. The aim is to provide a nuanced and comprehensive understanding of the project's impact on promoting gender equality and addressing other critical development issues in different countries throughout the project life thus far.

3.2. Scope of Evaluation

This TE aims to assess the project's results against expected outcomes and outputs, focusing on implementation approaches, progress, challenges, lessons learned, and best practices. The TE will utilize OECD/DAC criteria for relevance, effectiveness, efficiency, and sustainability. It will evaluate project activities, management, and partnerships, comparing planned and actual outputs, assessing management efficiency, and identifying causes of unmet targets. Gender and cross-cutting issues will be addressed throughout the evaluation.

In Ethiopia, the TE will review the project's performance from May 2019 to April 2024, focusing on its overall contribution and effectiveness. The Ministry of Water and Energy of Ethiopia (MOWE) implemented the project, with China's Ministry of Science and Technology and China Agricultural University as responsible partners. The project, with a budget of USD 2,042,000, was co-financed by the People's Republic of China, Ethiopia's Global Environment Facility (GEF), and UNDP. The evaluation will assess the roles and relevance of the key actors involved.

For Sri Lanka, the evaluation will cover the project's performance from May 2019 to June 2024. It will assess the achievements and contributions in transferring renewable energy technology, building local

capacity, and meeting the project's goals in Sri Lanka. The evaluation will focus on the effectiveness of the project's interventions and their impact on the country's agro-industrial sector, as well as the project's ability to achieve its intended outcomes.

3.3. Evaluation Methodology

General methodology

The terminal evaluation employed integrated and yet customized approaches and methodologies.

a) Approaches: The Terminal Evaluation followed a collaborative and participatory approach ensuring close engagement of all stakeholders in accordance with UNDP evaluation guidelines and DAC Evaluation Quality Standards. Collaborative and participatory interactions with all stakeholders mainly donors, implementers and target beneficiaries employed to ensure inclusiveness of experience and knowledge exchange partners as much as possible. Close communicative works with Ministry of Water and Energy of Ethiopia (MOWE) and UNDP Ethiopia country office has been put in place.

b) Methods: The fundamental logic behind the evaluation was to substantively check the results yielded against the theory of change (TOC) and the planned result framework as stipulated on the project document as well as past work plans. It was therefore involved review and revisit of the linkages between different levels of results (i.e. activity – output – outcome - impact), the assumptions and risks, and Result Based Management (RBM) -structure through the following.

   I. **Desk Review** – This was an examination of all relevant documentations obtained from the project management unit and other sources. Documents reviewed amongst others include but not limited to lists indicated in Annex 5 were systematic reviewed and analyzed in the document.

   II. **Briefing Evaluation Progress** – Information obtained from desk review and from some key informants were summarised and briefed to programme teams and trilateral partners on the session arranged by UNDP.

   III. **Interview and Discussions**- The evaluation also involved conducting Key Informant Interview (KII) and Group Discussions (GD). Knowledgeable and experienced stakeholders on the project design, implementation and monitoring and evaluation were identified and contacted for interview and discussion to provide primary data. It involved stakeholders such as project staff, beneficiaries and government partners who offer important feedback and insights. Focus groups discussions were made with beneficiaries for their experiences and perspectives on the project. The selection of the respondents made to ensure gender balance that support investigation of gender equality and woman empowerment. Accordingly key informant interviews and group discussions held in this evaluation. For the detail resource persons or stakeholders involved in this TE, see Annex 6.

   IV. **Field Visits** -The other method this Consultant applied was project field visits to collect and validate "tangible" result verification on the ground, facilitated by the Evaluation Reference Group.

V. **Evaluation Matrix**. Refer to Annex 3 for the evaluation matrix of both project segments in Ethiopia and Sri Lanka.

Special arrangement for multi-country and multi-evaluator context

Led and coordinated by the Evaluation Manager in UNDP China, the evaluation was conducted by two dedicated independent evaluators, working across three countries: China, Ethiopia, and Sri Lanka. This multi-country, multi-evaluator approach was essential given the project's scope and the diverse contexts within which it operated. To manage this complexity:

- **Collaborative evaluation framework**: Two dedicated evaluators were appointed to undertake this comprehensive assessment, bringing together diverse expertise and perspectives to the evaluation process. This collaborative approach was crucial in maintaining a consistent evaluation methodology while allowing for the adaptability needed to address the unique aspects of each project segment.
- **Standardized evaluation practices and quality criteria**: Both evaluators in Ethiopia and Sri Lanka adhered strictly to the same evaluation guidelines[1], timetable, TOR, report format, as well as quality criteria checklist. This standardized approach facilitated a harmonized evaluation process, ensuring that both country assessments maintained the same level of rigor and thoroughness.
- **Country-specific adaptations**: While the overarching evaluation guidelines remained consistent, specific adaptations were made to better fit the local contexts of Ethiopia and Sri Lanka. These adaptations were informed by the evaluators' ongoing analysis and stakeholder feedback, ensuring that each country's particular challenges and successes were accurately captured and reflected in the final evaluation report.
- **Regular progress checks and quality assurance**: The Evaluation Manager of UNDP China conducted periodic reviews of the evaluators' reports and provided feedback to refine and enhance the quality of the outputs. These checks were instrumental in identifying any potential issues early in the process, allowing for timely corrections and adjustments.

Data collection and analysis

Data collection and analysis for the evaluation were guided by the need to gather reliable and valid data that answer the key evaluation questions laid out in the ToR. A combination of primary and secondary data sources was used to ensure comprehensive coverage of all relevant aspects of the project, with a dedicated focus on assessing gender-specific outcomes and indicators.

1) Primary Data Collection:
    - **KII and FDG**. For both countries, the evaluation utilized a combination of key informant interviews (KIIs), focus group discussions (FGDs), and site visits. The rationale for selecting these methods included their suitability for gathering in-depth insights from various project stakeholders, including project coordinators, government officials, and beneficiaries. These

[1] UNDP Evaluation Guidelines: https://erc.undp.org/methods-center/guidelines/undp-evaluation-guidelines

methods were pivotal in understanding the project's implementation context, challenges faced, and outcomes achieved.

- ***Ethiopia***: The evaluation team conducted 29 KIIs and 3 FGDs, stratified by stakeholder group (government officials, UNDP coordinators, university staff, and beneficiaries) to ensure comprehensive coverage. Gender-disaggregated data were collected to assess the project's impact on both men and women.
- ***Sri Lanka***: In Sri Lanka, the evaluators engaged with 25 key informants and conducted multiple FGDs across different provinces, ensuring that the sample included a balanced representation of genders and roles within the renewable energy sector.

- **Site visits**: Detailed insights were gained through site visits to project locations in both countries. These visits allowed the evaluators to observe the project's tangible outcomes and interact directly with beneficiaries and local implementers. The sites were chosen based on their significance to the project's goals and their geographic representation of the project's scope.

2) Secondary Data Collection:
   - Project Reports Analysis: Analysis of all available project reports and monitoring data to quantify project outputs and outcomes, specifically looking for gender-disaggregated data and information.
   - Review of Existing Evaluations: Review of previous evaluations and related studies to compare findings and assess progress over time.

Triangulation and validation

To validate the findings, data from different sources were triangulated. This involved comparing information from direct observations, documentary reviews, and verbal testimonies to check for consistency and reliability. Discrepancies were further investigated through follow-up interviews and consultations with project staff and beneficiaries.

Evaluation Criteria Rating

Table 2 Evaluation Criteria Ratings Employed

Rating Scale	Rating Description
6 = Highly Satisfactory (HS)	Level of outcomes achieved clearly exceeds expectations and/or there were no shortcomings
5 = Satisfactory (S)	Level of outcomes achieved was as expected and/or there were no or minor shortcomings
4 = Moderately Satisfactory (MS)	Level of outcomes achieved as expected and/or there were moderate shortcomings.
3 = Moderately Unsatisfactory (MU)	Level of outcomes achieved somewhat lower than expected and/or there were significant shortcomings
2 = Unsatisfactory (U)	Level of outcomes achieved substantially lower than expected and/or there were major shortcomings.

Rating Scale	Rating Description
1 = Highly Unsatisfactory (HU)	Only a negligible level of outcomes achieved and/or there were severe shortcomings
Unable to Assess (UA)	The available information does not allow an assessment of the level of outcome achievements

3.4. Constraint and Limitations

Communicating and Quality Assurance Challenges

Conducting an evaluation across three countries—China, Ethiopia, and Sri Lanka—presented significant logistical challenges. Maintaining consistent communication and coordination across different time zones, languages, and cultural contexts often led to delays and discrepancies in data collection and analysis. Moreover, aligning the evaluation activities to match each country's pace and timelines proved difficult, impacting the overall synchronization of the project's evaluation phases.

The challenge of ensuring uniform quality across all evaluation reports was another hurdle. Divergent local practices and standards in reporting required additional efforts to consolidate findings into a cohesive final report that accurately reflected the diverse inputs and contexts from each participating country. These constraints underscored the complexity of evaluating a trilateral cooperation project and necessitated robust mechanisms to manage and mitigate these issues effectively.

Geographical and Logistical Challenges

The project covered 5 of the 9 administrative provinces in Sri Lanka, representing a large geographical area. This presented significant challenges in terms of mobility, given the widespread distribution of farmer-beneficiaries. However, to ensure the accuracy of data collected, the team sampled specific regions within each province and employed a combination of virtual and in-person data collection methods. Virtual methods were particularly used to engage government officials and consultants. This approach mitigated the challenges by limiting travel but still ensuring sufficient interaction for data accuracy.

Similarly, in Ethiopia, the challenges stemmed from the limitations of both qualitative and quantitative tools. Secondary sources were largely progress reports from internal staff, leading to potential biases. Moreover, primary data collection, though inclusive, relied on non-random qualitative samples, which raises questions about the overall representativeness. However, these challenges were mitigated through rigorous triangulation of data sources—by comparing documents for consistency and cross-verifying them with primary data collected through field visits, interviews, and focus group discussions. This approach enhanced confidence in the findings.

Bias in Secondary Data

In both cases, the secondary data sources presented challenges. In Sri Lanka, government officials and consultants provided reports that might not have been fully independent, while in Ethiopia, internal staff

also contributed to progress reports that may have introduced bias. To address this, the evaluation incorporated virtual methods and employed cross-verification of findings. In addition, primary data was compared against secondary data for a more reliable analysis. The team ensured that key informants and stakeholders represented different professions and responsibilities, fostering an environment where opinions could be raised freely.

Data Collection Methods and Verification

In Ethiopia, triangulation of data sources played a key role in mitigating methodological limitations. By comparing documents and data from multiple levels of analysis, a high level of consistency and confidence was achieved. The use of a mixed-methods approach, including field visits, interviews, and focus group discussions, helped capture a wide range of perspectives and verify the integrity of the data.

Both projects used innovative strategies to overcome significant challenges. In Sri Lanka, geographical challenges were mitigated by a hybrid data collection approach, while in Ethiopia, the combination of mixed methods and data triangulation ensured a higher degree of confidence in the findings. These approaches underscore the importance of flexibility and the use of diverse methodologies in overcoming constraints.

3.5. Structure of the Report

The TE report is structured according to the "Evaluation Report Template" outlined in the Terms of Reference (TORs). The Executive Summary provides a concise overview of the evaluation, including the intervention details, purpose, objectives, principal findings, evaluation ratings, and recommendations for the future.

The remainder of the report is organized into several key sections. The first section covers the project description and development context, outlining the need for the evaluation and its scope. Following this is the section on the purpose, objectives, and scope of the evaluation, which includes a discussion of the evaluation methodology and details the methods and tools used for data collection and analysis.

The report then presents the evaluation findings, divided into sub-sections: project design and formulation, project implementation, and project results. The assessment of project results is conducted through the lenses of relevance, effectiveness, efficiency, sustainability, and cross-cutting issues, concluding with overall findings.

The recommendations and lessons section focuses on strategies for improving the sustainability of the results attained. Finally, the annexes include supplementary materials such as the Evaluation TORs, evaluation matrix, list of documents reviewed, list of informants interviewed, summary of field visits, Code of Conduct signed by the evaluator, and the audit trail.

4. Main Findings

The results and findings from the Terminal Evaluation of both projects are structured according to the evaluation criteria outlined in the TORs. Insights and feedback were gathered through desk reviews and interviews with key implementing partners, including provincial councils, departments, and institutions involved in developing provincial energy plans, capacity-building programs, beneficiary selection, and stakeholder engagement. The evaluation placed particular emphasis on cross-verifying evidence from documents, resource persons, and field assessments. By utilizing multiple information sources, efforts were made to minimize overreliance on interview-based opinions.+

4.1. Projects Results Framework, TOC and M&E Arrangement

In summary, both Sri Lanka and Ethiopia segments demonstrated a strong alignment with their respective Results Frameworks despite significant operational challenges. In both cases, the frameworks proved adaptable, allowing for necessary modifications in response to external shocks such as the COVID-19 pandemic and economic crises. In further detail, the two evaluation teams have presented the following findings:

Finding#1. The project segment in Ethiopia demonstrates strategic alignment with energy and GHG reduction goals, though it reveals gaps in causal clarity and consistency across frameworks. Overall, the project mostly adheres to SMART criteria, demonstrating progress toward its objectives.

Project Results Framework and TOC (Ethiopia segment)

The analysis of the Ethiopia Project Results Framework was to be assessed in respective of the project TOC in order to establish whether it has the necessary elements and whether it enabled measurement of success and progress to success. The project TOC summarized and depicted the project strategy. The TOC was directed in a short narrative way not supported by developed figurative map as a simplified model so not fully plausible. In particular, the TOC depicted the requirement of multiple interventions to reach a long-term objective and activities planned to look after a set of outputs/outcomes to be met to achieve the objective. The challenges supposed to be tackled by project outputs as the results immediately linked to the activities for which the project was fully accountable to bring outcomes.

However, it showed the objective that persistently aimed to improve demonstrated use of hybrid RET systems for Energy Savings and GHG emission reduction was to be attained through demonstration of biogas and solar for productive uses. Similarly, the results framework outcome one “capacity for RET transfer built through demonstration of biogas and solar for productive uses” emphasises on capacity built through RE demonstration site construction. The achievements of these targets require longitudinal practices and repeated demonstrations that necessitate internalization of knowledge transfer and replication of effective uses to meet the intended outcomes.

The other outcome that stated facilitate south-south knowledge and experience exchange between China, Ethiopia and Sri Lanka seems practical since the exchanged experience involved different modes of exercise including workshops, demonstrations, discussions, visual and physical trainings and knowledge transfer. However, the outcomes do not show about other actors (outside the project) that are expected to support and contribute to extended services and eventually become key drivers for the achievement of the planned once. The assumptions and risks in the TOC were analysed in general terms but specifically not indicated in project results and resources framework (Annex 2). For example, operational risk stated as insufficient maintenance of equipment provided; the risk aversion measures listed down did not include the perspective supply and availability of spare parts during and after the project operation. The directed risk aversions did not project its availability and accessibility for constant operation and maintenance.

On the other hand, the relation of the theory of change as discussed in the project document to results framework of the project design was not fully in harmony in indicating the outputs and the output indicators. For example, the output 1.1 discussed under TOC stated 'key partners identified and demonstration sites selected' while the result framework stated as 'enhanced partnerships among key partners through demonstration of biogas and solar for productive uses'. Output 1.2 has also additional wordings in the results framework that could change understanding of the narration i.e. 'capacity built through demonstration' in the narration of TOC while it is 'capacity built through RE demonstration site construction' in the result framework. Similarly, Output 2.1, indicator 2.1.1 in the TOC narrated as 'site planning and construction' while in results framework it was stated as 'training of trainers in installation, operation and maintenance'. Indicator 2.1.2 also stated in the narration of TOC as 'on-site training for operation and maintenance' while in the results framework it was stated as 'Training on system design. Therefore, the Evaluator concludes that the incomplete TOC does not present sufficiently clear causal pathways leading to outcomes and the project objective.

Eventually, after analysing the progress towards the tow outcomes of the project based on indicators and targets put in the project results and resources framework which corresponds to the project multiyear work plan (Annex 9) using SMART (Specific, Measurable, Achievable, Relevant, and Time-bound) analytical method. As presented in Annex 9, the two outputs under outcome 1 have different results. The first output has two indicators that the first indicator is fully compliant while the other indicator is questionably compliant to the SMART criterion. The second output has also two indicators which are both fully compliant in the one indicator and questionably compliant in the other indicator to the smart criterion. The outcome 2 with its two outputs and their respective indicators are fully compliant to the SMART criterion. The columns 'Project Targets Attained" of the table was populated with information from the project annual performances and analyzed in terms of the targets and results framework as end of project completion. Using that data, the TE Evaluator completed the analysis and concluded whether targets have already been compliant to SMART criteria colouring green; questionably compliant for partially meet (colouring orange); and non compliant for not meeting the SMART criterion (colouring red), details see in Annex 9.

M&E Arrangement (Ethiopia segment)

The Ethiopia Project developed, used and reported on a rigorous results-based management framework with costing details and specified data collection sources to support both project management and monitoring. It was practiced and deployed in accordance with UNDP's programming policies and procedures. MOFCOM and UNDP Ethiopia have defined a detailed M&E plan that considered and proposal of coordination modalities for reporting on national components activities as well as overall project progress. TSSCO project management coordinator in collaboration with UNDP China was coordinating and following the monitoring and evaluation aspects of the overall project performance.

Inception report that composed of agreements reached during the stakeholders' workshop, reported to the concerned body immediate to the events. A project review conducted annually assessing performances of the project with appraisal of the project future work plan. At the project implementing agency level it was monitored with the exiting monitoring and evaluation system in accordance with the UNDP directives and guidance. The project manager report annual assessment findings in an annual review report following UNDP's reporting guideline and shared with UNDP coordination office and presented to the TSSCO Project Board.

The M&E concentrated on the output level to understand the ***achieved targets*** of the programme, that attribute to the importance of the processes and to facilitate synthesis and interpretation of progresses and performances. The M&E packaged deployed during the project implementation comprised of the following elements:

- Regular coordination;
- National consultations and inception workshops;
- Joint Action Plans;
- Annual work plans;
- Responsible project committee meetings;
- Quarterly Progress Reports (QPR);
- Project visit and observation;
- Technical verification, progress performance and systematic assessment;
- Common Communication Checklist
- Annual strategic steering committee meetings on progress reports (both technical and financial);
- Outreach and advocacy platform.
- Key coordination meetings
- Annual performance assessment reporting both financial and technical; and
- Terminal evaluation.

All Ethiopia Project activities were closely monitored by UNDP Country Office. To this effect, a project management team with a project coordinator and project manager engaged in the attainment of the established project outputs. UNDP M&E Unit were backstopping the program and support the deployment of M&E packages. UNDP China closely works with project management team on the status reports on quarterly, annual and or more regular basis. The reports reach the Project Management Board and kept informed of any contemplated project performance and progress. In general, the deployed M&E

system and procedures have provided feedback for enhanced delivery of the project. From the evaluator assessment point of view the M&E design and implementation of the project is rated as in the following (Table 4).

Table 3 Ethiopia Project M&E Design and Implementation Rating

Monitoring and Evaluation	Rating
• M&E Design	6 = Highly Satisfactory (HS)
• M&E Implementation	6 = Highly Satisfactory (HS)
• Overall M&E	6 = Highly Satisfactory (HS)

The Sri Lanka Project's Results framework of the 5 main categories of outputs are specified under 2 main Outcomes (Annex 2). The achievements of the project as extracted from various documents including Annual Work Plans, implementation reports, and periodic Progress Reports. The fieldwork including consultation meetings was utilized to carry out an evidence-based validation of reported achievements in terms of quantity and quality criteria.

Finding#2. The project segment in Sri Lanka showcased resilience and adaptability in its Results Framework and TOC, successfully adjusting to disruptions from the pandemic and economic challenges. Expanding from 2 to 5 provinces, the project maintained its focus on energy savings and GHG reduction in the agro-industry, effectively managing changes to ensure progress towards its objectives.

Project Results Framework and TOC (Sri Lanka segment)

In essence, the TOC for the Sri Lanka segment was designed to achieve substantial reductions in greenhouse gas emissions and promote renewable energy through the adoption of biogas and solar technologies in the agro-industrial sector. The feasibility of this TOC relies on the ability to effectively transfer technology and knowledge from China to Sri Lanka, which was supported by a robust framework of training, capacity building, and pilot projects. While the TOC faced challenges due to unforeseen economic and health crises, its flexibility allowed for adaptive responses that ensured continued progress towards achieving project goals.

The Sri Lanka Project's Results Framework was gauged to be robust as seen by its relevance amidst major disruptions in the operating environment. The two major shocks precipitated by Covid-19 pandemic and the economic crisis resulted in major implementation delays. While the results framework remained unchanged, the End-of-Project output targets specified at the project inception underwent significant modification with the adjustments made in the implementation plan in response to the changing operational conditions observed earlier. For example, the initial project document envisaged project implementation in only 2 Provinces which was subsequently expanded to 5 Provinces following delays that prevented the project from taking over activities of the 'Energy NAMA' project. Such adjustments substantially modified the complexion of the output indicators in the original results framework quantitatively and from the delivery schedule making them untenable. Progress indicators of the project

were established iteratively considering the changes made in the implementation plan with the results framework unchanged.

The causal chain of project outcome, output, and activities was well linked ensuring the capacity to reach its objective of '*Supporting national target for energy savings and GHG emission reduction through trial and demonstration of biogas and solar in the agro-industry sector*.' The rationale and approach of leveraging support and experience from China on RETs was a prudent decision given the technology leadership of China in RET applications in all types of industries. The Chinese organizations enlisted as partners had the appropriate orientation and kills to support a project of this nature that involved applied research and technology modification to suit specific user requirements.

Outcome 1 relates to 'the demonstrated use of hybrid RET systems for energy savings and GHG emission reduction in small & medium-sized agro-industries' and was planned to be achieved under 3 output categories.

Output 1.1 related to the capacity building of 5 five PCs to establish energy savings & GHG emissions reduction targets for the agro-industry. Although the delivery of training posed a major challenge as the conduct of workshops was infeasible due to pandemic restrictions requiring the project to resort to online delivery, it was achieved with a significantly higher number of provincial stakeholders trained.

Output 1.2 envisaged developing Provincial Energy Plans which was completed successfully. The trainees were satisfied with the skills acquired and confident in their ability to assess energy savings. However, related developments under this output for deploying the built capacity to account for energy savings through updating the 'ENERGIS' database failed to materialize as desired. The project developed and deployed the necessary interface and provided the essential IT equipment. Discussions with provincial officials during the field visits revealed a lack of enthusiasm to update the database as they perceived actual energy savings and GHG emission reductions from the newly added RET applications to be small.

Output 1.3: The final output of Outcome 1 involved multiple steps such as identifying and screening potential technology options, earmarking potential suppliers, conducting feasibility studies to determine appropriate demonstration projects, beneficiary selection, installation and commissioning of RET systems, and training end users to operate the systems. Completing these steps required the participation of many service providers whose competency and commitment were critical for successful delivery. The CAU identified 52 commercially available RET applications and the PMU using a scheme based on 14-point sustainability criteria, shortlisted 28 RETs for feasibility studies. Eventually, 30 feasibility studies were carried out to select RETs appropriate for piloting. Likewise, assessments were carried out systematically engaging several service providers to determine the applications best suited to local conditions, identify the right beneficiaries and needs, and draw up specifications. Details of these are summarized under 'Capacity Building

Training'. In the next stage, the PMU enlisted qualified contractors to supply, install, and train end users on operation and maintenance. Completing these tasks required significant planning and coordination in an environment of many uncertainties. Overall, the project management performed well in delivering this output. The supply of small, farm-level RET applications presented similar challenges in identifying and securing the appropriate applications. The supply and delivery of 225 small applications to selected beneficiaries was achieved on time with the assistance of service providers and PC staff. The Agriculture Department Staff from the 5 Provinces were given appropriate guidance on beneficiary selection. The field staff of the Department handled the collection and delivery of equipment. The beneficiary training was carried out primarily by the field officers of the DOA who were trained following a 'Training of Trainer' modality.

Various capacity-building activities planned and delivered under Outcome 1 on RET equipment installation, operation, and maintenance aggregate to significant human resource development relating to a new technology area within the 5 participating provinces and nationally. Altogether 233 beneficiaries including 80 women benefitted from the distribution of RET equipment, i.e. Total of 8 large RET applications of 5 categories and 225 small RET equipment of 3 categories along with technical training on the operation and maintenance of RET equipment.

Outcome 2 relating to the exchange of South-South knowledge and experiences included 2 Outputs.

Output 2.1 envisioned tailored mentorship through the training of host country officials in China and e-learning. It was founded on establishing the Joint Research and Extension Center (JREC) and developing the research agenda as a learning platform both for China and Sri Lanka to promote international RET transfer and adoption in the agriculture sector. The CAU is the principal partner earmarked to collaborate with the University of Jaffna (UOJ) under this activity. Although even with the installation of a biogas plant with electricity generation capacity at the UOJ farm and the preparation of the 'Roadmap' for JREC completed, the initiative failed to materialize on time due to unforeseen administrative delays. Even though the PMU managed to enlist the support of Eastern University to join this programme, the full realization of this output before project termination is now unlikely.

Output 2.2 proposed exposing energy stakeholders from China and Sri Lanka to best business practices in the RE industry via business matchmaking programmes and best business practices workshops. Considerable progress was made under Output 2.2 with the planned assessment reports on RET transfer, drafting of a bilingual online catalogue of transferrable RETs from China and online training courses for capacity building of local stakeholders, and joint workshops involving Chinese and Sri Lankan stakeholders carried out.

M&E Arrangement (Sri Lanka segment)

Broadly speaking, the Monitoring and Evaluation design for the Sri Lanka project was robust and aligned with UNDP's rigorous standards, setting a strong foundation for comprehensive tracking and assessment of project outcomes. When faced with the challenges brought on by the COVID-19 pandemic, the implementation of M&E was adeptly adapted by the project team. This flexible approach ensured the project continued to monitor outcomes effectively and manage resources efficiently, achieving its objectives with a high level of transparency and accountability.

As outlined in the ProDoc, the project was to be monitored following UNDP programming policies and procedures outlined in the Programme and Operations Policies and Procedures (POPP). This approach required the preparation of an *Inception* Report and followed by the production of *Quarterly* and *Annual* Reports. The ProDoc recommended developing two main products relating to project monitoring, i.e. Detailed Monitoring Plan covering Outcome 1 most of which was to be carried out within Sri Lanka, and a Joint Monitoring Plan covering all activities under Outcome 2 carried out in all 3 partner countries. As customarily practiced, the Inception Report outlined agreements reached during the Stakeholder Workshop concerning the project administration and management procedures, the Revised Joint Annual Workplan agreed by the 3 partner countries, the schedule of TSSC Board meetings, and monitoring plans. The monitoring and reporting plans laid out at the project inception underwent substantial change in the ensuing period with delays and disruptions caused by the Pandemic.

The Multi-Year Workplan 2019-2021 covering the activities to be implemented in Sri Lanka over the project life laid out Activities planned under the two Outcomes and for each Output under them with indicators. As explained earlier, while many of the envisaged results in this work plan remained intact qualitatively, specific outputs and quantities were adjusted during the implementation to suit the constantly evolving operational environment, with the result indicators in the Multi-Year Workplan no longer relevant. In 2020, the PMU produced a 'Project Results and Monitoring Pathway' framework containing all planned project activities, budgets, timelines, and most importantly targets and indicators for planned deliverables. However, with delays taking place with the onset of COVID-19 pandemic, this framework became outdated.

As the Sri Lanka project life extended in several phases, the PMU produced Revised Annual Work plans capturing changes agreed upon by stakeholders and resorting to Annual Progress Reports (APRs) to capture progress. Project Progress Reports issued covering Jan. 2020 -Dec 2020, Jan 2021-April 2022, and May 2022-Dec. 2022 outlined in detail the activities implemented. These APRs also reported on decisions reached and plans approved at the Project Steering Committee Meetings and Ad-hoc Executive Committee (ExO) Meetings held during the review period. While these APRs provided updated information about project achievements, the conventional practice of reporting against an agreed set of indicators was not followed. Furthermore, the APRs reported comprehensively on challenges encountered and the corrective measures adopted in response, updated the Risk Log, and annexed various reports and communications products covering the project achievements. Upon closer evaluation of the alternative to customary monitoring practice adopted by the project, it can be concluded that the arrangements were satisfactory overall.

The fieldwork undertaken for the evaluation revealed other elements of monitoring that could have been productively employed but overlooked by the project. In organizing and delivering the capacity-building training, the Project was supported by a Liaison Officer identified by the Provincial Council. Likewise, in distributing the 225 small RET equipment to farmers, the Provincial Ministry and the Department of Agriculture were engaged to select beneficiaries and deliver equipment. These presented opportunities for the project to enlist the support of the respective counterparts to monitor activities initiated within the province via a MOU or a similar agreement ensuring regular follow-up at the local level. Given the small team at the PMU and the absence of a dedicated monitoring officer, formally enlisting stakeholders' support could have further improved the quality of results.

The Sri Lanka project's financial performance overall confirms that the adaptive implementation arrangements were successful in achieving the desired objectives. The total MOF grant of USD 1 million was fully utilized or committed. The project was able to account for equitable local contributions from the national implementing partners.

4.2. Relevance

The terminal evaluation highlights the high relevance of the interventions in their respective contexts of Sri Lanka and Ethiopia. In both countries, the projects were aligned with national development priorities, particularly around RET adoption, climate resilience, and GHG emissions reduction. The projects were also consistent with UNDP program priorities and organizational policies, emphasizing SSC and capacity building.

Finding #3. The project effectively aligns with China's strategic focus on South-South Cooperation (SSC) and global partnerships, and in line with UNDP China CPD 2021-2025.

China's commitment to enhancing its role in global partnerships and SSC is a central pillar of its current international policy agenda, as outlined in its recent Five-Year Plan. Additionally, the project's focus on renewable energy technology transfer and capacity building initiatives is particularly relevant, as it supports China's objective to share sustainable energy solutions and expertise with developing countries. This alignment not only boosts the project's strategic relevance within China's SSC framework but also strengthens its role in promoting sustainable development across its partner countries.

Table 4 China's national laws and policies on renewable energy

Year	National laws and policies
1995	New Energy and Renewable Energy Development Outline (1996-2010)
2006	Renewable Energy Law
2007	Medium and Long-term Development Plan for Renewable Energy
2012	12th Five-Year Development Plan for Renewable Energy
2016	13th Five-Year Plan for Renewable Energy Development New Energy Generation and Consumption Revolution Strategy 2016-2030 Energy Technology Revolution and Innovation Action Plan (2016-2030)
2020	Energy Law of the People's Republic of China (Draft for Comment) Chinese President Xi Jinping promised carbon peaking and carbon neutrality goals
2021	14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Outline of Long-Term Goals for 2035

Further, the UNDP China CPD 2021-2025 prioritizes fostering international cooperation through SSC to tackle environmental challenges and promote sustainable energy practices. By aligning with these goals, the project not only adheres to China's strategic international cooperation objectives but also amplifies its impact through UNDP's established networks and platforms. This strategic alignment enhances the project's capacity to influence global energy policies and practices effectively, facilitating broader adoption of renewable technologies and contributing to global environmental sustainability goals.

Finding #4. The project segment in Ethiopia aligns closely with both SDG 7 and the country's 10-Year Development Plan by promoting access to modern energy through biogas technology. This integration not

only supports sustainable economic development and climate change mitigation but also advances national policies on technology transfer and capacity building in the energy sector.

It is the opinion of the TE Evaluator in Ethiopia that the current project is highly relevant (6 = Highly Satisfactory (HS). The Ethiopia project that aimed to build a successful case for medium scale biogas and integrated energy system through demonstration for the productive use was directly relevant to sustainable development goal (SDG) 7 that states "by 2030 ensure universal access to affordable, reliable and modern energy services and ensure access to affordable, reliable, sustainable and modern energy for all" . Similarly, the project is directly relevant to the 10-Year Development Plan targets of the country among others the target to "providing the rural population with clean energy supply technologies; encouraging private investment in the sector and developing skilled and ethical manpower".

The Ethiopia project was also designed based on UNDAF/CPD China Outcome 3 that stated, "China expands and improves the effectiveness of its development cooperation with other developing countries through TSSC framework and Ethiopia Outcome 5 that states by 2020 key government institutions at federal and regional levels including cities are better able to plan, implement and monitor priority climate change mitigation and adaptation actions and sustainable resource management". It was targeted to meet UNDAF/CPD China Output 3 that stated, "the effectiveness of China's engagement in international cooperation is enhanced for the mutual benefit of China and the world" and UNDAF/CPD Ethiopia Output 4.3 that stated "Technologies and practices including finance and market mechanisms that promote a climate resilient green economy introduced and scaled up" .

Ethiopia's approach to TSSC project was implemented by the MOWE integrating to National Biogas Program of Ethiopia (NBPE) which was started its operations in 2008. The project is directly relevant to meet the objective of NBPE that stated "to develop a commercially viable domestic biogas sector, providing access to clean energy". The implementation of "bio digesters are substituting the use of firewood, increasing agricultural production through the application of bio-slurry (the liquid effluent from the digesters), improving living conditions by reducing the workload and improving health and sanitation for mostly women and children, while increasing employment and income and contributing to the reduction of greenhouse gas (GHG) emissions" . As the world moves towards a future development guided by the SDGs, the Trilateral South-South Cooperation project was a relevant experience in building partnerships with the national public and private sector, fostering jobs and opportunities for all, advancing technology and innovation and addressing sustainability.

Ethiopia's national economic policy also fosters at building of technology capability that enables the development of small, medium, and large scale energy supply programs that could be picked as a major indicator for the nation's perspective towards technology advancement. The project biogas and integrated energy system development through demonstration for the productive use was to realize the innovation component of country's policy strategy. The Ethiopian government set significant and systemic institutional structures as a key priority area of 'multi-sectoral and diversified sources of growth and job opportunities' as stated in ten-year development plan. The involvement of public institutions and medium

scale private sectors to technology transfer through learning and demonstration is in line with one of the key strategic pillars of the plan that stated 'technological capability and digital economy' to the improvement in income levels and wealth accumulations so that every citizen would be able to satisfy their basic needs and aspirations.

The Ethiopia project is also very relevant to coordinated governance framework mechanisms. The technology transfer is supporting technology research and indigenous knowledge, strengthening links between innovators and enhancing public intuitions and the private sector for a creation and utilization of sustainable renewable energy. As the project is relevant to the targets of SDGs and to the needs and priorities of home grown reform agenda set in 10 years development plan of Ethiopia, it is also consistent with the strategic and programmatic priorities of the MOWE. For example, the Rural Energy Technology and Development sector of the Ministry owns the project and guide rural technology development, rural energy development and resource study development of which the project is directly relevant. It is also demand driven and meets the need of the community fostering and promoting education and research.
The Trilateral South-South Cooperation has also enhanced government experience to reach public institutions providing service to the community in rural off grid areas with transforming biogas to the use of electricity and solar pumps for irrigation. The technology introduced by the project which include both solar and biogas are complimentary to each other and potential to reach the unreached community sector by energy. It is in line with the need of the beneficiaries with its multi benefit effects. It consumes materials available in the beneficiaries' locality, provides renewable energy for productive use and produce waste/ byproduct which is environmentally friendly and economically substituting fertilizer. It also promoted the capacity of the implementing agency in that the technology brought by the project was exemplary and initiated the development actors to develop guidelines for 80 institutional based biogas projects previously built and used at small scale for 50 -54 kilowatt and promote it into the highest 98 kilowatt energy supply.

Public institutions, growth-oriented SMEs and start-ups, business oriented households and off grid farming communities are direct beneficiaries of the project that ensures them ownership, capacity building and alignment to national government priorities and harmonization with other development programs.

Finding #5. The project segment in Sri Lanka is highly relevant, aligning with national priorities for GHG emission reduction and sustainable development through effective RET integration in the agro-business sector. It supports local capacity building and gender inclusivity, ensuring sustainable adoption and monitoring of RETs across provincial levels.

Moving onto the Sri Lana Project; The TE assessed that the Sri Lanka Project interventions were **highly relevant (6 = Highly Satisfactory (HS)**. This determination was based on consideration of several perspectives suggested in UNDP guidance such as the extent to which the planned outcomes are aligned with national development priorities and UNDP program priorities and organizational policies, recognized priority needs in RET transfer of the country, the views of key stakeholders have been incorporated, and

relevance to needs of the target beneficiaries adopting technology. The TE looked at the appropriateness of the objectives of the intervention and its design given changed circumstances. The principal sources of information for the assessment were desk reviews of the project document, planning and progress reports of the project, and other relevant policy and strategy documents issued by the government, and interviews of main stakeholders including government officials, UNDP CO, SLSEA etc.

The Sri Lanka project raised awareness of the potential of RET transfers to be used in the agro-business sector achieving energy savings and GHG emission reductions. It demonstrated that the adoption of RETs will be technically feasible, profitable to the users, and has no downsides. The project interventions will support Sri Lanka in achieving its sustainable development goals.

Alignment with GOSL and Development Partner Priorities including South-South Cooperation:
The Sri Lanka Project interventions have a strong potential to contribute to Sri Lanka's GHG emission reduction national targets. The GOSL has outlined a low-carbon development pathway that is considered very ambitious from the level of emission reductions envisaged. Through the 'Updated NDCs', Sri Lanka committed to reducing GHG emissions by 14.5% for the decade to 2030, including an unconditional reduction of 4%. The government also established 2030 targets to achieve 70% renewable energy in electricity generation. Under the sustainable development objectives outlined in 'C Net Zero Roadmap' Sri Lanka expects to achieve Carbon Neutrality by 2050 and has committed to not increase the capacity of its coal power plants. All these plans point to the need to move at a significant pace to adopt RETs wherever possible. In this context, project interventions by extending applications of RETs in agricultural operations where the potential for RET applications has not been tested confirmed the strong relevance of project interventions.

The decision to go down to the provincial level in raising awareness and building capacity to monitor energy savings and GHG emission reductions showed a strong commitment to appropriate development and delivering sustainable results. The project operated in 5 of the 9 Provincial Councils in the country. Often, projects result in building the capacity of national counterparts thereby preventing required capacity upgrading close to where the action takes place. In a highly dispersed sector like farming and agro-processing, local capacities are critical to promote technology dissemination and tracking benefits.

As the implementing agency, the UNDP was expected to contribute to achieving planned outcomes by serving as a convener, knowledge broker, and partnership builder. The project aligned well UNDP role and mandate of supporting South-South cooperation efforts, strengthening partner-country institutional and technical capacities, and knowledge exchange, and UNDAF/CPD outcomes and outputs in Sri Lanka of improving technologies and approaches used by government and private sector towards climate change mitigation. The intervention was also well-aligned with the UNDP China UNDAF outcome of seeking to expand and improve the effectiveness of its development cooperation with other developing countries through the TSSC framework, and the output linked to it of enhancing the effectiveness of China's engagement in international cooperation.

Awareness Building on RETs:
The Sri Lanka Project resorted to following a 'trial and demonstration' approach to build awareness of RETs and to prove their technical feasibility and financial viability. Field evaluations carried out for the TE validated the project's contribution to improving knowledge and skills in RET use as addressing the critical needs of stakeholders. Furthermore, through the implementation activities, the project provided lessons and experiences supporting large-scale RET adoption in agriculture that had not been explored previously.

Project Design Elements:
The Sri Lanka Project's scope, design, and implementation approach can be considered sound toward delivering the expected results. Its design is found to be coherent between the expected results and implementation approach as far as RET Transfer needs and potentials in Sri Lanka and China are concerned. The Results Framework is realistic for a small project raising awareness and facilitating the implementation of a pilot project aiming to build confidence among the key decision makers on RETs as technically feasible, cost-effective, and environmentally friendly alternatives to fossil fuels. While China possessed many RETs that were appropriate for use in the Sri Lankan farm sector, there was a significant scale mismatch that prevented the direct transfer of RE technologies from China to Sri Lanka. Through extensive knowledge and experience sharing process, the project was successful in earmarking technologies that were appropriate to start knowledge transfer.

The objectives and approach of the Project design ensured the inclusion of knowledge built up through previous interventions and views of key stakeholders that could affect outcomes by building on to work packages identified by the NAMA project that had parallel objectives.

In designing interventions, the project activities paid attention to accommodating gender and promoting inclusivity by establishing procedures that selectively promoted the selection of women beneficiaries. Although it was not a factor considered specifically, in making RET equipment available free of charge, women beneficiaries were able to benefit equally from the RET transfers. There are of course additional concerns relating to improving gender consideration of the project discussed under project effectiveness.

4.3. Effectiveness

The assessment of effectiveness across both the Sri Lanka and Ethiopia components of the Trilateral South-South Cooperation Project demonstrated notable achievements despite external challenges, particularly those related to COVID-19 and economic instability. In both countries, project outputs were generally aligned with the planned objectives.

Finding #6. The project's promotional activities have effectively achieved significant media exposure and recognition, successfully aligning with its strategic objectives and contributing to its overall effectiveness. However, there is an opportunity to elevate visibility to extend the project's reach and impact even further.

The project has effectively leveraged promotional activities to enhance its visibility and underscore its strategic relevance, achieving notable recognition on various prestigious platforms and events. These accomplishments highlight the project's effective alignment with its planned objectives:

Table 5 Media Coverage and Honors Awarded

Listings: • UN Good Practices in South-South and Triangular Cooperation in Least Developed Countries • CTCN Technology and NDCs: Summary for Policymakers • CCICED (China Council for International Cooperation on Environment and Development) Special Report: Key Pathways on a Green and Low-Carbon BRI
Demonstrations: • The Belt and Road Conference on Science and Technology Exchange 2023 • UNESCAP-APCTT 19th Session of the Governing Council and International Conference on Green Technologies for Climate Action and Resilience • The project outcomes have garnered positive remarks and directives from state leaders in China, underscoring its strategic importance and success in achieving its objectives.

Despite these positive strides, as noted by Chinese government partners the project's promotional activities in the second phase did not reach the high visibility level achieved during the first phase, which benefited from the endorsement of the United Nations Secretary-General. This lack of similar high-level exposure has highlighted a significant gap in achieving widespread recognition and influence. Effective communication will be crucial for the long-term success and expansion of the project, ensuring that its valuable contributions are widely acknowledged and adopted.

Finding #7. The Ethiopia project's effectiveness is rated satisfactory, achieving most output targets despite challenges. Key successes include enhanced partnerships through biogas and solar demonstrations, effective mentorship programs, and significant exposure to best RE industry practices, indicating strong progress in capacity building and collaboration.

The effectiveness of the Ethiopia project outputs achieving its output targets are rated **5 = Satisfactory (S).** The effectiveness of the Trilateral South-South Cooperation Project terminal evaluation assessment showed considerable progress made by the actors towards achievement of the project outputs despite the unforeseen challenges occurred during implementation. The achievements of the project were assessed comparing expected targets at the project design and actual achievements of the project at the terminal evaluation. The information presented in this section has been sourced from the project document, annual work plans, project progress reports for 2019, 2020, 2021 2022 to 2024 supplemented with information compiled from the stakeholder interviews. The result analysis and achievement of output indicators were summarized as in the Annex 7.

Table 6 Project Multiyear Workplan Indicator Reporting - Ethiopia Project Segment

Indicator	Expected Targets	Achievement at TE	Rating
Output 1.1 Enhanced partnerships among key partners through demonstration of biogas and solar for productive uses			
Indicator 1.1.1: Short listing potential institutions	Call for Expression of Interest (EOI)	7 out of 17 seats, has been selected	**Achieved**
Indicator 1.1.2: Undertake 10 initial energy needs assessments	10 initial energy needs assessments	1 energy need assessment report developed	Underachieved
Output 1.2: Capacity built through RE demonstration site construction			
Indicator 1.2.1: Site planning and construction	Site plan & construction	4 selected demonstration sites	**Achieved**
	Construction	Construction on process	Underachieved
Indicator 1.2.2: On-site training for operation and maintenance	Training on operation and maintenance	Technical training and commissioning for one 300m^3 biogas system and four solar PV systems and appliances was completed	**Achieved**
Output 2.1: Tailored mentorship/traineeship program for exchange with China developed and participants trained			
Indicator 2.1.1: Training of trainers in installation, operation and maintenance	Training on installation, operation and maintenance	Skill-Building Training and Training Module on RET System produced and circulated,	**Achieved**
Indicator 2.1.2: Training on system design	Training on system design	50 government officials and experts provided practical knowledge and skills on renewable energy systems design, and symposium attended.	**Achieved**
Output 2.2: Energy stakeholders in China and Ethiopia are exposed to best business practices in the RE industry			
Indicator 2.2.1: Develop and trial Renewable Ethiopia Awards	Develop and trial Renewable Awards	Excellence Award Scheme developed	**Achieved**
Indicator 2.2.2: Facilitate business best practices forum	Business bet practice	Renewable energy transfer on technology assessment, business models and investment plan	**Achieved**

Indicator	Expected Targets	Achievement at TE	Rating
Indicator 2.2.3: Coordinate business match-making platform for energy service providers	Business match-making platform for energy	Capacity building provided and RE training curriculums added on SSTC centre website	**Achieved**
Indicator 2.2.4: Joint research projects	Joint research projects created	Research agenda has been identified, on mainstreaming biogas and solar potential, transition to sustainable energy produced	**Achieved**
Project Management: Coordination mechanism			
Coordination mechanism further regularised and enhanced	Set-up project management structures at all levels	Effectiveness of the project	

Following the indicators columns expected project targets and achievements at the TE are populated with information from the project results framework. Using that data, the TE Evaluator completed the column achievement at TE and concluded whether project targets have already been achieved (colour item green); partially achieved or under achieved (colour item orange); and or not achieved by the end of the project (colour item red) to show the status of the project completion. As indicated in the above sections, the two outcomes of the project have two outputs each with defined indicators. The effectiveness of the project outputs are discussed as in the following.

Output 1.1: **Enhanced partnerships among key partners through demonstration of biogas and solar for productive uses**

Output 1.1 has two indicators namely short listing potential institutions and undertake 10 initials of energy needs assessment. All of the output indicators under Output 1.1 were not equally met the expected targets. The first output indicator has been achieved whereas the second one was underachieved.

Output 1.2: Capacity built through RE demonstration site construction

This output also has two indicators i.e., indicator 1.2.1, site planning and construction; and indicator 1.2.2, on-site training for operation and maintenance. The first indicator has two components in which the first component has been **achieved** and the second component u**nderachieved**. The second indicator 1.2.2 of the output has been **achieved**.

Output 2.1: Tailored mentorship/traineeship program for exchange with China developed and participants trained

This output indicators have two components training of trainers in installation, operation and maintenance, and training on system design. The two components of this output have been **achieved.**

Output 2.2: Energy stakeholders in China and Ethiopia are exposed to best business practices in the RE industry

There are four indicators under this output which include: indicator 2.2.1, develop and trial renewable Ethiopia awards; indicator 2.2.2, facilitate business best practices forum; indicator 2.2.3, coordinate business match-making platform for energy service providers; and indicator 2.2.4: joint research projects. All of the output indicators were effective and **achieved** the targets set for the project.

Finding #8. The Sri Lanka project is rated satisfactory in effectiveness, achieving most of its objectives despite challenges from COVID-19 and economic disruptions. It successfully implemented renewable energy technologies, enhanced local capacities, and promoted gender inclusivity, although monitoring of energy savings and GHG reductions was limited. The project adapted well, meeting revised targets under challenging conditions.

The Sri Lanka Project interventions were assessed as **effective (5 = Satisfactory (S)).** The assessment of a project's effectiveness is concerned with the extent to which an objective has been achieved or how likely it is to be achieved. The assigned rating is based primarily on the level of achievement of outputs, both in quality and quantity. Considerations such as the progress made towards outcomes, how well the project outputs and outcomes were informed by the theory of change underpinning the project, the contribution of capacity-building activities to project outcomes, measures adopted to manage the impacts of Covid-19 pandemic, and the project's contribution toward empowering women were also factored in gauging effectiveness. The primary data sources for the effectiveness analysis were project work plans and progress reports, project communications, interviews with PMU staff and main implementing partners of the project, interviews with project beneficiaries and their feedback on the contribution from outputs, and risk logs.

Table 7 Project Multiyear Workplan Indicator Reporting – Sri Lanka Project Segment

Outputs/Indicator	Baseline	EOP Values		Observations
		Target	Actual	
Outcome 1. Demonstrated use of hybrid RET systems for energy savings and GHG emission reduction in small & medium-sized agro-industry including farm, agricultural activities, and agro-processing				
Output 1.1: Capacity of two Provincial Councils to establish energy savings & GHG emissions reduction targets for the agro-industry				
▪ Biogas and Solar data Collection system established ▪ Provincial Council staff and beneficiaries trained	▪ 0	▪ 01 database ▪ 125 PC staff ▪ 30 beneficiaries	▪ Database established ▪ 134 and 25 trained	▪ Achieved, 100% ▪ Achieved, 102%
Output 1.2: Data consolidated to support the formulation of provincial energy plans				

▪ Agriculture sector energy-related data feeding to ENERGIS/ EDMS established ▪ Provincial energy plans developed and updated	▪ 0	▪ 01 system ▪ 04 New plans, ▪ 01 Updated	▪ System established ▪ 5 PEPs developed	▪ 100% ▪ 100%
Output 1.3: Capacity built through demonstration				
▪ Feasibility studies on the appropriate technology for the demo projects prepared ▪ Demonstration sites selected covering all the provinces according to project objectives ▪ Number of technologies transferred & tested ▪ End users trained on technology applications, O&M, and safety ▪ Number of operational RETs systems	▪ 0	▪ 20 Reports ▪ 15 sites ▪ 03 technologies ▪ 30 end users trained) ▪ 15 RETs	▪ 30 reports ▪ 08 ▪ 03 sites ▪ 35 Trained ▪ 08 RETs	▪ 150% ▪ 53% ▪ 100% ▪ 116% ▪ 53%
Outcome 2. South-South Knowledge and Experience Exchanged				
Output 2.1: Tailored mentorship/traineeship program for exchange with China developed and participants trained				
▪ Capacity needs assessment reports prepared ▪ No. of participants training ▪ No. of participants in system design training ▪ % of positive evaluation of the training ▪ Hands-on training course for design and optimization ▪ Regional technology support centers established ▪ No. of participants received training on e-learning	▪ 0	▪ 01 Report ▪ 30 trainees ▪ 30 trainees ▪ 80% ▪ 02 courses 30 participants ▪ 02 Centers ▪ 50 participants	▪ 01 ▪ 30 ▪ 30 ▪ 89% ▪ 02 courses 30 participants ▪ 0 ▪ NA	▪ 100% ▪ Achieved, 100% ▪ 100% ▪ 100% ▪ 100% ▪ 0% ▪ NA

course on SSC center website				
Output 2.2: Energy stakeholders in China and Sri Lanka are exposed to best business practices in the RE industry				
▪ No. of reports produced on best business practices workshop ▪ No. of participants in best practices workshop ▪ No. of Financial Institutions attending forum ▪ No. of Sri Lanka participants to Business platform in China	▪ 0	▪ 3 for the three sectors ▪ 10 ▪ 05 ▪ 10	▪ 03 ▪ 0 ▪ 05 ▪ 10	▪ 100% ▪ 0 ▪ 100% ▪ 100%

Alignment of Project Results with the Project Objectives:

How well the project outputs and outcomes were aligned to deliver the project objectives is a critical consideration in assessing the effectiveness of interventions. Project outcomes must be feasible and related to the implementation logic and theory of change of the intervention. The achievement of planned outcomes when delivered was assessed to ensure the achievement of project objectives. It was estimated that the project made satisfactory achievements toward achieving the objective in the installation of RETs. It had limited success in effectively monitoring energy savings and GHG emission reduction from project interventions despite having delivered the necessary capacity building. This can be attributed partly to the difficulty in motoring effects of interventions with relatively small individual impacts, thinly distributed across a large geographical area.

***Level of Achievement of Planned Results*:**

The project log frame targets at the output level were defined in terms of a range of activities as seen in **Annex 2**. At the time of the project launch, specific targets were established for many of the capacity-building activities, but not for the supply and commissioning of RETs due to lack of precise information on the potential technologies and cost considerations. The Project faced significant operational constraints in areas such as face-to-face contact, international travel, mobility, breakdowns in RET supply chains, and cost increases from the pandemic and economic crisis, and made significant changes to its work plan to achieve the expected results but with some delays. The Revised Multi-Year Work Plan adopted a pragmatic results framework.

The progress in achieving updated output targets was very satisfactory with targets reached or even exceeded by many indicators. Weighed against the additional time made available for the delivery of them due to project extensions, this is to be expected. The extended project life provided a cushion to plan and

deliver outputs, although a significant portion of the time available for field operations was lost due to COVID-19 and the unrest in the country from the economic crisis. Nonetheless, the over-achievement of targets at the output level is a testament to the dedicated effort of the PMU team.

The Sri Lanka project achievements were especially high for outputs 1.1 and 1.3 under Outcome 1, which were concerned with the delivery of capacity-building training and the transfer of RET equipment. Under Output 2 a significant amount of training and capacity-building activities was delivered. As revealed from the interviews with provincial officials, the capacity acquired through training was useful but did not translate to anticipated results at a higher level, for example, regular updating of provincial energy databases.

Effectiveness of Key Project Outputs:

In terms of time and quality, the high level at which the outputs were achieved do not fully correspond to their level of effectiveness. Aforementioned delays that disrupted field operations at the same time provided additional time for improved planning enabling their delivery, albeit somewhat late in the project life. Thus, in terms of quality as gauged by actual performance in the field concerns are evident in relation to certain deliverables, particularly small RET tools supplied to farmers. While the RETs supplied were relevant, they varied in impact at the farmer-level. This was more so with solar insect traps and solar animal repeller than with solar sprayers. This was affected by a combination of factors, some of which were related to the planning process such as rigor in beneficiary selection, level of orientation and training, and needs mismatch. However, the proportion of such situations was not significant enough to prevent realizing the primary benefit of awareness raising on the availability of a range of RET options in agriculture sector through trial and demonstration. Details of beneficiary experiences with these technologies described in Annex 3 provide additional details of user experiences.

In the case of large RET transfers, beneficiaries were strongly convinced of the reliability and financial viability of applications such as solar-powered cooling systems (Cold room, Greenhouse, Milk chillers, and Paddle aerators). Even when the beneficiaries were aware of the availability of technology for these uses, the lack of confidence in the reliability of the systems and the high initial investment cost did not give them enough confidence to install these systems. Experience with the systems supplied by the project has convinced users of the economic benefits, system reliability, and long-term sustainability of solar-powered equipment as viable alternatives to totally relying on grid-connected electrical power. The introduction of systems for electricity generation from biogas by demonstrating the potential for installing high-capacity biogas digesters created an interest in expanding the use of biogas technology. While proven systems for biogas digesters have been available in Sri Lanka for several decades, due to limitations associated with using the output in gaseous form the uptake of the technology was confined to small systems. The initiative by the project to demonstrate the feasibility and improved flexibility of attaching electricity generation capacity to biogas digesters appears to be an advantage that favour widespread adoption of the technology as an energy source. The biogas plant commissioned at the University of Jaffna has enabled the successful demonstration of the technology. The challenging initial experience with the UOJ biogas plant emphasizes the importance of paying attention to operational considerations such as

the regular supply of raw material, the O&M capacity on site, ease of access to technology servicing, and the versatility of uses. The biogas electricity generation plant at the DAPH farm in Uppuveli is ready to be commissioned and plans are afoot to extend the use of electricity to a wider range of applications in the farm given the high value of electricity generated from biogas for the farm operations. In terms of trial and demonstration impact, this can be identified as a highly effective intervention.

Addressing of Socio-Cultural Considerations:
The project planning process paid attention to gender and social inclusivity considerations in the delivery of project benefits. The instruction issued to the implementing partners from the provinces to pay attention to a higher representation of women in the beneficiary selection was well adhered to. Also, in the selection of beneficiaries for large RET applications, the project paid attention to gender balance by choosing enterprises that had high women representation among employees.

The beneficiary interviews revealed other opportunities that should be taken into consideration in making technology itself more women friendly. For example, although some recipients of knapsack sprayers were women farmers, the actual use of the equipment was limited to men. While the plastic construction of the sprayer body made it lighter compared to the traditional metal-fabricated knapsack sprayers, the sprayers were still too heavy for use by women despite the advantage that enabled women to use it due to reduced drudgery from the elimination of pumping action. A smaller capacity tank would make the unit usable by women and amenable to its use in the home gardens.

Partner and Beneficiary Capacity Development:
The supply and installation of large RETs were carried out under the direct engagement and supervision of the PMU. Beneficiaries of this equipment possessed the level of competency and financial interest required to maintain the equipment. However, this was not the case for small RET equipment that was supplied through the implementing partners in the provinces and the use theoretically overseen by them. Although, at the time of equipment handover, the PMU arranged 'training of trainers' and even direct beneficiary training of equipment where possible, the transition of knowledge was incomplete in the case of many beneficiaries as seen during the field interviews and inspections. There were several documented instances of improper or sub-optimal use. This resulted primarily from the absence of an arrangement by the implementing partners to have an effective follow-up system after distributing the equipment. An effort to carry out such a follow up was seen only in the Southern Province. Also, poor awareness by field extension workers about the proper usage of the equipment was another factor that prevented them assisting farmers facing problems.

Not having awareness of the servicing arrangements for the equipment was another shortcoming relating to the use of small RET equipment. The equipment was assembled and distributed by the firm contracted by the project which also provided the training. However, provincial staff were unaware of any servicing arrangements, and when equipment breakdown or malfunction occurred, no support was available to the users. As the equipment was distributed more than a year ago, it is plausible that the need for servicing should have been anticipated and addressed. Although the PMU identified the need for regular field visits

to project locations to oversee and monitor the project beneficiaries and the status of RET equipment, with the equipment distributed covering an area as large as a province it wasn't practical to cover small RET recipients adequately. This was one downside of having a small PMU with limited human resources to coordinate a programme with wide geographical coverage.

In terms of awareness building, one of the good practices was the inclusion of several Provincial and District Agricultural Training Centers as recipients of solar-powered RET equipment. The presence of the equipment at these Centers raised awareness about the availability of such technologies among farmers, motivating some to make inquiries about their commercial availability. Support of these centers could have been solicited to hold field days and experience-sharing events around farm-level RET equipment. Communication products developed by the project were designed well to educate viewers regarding the promise and benefits of RETs. Also, media coverage was arranged for project events to draw publicity for RETs. More use could have been made by making the communication products available to use during field extension programmes and training conducted by the technical departments in the provinces.

Strengthening Policy and S-S Partnership Environment:

The Project's Theory of Change and implementation logic were based on finding and introducing appropriate RET applications. The support from Chinese institutions for this process was highly complementary. However, the effectiveness of project intervention in terms of driving policy, regulatory, and partnership arrangement under South-South knowledge and experience exchange for Outcome 2 remains too early to gauge. A major hindrance in achieving a closer collaboration in this area was the restricted communication and people exchange resulting from COVID-19 and Sri Lanka's economic crisis. In terms of operating within a conducive environment for driving knowledge and partnership, the launch of project interventions coincided with a highly challenging period. These delayed or prevented the full development of knowledge-management platforms between experts from China and Sri Lankan stakeholders. The partnership strategy could have been more effective if it was possible to place Chinese Experts in the country, closely working with the PMU.

The UNDP CO in China through the SL PMU led partnership arrangements engaging China Agricultural University (CAU) in developing the research agenda of the Joint Research and Extension Center (JREC), also enlisting the support of the National Center for International Research of Bioenergy Science and Technology (iBEST). The JREC was expected to serve as a learning platform for both China and Sri Lanka to promote international RET transfer and facilitate the adoption of RETs in the agriculture sector. The 'Tailored mentorship/Traineeship Program' for exchange with China remains incomplete due to the delay in engaging a Sri Lankan University as a counterpart. The recognized complexity and learning nature of this process suggest that perhaps the level of effort identified for this task could have been augmented.

4.4. Efficiency

The intervention in both Ethiopia and Sri Lanka showcased positive efficiency in the use and allocation of human and financial resources. Both project segments have *fully* utilized the $1 million provided by the

Government of China, demonstrating their financial management capabilities and efficiency. In Ethiopia, despite some challenges with planning and bureaucratic processes, the strong support from the government and effective funding from the Government of China contributed to a generally efficient utilization of resources. In Sri Lanka, the project demonstrated high-level efficiency, with strategic financial management and adept handling of human resources ensuring resilience and adaptability during economic and health crises.

Finding #9. The Ethiopia project's efficiency is rated as moderately satisfactory, significantly bolstered by strong government support through MOWE, which facilitated key implementations and mobilized regional actors. However, challenges such as inadequate resource planning and bureaucratic hurdles impacted the overall efficiency, limiting the project's ability to fully achieve its objectives.

Based on the progress in implementation of the Ethiopia Project the efficiency of the project is **4 = moderately Satisfactory**

Role of government in successful delivery of the project

The renewable energy development project mainly biogas-biomass development to generate electricity for productive use is new and unique to the country. It is a new idea to induce a successful project intervention promotion to public institutions in simplifying jobs and the restoration of the existing knowledge and experience. The engagement and support of the government agency, MOWE, expressed as it induced ownership of the project at different levels, embedded its activities under the government structures, funded the project for its effectiveness, mobilized actors across the regions and followed its implementation constantly[13]. The government through its MOWE involved in the resolution of challenges affecting the delivery of the project, most of which required technology transfer interventions at public institutions as a strategic change.

An example of the strategic change the government made to the implementation of the project was collective effort aimed at advancing the productive use of renewable energy technologies installed biogas and solar systems and appliances, with people from communities, universities, schools and other public institutions in rural areas, benefiting people of which 32 percent female. The government hosted National South-South Project Steering Committee (NSSPSC) meetings and participated at the state minister level on discussion of major project progress, outstanding challenges, lessons learnt and the way forward. It was learnt that the involvement of the MOWE was more than it was expected in that it totally assumed to the project ownership, covered costs of implementation mainly experts cost outside its contribution for further enhancement the project efficiency. MOWE also created good relation with UNDP and donor partners and took immediate action when challenges occur. For example, it utilized UNDP's global procurement experience in enhancing procurement process with good quality bidding for efficient performance of the project. Communications with regions were somehow efficient and induced the commitment and ownership of the regions to the project advancement. It also engaged them to available capacity building, created knowledge management platforms and online communications. The overall

project prospects boosted the capacity of the government for its initiation that culminated in effective project implementation on the installation, electric wires lining and etc.

Sufficiency of Human and Financial Resources for Project Delivery

It was indicated that the effectiveness of the project has burdened the implementing agency, MOWE, since the involvement of the experts on the project design was minimal and budget for project implementation related technical requirements were not adequately considered[14]. It was forced the Ministry to allocate expertise covering the back log on providing assistance to regions that exposed it to unforeseen budget and technical inputs. In addition, there were staff turnover that created gaps of knowledge and capacity building mainly in areas of monitoring and evaluation. The budget assigned for the follow up and M&E section for the Ministry was low and led to miss management of technical requirements and reprogramming of the activities, reallocation of financial budget outside the project budget to fill the gap.

On the other hand, the project had created access to experience sharing, exchange of practical visits and workshops that initiated the staff to reach the project inputs to wider users and regional and institutional practitioners. The project was uniquely considered and taken care at government structures and back logs were tried to be covered to ensure efficiency of the project implementation. Technology transfer to institutional setups in the implementing areas upgraded the capacity of energy related experts and researchers to work more and satisfy the user community.

The project team at UNDP and across the project donor had strong experience in financial, procurement and coordination among others. The implementing agency has used these experiences on the implementation of this project. It identified the gap of experience in the international procurement procedures and practices to control the quality of the bid, time of floating in the air, identification of incompetency of the bidders and other factors and endorsed and used UNDP procurement practices to enhance quality and efficiency of the procurement. The financial management prospects of the project showed that the total estimated project budget to meet up with the achievement of its objectives was USD 2,042,394. The actual budget deployed and implemented in the project was USD 1,628,663.44 (79.74%). The project implementation rate compared to the allocated budget was showing lower implementation rate.

Although the management has delivered their duties to enhance the implementation of the project, the project was not efficient due to different barriers. The main factor affected the efficiency of the project's financial grant implementation next to impact of COVID 19 was the bureaucratic hurdles faced by the project in the international procurement related to grant funds, peace and security, change in management structures, delay in procurement management process to maintain quality, as well as change in site selection where the project was to be implemented. Interviews with stakeholders of implementing agency revealed that the efficiency of the project would have been enhanced if there were no delay in quality bid and supply delivery. Correspondingly, it was pointed out that the project has multi stakeholder actors which are an opportunity in knowledge and experience and responsibilities sharing on

one hand but a challenge in decision making on the other hand. The reason brought forward was that each entity follows the institutional interest to be maintained in the processes that influence the efficiency of the project implementation.

Finding #10. The Sri Lanka project's management of resources and strategic adaptability in response to significant challenges is rated highly satisfactory. The project effectively leveraged its management structure, financial strategies, and virtual tools to continue delivering impactful interventions despite economic constraints and the COVID-19 pandemic.

The use of project resources in Sri Lanka was very **efficient (6 = Highly Satisfactory (HS)).** This determination is based on the efficacy of the use of programme resources and funds for project management arrangements and delivering the interventions, how strategically funds have been allocated to promote critical activities, for example, those with higher impact, and the allocation of funds to support partner activities including capacity building. Data for making the assessment was primarily sourced from project documents, work plans, and progress reports, as well as interviews with principal implementing partners, i.e., SLSEA, and Provincial Council staff.

Project Management Structure:
The PMU was staffed by a small professional team that consisted of a highly experienced Program Coordinator, Junior Program Officer, Technical Coordinator, and Project Assistant, and supported by the 'Energy Sector' Team of the UNDP. The project design benefitted fully from UNDP's comparative advantage in Sri Lanka, strongly in line with the UNDAF and CPD priorities of the agency. Well-organized regular coordination and communication arrangements with the UNDP guided project implementation efficiently. The PMU enlisted external resources efficiently to develop the information necessary to deliver project activities by contracting out feasibility studies, screening of beneficiaries, technical design etc. The close and regular communication lines with the provincial staff were maintained throughout using multiple platforms amidst difficult operational environment. This relationship made them close collaborators in organizing training with the participation of a large number of officials from the relevant provincial departments.

All key components of the project including work planning, completion of needs assessments, feasibility studies, training, etc. were impacted by shocks to the economy, i.e., at the start by COVID-19 and thereafter by the economic crisis in Sri Lanka. The PMU also developed contingency plans by conducting a comprehensive risk assessment of the situation. The project effectively used virtual settings to conduct meetings and training that required the coordination and participation of 5 provincial teams by providing communication devices and equipment to Provincial councils and government officers to facilitate that. This limited the disruption of the work programme in an environment where COVID-19 quarantine restrictions prevented physical meetings, training, and field visits.

Financial Management, Implementation, and Monitoring:

The project efficiently utilized the funds available, with the implementation period extended by 2 years with the actual budget remaining unchanged. The project implementation and expenditures were managed by the UNDP CO under the '*Direct Implementation'* modality that provided the required flexibility to adjust expenditures '*on-need*' basis as the expenditure pattern was extremely hard to predict both due to the complex nature of the 'hardware' supplied and the changing operational environment. The final project budget was USD 1 million of which USD 262,955 was spent by UNDP China CO for the project expenses in China and the remainder by UNDP CO in Sri Lanka. The share of the project management expenditure was less than 15%.

Rising costs due to the economic crisis limited the number of technologies transferred and piloted. Project costs were managed to remain within budgeted levels by scaling back some activities without causing major disruptions in the range of RETs supplied. Also, potential beneficiaries faced difficulties in participating in cost-sharing arrangements requiring the project to supply them on a grant basis, even while facing funding limitations. This shows that the project successfully used adaptive management to protect implementation efficiency amid two back-to-back shocks.

Table 8 Sri Lanka Project Financial Performance (as of March 2024)

Project Activity	Budgeted (US$) (Revised)				Actual Expenses (US$) as of Jan 2024 (including anticipated)						
	2019	2020	2021	Total Year 3 -5	2019	2020	2021	2022	2023	2024	Total Year 3 -5
1. Capacity building of 5 PCs	24,070	159,713	61,396	245,179	3,072	47,821	71,156	22,687	1,170		**145,906**
2. Formulation of PEPs	500	57,840	28,368	86,707		4,027	13,361	8,845	2		**26,236**
3. Capacity built through demonstration	13,500	449,126	237,456	700,082	4,593	1,667	74,703	115,962	5,955		**202,880**
4. Tailored mentorship	8,500	204,000	78,700	291,200	222	1,104	53,726	10,334	115,419	6,700	**187,505**
5. RE Best business practice exposure	0	129,800	165,001	294,801		5,714	15,137	20,475	14,919		**56,244**
6. Project Management	71,536	139,936	170,560	382,032	15,028	33,136	34,225	44,253	8,343		**134,985**
Total Spent by SL CO	**118,106**	**1,140,415**	**741,480**	**2,000,000**	**22,915**	**93,468**	**262,309**	**222,556**	**145,807**	**6,700**	**747,055**
Spent thru UNDP China CO											**252,945**
CAU Expenditure (from SL CO budget)											(193,600)

The Sri Lanka Project planning was made difficult by the pandemic and economic situation. The project had a three-year life running from May 2019 to May 2022. Then the project closing date was extended to Dec. 21, 2022, and thereafter to 30 June 2023. Presently, it is scheduled to end on 31 May 2024. In terms of annual expenditure, major expenses were incurred from 2020-2023 with 13%, 35%, 30%, and 20% of the expenditure taking place annually. These were mainly on the supply of solar-powered RET infrastructure and the capacity building of the 5 provinces. The project used the narrow windows of opportunity that opened from 2020-2022 amidst the ongoing pandemic and economic crisis to get the RET infrastructure in place. During 2023 and 2024 the PMU efforts have been focused on consolidating the investment made on the Solar RETs and completing the installation of the biogas infrastructure under

the ‘Tailored mentorship’ activity. This demonstrates the dexterity shown by the PMU team to maneuver the project through a turbulent period.

Project Management:
Reporting remained a challenge throughout although the timeliness and frequency of Financial and Progress reporting is customary for projects of similar budget and lifespan. However, the complexity of the project implementation required a great deal of proactive action on the part of project management and the UNDP CO. The RET equipment to be installed had to be virtually custom-designed for Sri Lankan conditions as the comparable RET equipment available in China considerable scale mismatch as far as the Sri Lankan requirements were concerned. The PMU had to engage in a great deal of handholding to have the Sri Lankan engineering firm selected to partner in the customization of the equipment.

Internal communication was a major hurdle for smooth project implementation. During the project planning stage, it was envisaged that Chinese experts would be placed in the two implementing countries which did not materialize in the backdrop of the COVID-19 pandemic. The project made every effort to continue partnership arrangements between Sri Lanka and China with communication, coordination, and joint decision-making adhered to despite serious challenges posed by the limitations of person-to-person exchanges. The National South-South Project Steering Committee (NSSPSC) meeting in Ethiopia was convened by Ethiopia CO in December 2022. In China, the ExO meeting was convened by China CO on 28 September 2022, during which key issues were discussed concerning the progress being made, no-cost extension, and next steps. Led by PMUs in Sri Lanka and Ethiopia, regular monthly meetings, as well as ad-hoc meetings, were held with Chinese and local experts through multiple communication channels, ensuring smooth communications and timely implementation and problem-solving.

4.5. Sustainability

The sustainability assessment of the Sri Lanka and Ethiopia projects highlights both shared strengths and challenges in maintaining long-term impacts.

Finding #11. Overall, the project's progression into a new phase is strongly supported, particularly, by findings from interviews with Chinese partners, highlighting the need for additional resources, deeper private sector integration through UNDP's networks, and enhanced face-to-face interactions.

Interviews with Chinese government and academic partners have highlighted great potential for advancing to a new phase of the project, given the substantial technical demand and the solid foundation established by the current phase. These discussions revealed that not only is there a continuity in interest and need for the project's offerings, but the groundwork laid previously makes the next phase poised for smoother deployment and potentially greater impact.

The Chinese partners expressed a keen interest in securing additional resources for the next phase, emphasizing the importance of integrating the private sector more comprehensively through the UNDP's networks and systems. They also stressed the need to enhance face-to-face interactions which were

planned but limited in the current phase due to the COVID-19 pandemic. Such interactions are crucial for effective knowledge transfer and building stronger partnerships. Furthermore, the need for capacity building was underscored, not only for the recipients but also for the providers of project technology. This dual focus on capacity building is essential to ensure that both sides are equipped to handle the challenges and opportunities of the project effectively.

These insights suggest that moving forward, new phase could focus on more robust resource mobilization, deeper integration of private sector capabilities, and enhanced interpersonal exchanges to foster a more resilient and dynamic collaborative environment. This approach would not only sustain but amplify the benefits of the South-South cooperation framework, making it a cornerstone of the project's strategy in its next iteration.

Below is the comprehensive analysis overview of the project sustainability, covering financial sustainability, economic sustainability, political sustainability, and social sustainability. For more details, refer to Finding #12 and Finding #13.

Financial Sustainability	Moderately Likely	In Ethiopia, the financial sustainability of the renewable energy initiatives has been moderately promising, primarily due to the government's strong support and investment in renewable technologies. However, the financial continuation of these projects is not entirely secured, as it heavily relies on continued government prioritization and funding. An established budget allocation or financial model conducive to long-term sustainability is yet to be fully implemented. In Sri Lanka, financial sustainability appears stronger due to the integration of RETs into national energy strategies, which is likely to attract continuous funding and policy support, ensuring the longevity of project impacts.
Economic Sustainability	Moderately Likely	Economically, the projects have contributed to local development by reducing energy costs and promoting sustainable agriculture practices. However, the economic sustainability of these results is contingent upon the broader adoption and replication of the technologies introduced. This requires ongoing capacity building and market development to foster a self-sustaining ecosystem of renewable energy solutions.
Political Sustainability	Moderately Likely	The political environment in both Ethiopia and Sri Lanka supports the continuation of renewable energy projects. In Ethiopia, the alignment with the national 10-Year Development Plan suggests strong governmental backing, although shifts in political priorities could alter the project's trajectory. Similarly, in Sri Lanka, the commitment to achieving 'Carbon Net Zero' by 2050 provides a stable political foundation for the sustainability of renewable energy projects.

		Nevertheless, political stability and consistent policy enforcement remain essential to safeguard the project's achievements.
Social Sustainability	Likely	Socially, both projects have successfully fostered community engagement and built significant capacities. The evaluation findings highlight that the capacities established through the project, particularly in Ethiopia, have laid a strong foundation. To build on the social gains already achieved, it would be beneficial to implement ongoing training programs and continue to engage the community actively.

Finding #12. The overall sustainability of the Ethiopia project segment is rated as "Moderately Likely" across most dimensions, with "Likely" in social and environmental sustainability. The project demonstrates a moderate likelihood of continuing its renewable energy services post-implementation, supported by varying degrees of institutional commitment, financial planning, and socio-economic integration, though challenges in technical capacity and resource allocation persist.

In Ethiopia, the assessment of sustainability calls for evaluation of risks that may affect the continuation of the project results. Sustainability of the project relies on functional solar and biogas-biomass renewable energy technology transferred as core results that was put in place analysed as in the following.

Institutional framework and governance sustainability

MOWE has invested as equally as the donor and internalized the importance of the inputs and expected to disseminate and expand the research output to the rest of the communities in rural areas through research and demonstrations. Training provided to representatives of the relevant national institutions beneficiaries or implementing agency has initiated the already existing institutional base links in the country. Ethiopia enabled the respective legal frameworks for institutions to be led by respective ministries. Institutions need be aware of the state of the project implementation and considered it as its mandate to promote that favor the sustainability of the project at lower governance project level.

The institutional set up the project implemented was in the areas of education and agriculture. These institutions are directly related to the project (district administration, district education office/or district agriculture office and research and higher education institutions) were the core governance structure of the project and need to interlinking the day to day activities of the project to their works, and to the alternative financial source or to their own budget lines so run the project sustainably. In this regard, the involvement of the anticipated actors in the project implementation and ownership has disparities from region to region.

The solar project in South Ethiopia Peoples Region, Wolaita Zone, Bolosos Sore District, Newasie Mulu Jounior Secondary School owned by the administration/ local government agency through organized two hierarchical communities based administrative committee responsible and accountable to run the project. The first committee is known as ‘Training Board’ with five members led by Newasie Mulu Kebele

Administration accountable direct to district administration. The second committee is 'Parents and Teachers Joint Committee' with seven members accountable direct to Boloso Sore District Education Office, cabinet member of the district administration. It was indicated that these two entities are jointly working on the project management utilization and future prospects.

In the Harari Region, the two Solar Projects were Karra Primary School found in Karra Kebele (lower administrative structure) of the Region and Kebelle Primary School found in Kebelle Kebele. Both projects were functioning during the field assessment and the community are happy in having such project although they complain it is late. In contrary to Newasie Mulu of South Peoples Region the institutional framework and governance that maintain the functionality of the project for sustainability is not organized and coordinated. Responsibility and accountability of the project lies on the school director with week 'Parents and Teachers Joint Committee' supporting the administration of the school. In the present situation the project will moderately likely to continue to provide its services following the phasing out of the project. In addition, the project sites were under gridline hydro electric power supply installation that might impact on full capacity utilization of the intended project and or might lead to abandonment incase simple technical failure that could be corrected occurs.

The biogas project under construction in Wolaita Dodo University campus has institutional framework and governance sustainability prospective. It was learnt that during the field visit the institutional setting of the project was under discussions among the concerned management authority and research experts who have strong affiliation in the project proposal writing during selection of the institutions for this project. It is believed that the discussion will end with fruitful operational direction for the project and the project will likely continue to provide services following the phasing out.

The project capacity building (training and experience sharing) knowledge was very unlikely to continue supporting activities of the initiatives. For example, the capacity building activities accruing to members on the project level (solar project) were a kind of orientation to the appliances not more than off and on button management. It needs technically incentivized and well oriented community technician to continue with promotion and advancement of service delivery and minor maintenance and replacement of the appliances. The other key important factors critical for the sustainability of the project service delivery indicated by the users at all level was lack of budget and resources to maintain its continuity to service delivery and restoration of the benefit. Likewise, there was no documented data indicating the process, procedures, guidelines and directives to the utilization, storage and avoidance of appliances in case something wrong happened. For example, there are 32 solar appliance batteries in each solar project sites serving with dangerous chemical for human being and no one knows how to manage them in case something happened.

Institutional framework and governance sustainability of the project is rated **3 = Moderately Likely (ML).**

Financial Sustainability

The financial sustainability has examined in relation to the importance and recognition of the investment mainstreaming to the obligations of the local government and or community resources. Budget or community resource allocation for the investment is crucial to maintain the functionality of the appliances and promoting community benefit in renewable energy service. As discussed above, Newasie Mulu Jounior Secondary School organized structures were working on income generation plan that include: provision of power/ light service to the surrounding community around the project and collect service fee, promotion of school farm to power generated pump irrigation and boost income from the farm and provision of computer training to the local community to collect service fee for the school. This is promising activity to ensure the sustainability of the project and effective utilization of innovation technology through responsible workforce and creating job for the economic improvement of the community.

On the other hand, the projects in Harari Region have no such potential perspective and sector government structure rarely involved to mainstream the project in the government budget. In addition, it was observed that both project sites at the time of this TE field visit are getting gridline power structures that can influence the functionality of these solar projects in the future. It was learnt that each solar supply appliances produce nine kilowatts but each school use only two kilowatts (22% of the potential). One can observe that there is no vision or effort to use the remaining potentials for other purposes to generate income or to reach neighbouring community with off grid. Actually, the project needs a proactive approach towards communication with the wider circle of stakeholders and local and regional administrations. Thus, the project will moderately likely to continue to provide services following the phasing out of the project.

The biogas project under construction in Wolaita Dodo University has potential sustainability position. It won the commitment as well as the involvement of top university management body and the Innovation and Research Department. It is, therefore, clear that future actions related to the project will either mainstreamed to the university budget line structure or functioning with alternative financial management structure.

The evaluator rates the financial sustainability as **3 = Moderately Likely (ML).**

Socio-economic Sustainability

All stakeholders of the Ethiopia Project agree that the projects do not have socio-economic risks to sustainability. Despite the delays caused in the implementation, most project activities seem to have been achieved except the biogas project. A major risk of Socio-economic Sustainability to the project is failure to maintain the safety of the appliances which restricts the potential capacity of the project rendering its services and limits its service lifetime.

The Socio-economic sustainability of the Ethiopia Project is rated **3 = Moderately Likely (ML).**

Social and Environmental Sustainability

Interview with all resource persons revealed that the project does not have negative social and environmental impacts. They rather mentioned that project implementation, the biogas, support cleaning the environment from dangerous gas mitten and guard against any impacts. Similarly, the byproduct of the biogas is organic and replaces chemical fertilizer contributing to sustainable environmental and social safeguarding.

Social and Environmental sustainability of the project is rated **4 = Likely (L).**

The results of the overall sustainability of the project are presented in the table below.

Table 9 Ethiopia Project Results of the Sustainability Rating

Sustainability dimension	Rating
Institutional framework and governance sustainability	Moderately Likely
Financial Sustainability	Moderately Likely
Socio-economic Sustainability	Moderately Likely
Social and Environmental Sustainability	Likely
Overall Sustainability Rank	**Moderately Likely**

Finding #13. The sustainability of the Sri Lanka project is assessed as satisfactory, with strong potential for continued impact of RETs integrated into national energy strategies and partner programs. Despite some challenges in ensuring maintenance and operation of small-scale RETs, the project's alignment with the national goal for Carbon Net Zero by 2050 and the internalization of interventions within existing systems suggest a robust framework for sustaining the benefits beyond the project's lifespan.

The Sri Lanka Project results are assessed to be sustainable **(5 = Satisfactory (S)).** The sustainability of interventions was looked at from the perspectives of project interventions sustaining the expected results after the project life, any social, political, or financial risks that may jeopardize the sustainability of outputs, and partner capacity and commitment to ensure continued sustainability including embedding the programme in the internal systems, and post-project arrangements for continuity. Desk review of project plans and documents, feedback from the PMU, and interviews with all key stakeholders including beneficiaries were used to make the assessment.

The outlook for RETs becoming a valuable force in Sri Lanka's future energy strategy remains robust due to the strong policy support to RETs may command with a national target for becoming a 'Carbon Net Zero' country by 2050. The growing cost advantage in favor of solar, biogas, and similar RET technologies due to the rising cost of grid-supplied electricity generated using fossil fuel is another factor that favours RETs. The project experience can support the broad-based promotion of RETs as a means of sustainable development.

Internalization within Partner Working Systems:

Chances of post-project sustainability interventions are improved significantly by the internalization of project outputs within existing partner programmes and operational systems. Some interventions of the project were naturally placed for integration with ongoing programmes like capacity-building training for monitoring energy savings and GHG emission reductions from RETs. The project interventions to enable accounting agriculture RET applications added value to the provincial energy planning and monitoring efforts as the modifications facilitated data entry for 22 different RET applications that were previously not components of the system. Although the incremental benefits from the RET applications were not at a level high enough to generate a great deal of eagerness for accounting present benefits, the availability of necessary tools will add value to the provinces and SLSEA ENERGIS system. The project and SLSEA can also look at ways of incentivizing the provincial authorities to count the benefits of RETs.

Value Creation for RET Equipment:

The Sri Lanka Project was effective in demonstrating that RETs can have applications along the complete value chain from 'farm to fork' with its efforts to introduce a range of novel RET applications. In terms of system sustainability, the large RETs are well disposed to be sustained by the recipients due to the significant economic benefit to the beneficiary. The experience also created incentives for the beneficiaries to explore installing additional systems on their own. However, of the Small-scale RETs, only the solar sprayers have benefits to users at a level that incentivizes the beneficiary to diligently operate and maintain them. The solar insect traps and animal repellers would need to prove their worth to create that level of interest. With a more scientific approach to their use, it is possible to create that value. As the equipment by design was suitable for use in very small land parcels, adjustments like the use of multiple units in a farm or increasing capacity may assist in bridging the gap. These are some follow-up actions the project can investigate before termination to improve the sustainability of RETs promoted by the project.

Essential Support for Widening Benefits from RETs:

The Sri Lanka Project interventions showed that stakeholder interest in RETs is strong even to support faster growth. Intensified efforts such as greater access to information, immediate and significant capacity building in service provision etc. can help turn the corner in making it a formidable force. The partnership strategy enabled the penetration of RET systems into agricultural extension systems. However, embedding RET applications in government programs and systems would need clear economic validation of technologies. The project can support some research in that regard to establish conditions for viable Ret application by way of clarifying the scale of operation etc.

The PMU was closely engaged with the delivery and post-installation operations of the large RET equipment using solar power. In terms of the level of expenditure, these were the major investments of the project. At the same time, the economic benefits to the recipients from their use were at a level that moved them to have the equipment promptly serviced. Thus, a strong working relationship materialized between the engineering firm that fabricated and supplied the equipment and the beneficiaries.

A greater emphasis on joint monitoring visits engaging provincial implementing agencies could have strengthened monitoring and backup support to small RET recipients many of whom had been left on

their own since the receipt of equipment. Although a periodic follow-up with beneficiaries had been discussed, the practice had not been put in place. This could have also improved learning from each other's experience and identified the need for pragmatic troubleshooting and servicing arrangements early.

4.6. Gender and Cross-cutting Issues

The evaluation of gender and cross-cutting issues in the Sri Lanka and Ethiopia projects reveals both accomplishments and areas for improvement in promoting gender equality and inclusion.

Findings #14. The project segment in Ethiopia effectively addresses gender and disability inclusion, achieving satisfactory outcomes by ensuring benefits reach women, girls, and persons with disabilities. Additionally, it excels in environmental and social safeguards, maintaining high standards throughout implementation.

Gender

Gender considerations were very high in the project design and targets were set to gender balance service delivery. Actually, the project implementation was institutional where every citizen could get the equal services regardless of the previous gender imbalance impacts in the country. It is customary that in Ethiopia the presence of women in expertise level to be assigned as executers of projects and or programs are scanty. Likewise, in the project implementation structures of the implementing agency downwards to the regions were dominated by male. It was clear and significant that there is a back log of gender disparities in the country as expertise and or as project and program management staff. Women were not found in such activities of working groups related to this project except one researcher at Wolaita Sodo University.

Before the introduction of the project, women in Ethiopia, particularly in rural areas, faced great challenges related to energy access and economic empowerment. The lack of clean and reliable energy sources disproportionately affected women, burdening them with time-consuming tasks and limiting their opportunities for education and income-generating activities. The project's results facilitated advancements for women by introducing renewable energy solutions that reduced labor-intensive tasks associated with traditional energy sources. For instance, the introduction of biogas systems in community settings not only alleviated the workload of women in fuel collection and cooking but also improved indoor air quality, reducing health issues related to smoke inhalation.

To the benefits of the project outputs, the project was serving the community in which the majority of the beneficiaries are women and girls. A school director of Harari Region using solar energy implemented by the project indicated that the majority (about 52 percent) of the beneficiaries of the school are female. This was also repeated in South Ethiopia Peoples Region, Wolaita Sodo, Newasie Secondary School using solar energy served by the project. It was also learnt that the biogas plant under construction in Wolaita

Sodo University relives noteworthy ratio of female cookers and benefiting them from smoke, tussle of fire woods, congestions and suffocation.

Thus, gender consideration of the project implementation is rated **5 = Satisfactory (S).**

Disabilities

The Ethiopia Projects implemented in all places are serving the community of all kind and the benefit is significant for women, children and disabilities. As special case, the project site selected and solar energy appliance implemented in South Ethiopia Peoples Region, Wolaita Sodo, Newasie Secondary School is serving the disabled children that made the project benefit significant for disabilities. It was also learnt that the project under construction in Wolaita Sodo University will also serve the whole community regardless of sex, religion, culture and disability.

Disabilities consideration of the project implementation is rated **5 = Satisfactory (S).**

Environmental and Social Safeguards

It was in the process of project implementation that the Program and Project Management (PPM) unit decided to undertake Environmental and Social Safeguards (ESS) assessment for the projects to be implemented. It was done as per the UNDP Guidance and Template to first identify and then try to avoid, mitigate and minimize adverse environmental and social impacts that may arise in the implementation of both solar and biogas projects. Resource persons at all level confirmed that the projects do not have any adverse effects on the environment and social safe guards. This was also observed during the field visit.
The Ethiopia project consideration on Environmental and Social Safeguards is **6 = Highly Satisfactory (HS).**

Finding #15. The Sri Lanka project effectively promoted gender equality and social inclusion, achieving satisfactory levels of women's participation and support for vulnerable groups. However, deeper gender equity opportunities were missed due to limited gender analysis resources.

The Sri Lanka Project interventions were used to promote gender equality and social inclusion as cross-cutting issues and were successful **(5 = Satisfactory (S))** in achieving positive results. Its efforts to be inclusive at the operational level by creating more space for women's participation and inclusion of the vulnerable were effective. However, potential opportunities for strengthening gender equity in RET interventions were missed due to the inability to factor in gender equity in greater depth. As discussed below capturing such opportunities required an in-depth gender analysis for which the time and resources were not in place. The evidence on the project's treatment of gender was gathered from the work plans and progress reports, project communications and media messages, interviews with implementing partners, and beneficiary interviews.

The Sri Lanka Project followed the conventional approach of generating gender-disaggregated data regarding project interventions. Gender representation among participants of capacity-building programmes in the 5 provinces was satisfactory with 26.7% women participation overall. Among the 134

participants of the Provincial Training Programmes, women accounted for 25% whereas in the RET capacity-building training women's participation was 33%. The interest for accommodating women and the vulnerable was maintained in selecting RET beneficiaries too. Of the 6 large-RET system beneficiaries, the Solar-Powered Greenhouse recipient was female. The Solar-powered Greenhouse and the Cold Room as well as the Solar Grid systems powering milk chillers employ women in the workforce for daily operations creating stable employment. Among the 225 small RET system recipients, 40 (18%) were women.

As highlighted earlier in the discussion on the effectiveness of project interventions, gender equity was achieved in the distribution of benefits by selectively accommodating women among beneficiaries and tracking the presence of women in the workforce of businesses receiving large RET equipment. The project used a proactive approach to promote gender mainstreaming by accommodating more women among beneficiaries of small solar RET equipment by requiring the provincial Department of Agriculture to include more women when selecting beneficiaries. The concern for the vulnerable was operationalized by favouring remote agricultural areas to receive more small RET equipment. It can also be inferred that the customary practice of identifying the male household member as the Head of the Household for registration purposes leads to the undercounting of actual women beneficiaries.

Additional gender-related benefits were identified with solar animal repellers as under normal farm settings it is the women who are generally employed to protect cultivations from damage by birds and other small animals. Furthermore, there was the associated benefit of reducing drudgery as chasing birds is a physically straining activity. The project interventions did not offer specific opportunities to consider disability inclusion.

The fieldwork revealed that accommodation of more women among beneficiaries alone is insufficient to guarantee equality as seen from the experience with solar-powered sprayers. As the sprayers are designed assuming operation by men, even in cases where the recipients were women, the sprayers were operated by the male farmer. It is necessary to look into leveraging technology itself in screening Interventions for stronger gender benefits.

The project reports did not demonstrate that it tracked any changes in women’s economic and social status because of its interventions. Breaking through structural aspects such as social norms and barriers requires deeper analysis and responsive action. Agriculture is well known for having deeply ingrained customs that work to women’s disadvantage. Engaging a gender consultant would have been useful to recognize other ways of better addressing gender concerns and social exclusion.

In conclusion, the project’s efforts to adhere to the Leave No One Behind (LNOB) principles are commendable, particularly in its effective promotion of gender equality and social inclusion. Although, as the evaluation observed, the integration of persons with disabilities (PWD) into project interventions could be further enhanced, it is encouraging to see that the initial project designs have inclusively addressed several community segments. Recognizing and addressing this could enhance the inclusivity of

the project, ensuring that the benefits of development reach all community members, including those with disabilities, thereby strengthening the project's overall impact and alignment with LNOB principles.

4.7. Risk Management

The risk management analysis for projects in Sri Lanka and Ethiopia identified effective strategies and areas for improvement.

Table 10 Risk encountered during project implementation

Risks encountered in Ethiopia	Risks encountered in Sri Lanka
Political instability	Beneficiary capacity
Insufficient coordination	Market disinterest in RETs
Covid-19 pandemic	Pandemic and economic crisis
Procurement system complexity	
Security risks	

Finding #16. The Ethiopia project effectively managed risks through strong coordination and robust management structures, adapting to unforeseen challenges like COVID-19, procurement issues, and political changes to maintain project performance.

The Ethiopia Project design dealt with the initial risk analysis and assumed the risks are monitored and updated the risk log accordingly. Risks and liabilities related to the implementing partner's security, and the full implementation of the project security plan emanated from contextual and programmatic conditions that culminating in the identification of project possibility. It was assumed that aversions be tackled to ensure national ownership and commitment to the achievement of project objectives, establishing and operational coordination mechanism and platforms in a timely and effective manner. It listed and illustrated major risks such as political instability, lack of coordination between implementing partners, willingness to engage in project led initiatives leading to limited technology and know-how transfer in pilot project country, and insufficient maintenance of equipment provided.

These key assumptions underlying the theory of change/strategy for this project were existent and well framed for the successful implementation of the project. UNDP played coordinating and closely monitoring role in collaboration with MOWE, and other key actors established a Project Management Team and appropriate governance mechanism based on a result-based frameworks. The risks were mitigated by ensuring that all project activities are closely coordinated with MOWE and other government agencies and implemented in partnership with government actors including universities and regional bureaus, and with door (Trilateral South-South Cooperation) partner.

Trilateral South-South Cooperation Project Coordinator established to work closely with all implementing partners, UNDP Ethiopia, UNDP China, the MoWE, Regional Energy Bureaux and other local actors. Project Management Unit (PMU) within MoWE was to ensure the day to day management of the project. To increase coordination of project activities the PMU was to be assisted by projects coordinators from GEF and TSSC projects. The project coordinators were responsible to smooth project implementation and raise

key concerns to be addressed as they arise in a timely manner. The Trilateral South-South Cooperation Project Coordinator was to oversee the harmonized implementation of the project activities and ensure overall project management, including financial management, on a full-time basis. Ensuring this management structure and coordination among stakeholders, the UNDP worked on the involvement and commitment of the government in owning the project idea and maintaining the project ownership at the ministerial level. This has reduced risks anticipated during the design and enhanced the performance of the project.

Unexpected risks that were not considered during project design were occurred during project implementations. The first was the spreading of COVID-19 globally causing huge impacts on health, economics, work, communication, travel constraints that hindered effective implementation of the project. The second unforseen risk occurred was the complexity of the in-house procurement portal, and the system glitches due to the migration of procurement system (ATLAS to QUANTUM) that enforced implementation to postponement. The third was Ethiopia's general political turmoil, process of government transition especially in leadership and government structure, etc. that contributed to impact on timely and efficiently implementation of the project.

For further understanding of the project status in terms of assumed risks and risk mitigation measures with assumptions to risks and the end term reliabilities related to the project implementation were presented in the following Annex 10. It is the opinion of the Evaluator that the project risks were adequately identified, and the provided mitigation measures were appropriate. Risks encountered during the implementation of the project were timely identified and measures were taken to minimize the incidence of the risks.

Finding #17. The Sri Lanka project adapted its risk management in response to the pandemic and economic crisis, effectively addressing some risks while continuing to face challenges with beneficiary capacity and market conditions for RET investments.

The Sri Lanka ProDoc identified 13 risks, having political, operational, or organizational origins and associated impact and probability scores that placed 2 in the high-risk category, 6 in the medium, and 5 in the low risks. The pandemic event in 2019 and the economic crisis in 2022 completely redefined the risk profile. Applicable risk profiles were updated periodically to reflect the evolving environment. Management measures undertaken to deal with these risks were reported as a part of the progress control process. In 2022, the risk profile was changed to 6 risks with some new risks related to the 2 shocks added. One risk that featured throughout with a 'high risk' ranking was 'Insufficient knowledge and capacity of the beneficiaries to operate and maintain RET equipment'. The identified mitigation actions included extensive training on O&M and safety for officials and end-users to build a pool of experts with knowledge and skills to address the risk. The end-of-project status raises the concern that this risk has been effectively addressed. For example, the solar technology promoted by the project was managed by one provider located closer to the Capital in the Western Province which was not partnering with the

project. There were no branches or agents of the company in the partnering provinces. Therefore, beneficiaries have limited opportunity to get services to meet capacity gaps.

Another important risk identified is 'the lack of interest to implement RETs by industries due to market conditions.' This is a risk that is likely to remain relevant as the affordability of RET investments can remain poor due to high upfront costs. While the project resorted to supplying equipment on a grant basis considering the economic situation prevailing at the time, this will continue to be a challenge unless some form of concessionary financing scheme does not come into place. More work should have been done in terms of working out investment profiles showcasing how the RET systems could have been made more affordable to potential investors. These remain opportunities lost in terms of optimizing learning from the project experiences.

5. Conclusions

At its core, the China-Ethiopia-Sri Lanka RETT Cooperation Project exemplifies a progressive approach to international development through South-South Cooperation, where China, Ethiopia, and Sri Lanka collaborate to address common challenges by sharing knowledge, resources, and technology. This partnership model capitalizes on the distinct strengths of each participating country, crafting tailored solutions that not only meet specific local needs but also contribute to broader global commitments such as sustainable development and climate change mitigation.

In Ethiopia, the project effectively harnessed shared knowledge and resources to tackle localized energy challenges while aligning with broader sustainable development goals. The cooperation led to the successful transfer and adaptation of renewable energy technologies to Ethiopia's unique socio-economic and environmental context. The project's effectiveness in Ethiopia demonstrates the profound impact of collaborative international efforts, significantly enhancing the country's renewable energy capacities and establishing a model for future cooperative ventures.

In Sri Lanka, the project aligned with the national objective of achieving 'Carbon Net Zero' by 2050, greatly benefiting from the insights and technologies facilitated through this cooperation. This collaborative framework allowed Sri Lanka to deploy cutting-edge renewable energy technologies (RETs), which were seamlessly integrated into local energy strategies. The success of the project in Sri Lanka underscores the transformative potential of South-South cooperation in driving substantial environmental progress and sustainable development through shared goals and mutual support.

Conclusion #1. Based on the comprehensive findings, the evaluation team concludes that the Ethiopia Project segment has been rated as **Satisfactory (5),** reflecting a successful overall implementation.

Table 11 Summary of Ethiopia TE Ratings for the Project

Evaluation Criteria	*Rating Score*
Relevance	6 = Highly Satisfactory (HS) [Highly Relevant]
Effectiveness	5 = Satisfactory (S)
Efficiency	4 = Moderately Satisfactory
Sustainability	5 = Satisfactory (S) [3 = Moderately Likely (ML)]
Institutional framework and governance sustainability	5 = Satisfactory (S) [3 = Moderately Likely (ML)]
Financial sustainability	5 = Satisfactory (S) [3 = Moderately Likely (ML)]
Socio-economic sustainability	5 = Satisfactory (S) [3 = Moderately Likely (ML)]
Social-environmental sustainability	6 = Highly Satisfactory (HS) [4 = Likely (L)]
Gender and Social Inclusion	5 = Satisfactory (S)
Gender consideration	5 = Satisfactory (S)
Disabilities consideration	5 = Satisfactory (S)
Environmental and Social Safeguards	6 = Highly Satisfactory (HS).

The TSSCO Project is highly relevant to Ethiopia. The project aligns strongly with national priorities and needs of the country as set in the 10-Year Development Plan targets. It was relevant and focused on introducing new technology, strengthening the capacity of national and regional actors to enhancing innovation in the energy sector that contribute to the improvement of public services delivery in on/off grid areas and to the growth of climate resilient economy and attaining the national and international targets. Moreover, as indicated in its project document, the project corresponds to UNDAF/CPD China Outcome 3 that stated "China expands and improves the effectiveness of its development cooperation with other developing countries through TSSCO framework" and Ethiopia Outcome 5 that states "by 2020 key government institutions at federal and regional levels including cities are better able to plan, implement and monitor priority climate change mitigation and adaptation actions and sustainable resource management".

The implementation of the project was done with unexpected time delays due to escalated political situation/ peace and security, staff/ management structures change, delay in procurement management process to maintain quality, as well as communication with regions where the project was to be implemented. However, the project made considerable progress towards achieving its outputs and rated satisfactory. Analysing results framework of the project against the SMART criteria, the assessment revealed the status of the project performance that gives clue to the implementers and the donors where to concentrate and increase their effort to the completion of the project before the project closure. The central pivot "build a successful case for medium scale biogas and integrated energy system through demonstration projects for productive uses" of the project is under construction. This needs completion and Chinese knowledge and experience sharing through practice for productive uses before the project closure.

The output 1.1 indicators were two each divided into two sub sections. The first output 1.1 indicator 1.1.1 is fully compliant to SMART criteria while the indicator 1.1.2 is sated questionably compliant because of the discrepancy in number of achievement between the indicated targets. The second indicator 1.2.1 has two sub sections. The first subsection is fully compliant to SMART criteria while the second subsection indicator is sated questionably compliant since construction is on process /not yet completed. Indicator 1.2.2 also has two sub sections. The first subsection is fully compliant to SMART criteria while the second subsection indicator is sated questionably compliant since construction extended. On the other hand, the output 2.1 also has two indicators which both indicators are fully compliant to SMART criteria. Output 2.2 has four indicators which all of them are fully compliant to SMART criteria. The project management component lately set as indicator is fully compliant to SMART criteria.

The Ethiopia Project was well coordinated, involved all stakeholders and put in place basic ground base for enhancement of the implementation of the activities. It overcomes project implementation barriers through discussion and implementing action plans. It provided capacity building for most concerned implementing partners in the form of training, workshop, experience sharing and field visits at both national and international levels. As to the achievement of the output targets, the TE showed that out of

the total 13 outputs indicators, 10 (77%) fully achieved while eight 3 (23%) achieved but under the target with ongoing process to the achievement.

The government of Ethiopia, MOWE, played a pivotal role in the implementation of the project and in the results achieved by the project. The Ministry mobilized regions and took direct implementation of the project and mandated towards the project goal. The staffing of the project at donor enabler Government of China and UNDP of both Countries were also sufficient to guide and support the implementers. Pertinent to the financial management the project was effective although there seem discrepancy in planned budget and implemented one that might be due to the cost of the ongoing constructions and practical trainings left.

The targets set and project objective was fully aligned with the key governmental agencies mandate and research and higher education centres goals and objectives. The project idea by itself has created awareness to the benefit of promotion of innovation as part of development initiatives in respective of their strategies specifically for higher education. Capacity building provided to representatives of the relevant national institutions is believed to be benefited to exert their mandates. It also benefited the beneficiaries and enhanced and qualified their public service delivery and recognitions of their rights. Hence, it is to be expected that following the phasing out of the project strategy the project will continue mainstreamed in the government institutions and respective regional bureau of mainly education, agriculture, water irrigation and energy, and Wolaita Soddo University as the owner of the project outputs. The gender and disabilities considerations in the project design and implementation need special strategy on the ground in which the implementing agencies obliged to promote the involvement of women and disabilities at expertise level and technical knowhow promotion level.

Conclusion #2. The evaluation ratings of the Sri Lanka project under the criteria listed are given in the table below along with a summary of descriptions of performance under each category. The overall Project's ranking is **Satisfactory.**

Table 12 Summary of Sri Lanka TE Ratings for the Project

Evaluation Criteria	*Rating Score*
Relevance	6 = Highly Satisfactory (HS) [Highly Relevant]
Effectiveness	5 = Satisfactory (S)
Efficiency	6 = Highly Satisfactory (HS)
Sustainability	5 = Satisfactory (S)
Gender and Social Inclusion	5 = Satisfactory (S)

TE comments on the overall rating:

Relevance: The project design was strongly aligned with the GOSL priorities for low-carbon development and supported capacity building for energy saving in agro-industry sector of which the potential had not been exploited. It used interventions effectively to address beneficiary needs.

Effectiveness: The project interventions were very effective in selecting beneficiaries and the appropriate transfer of large RETs. The success rate is not as strong with small-scale RETs. Capacity-building training for monitoring RET adoption was delivered on time, although not yet fully assimilated into provincial implementation. Core elements of South-South collaboration were implemented with some work remaining to be concluded.

Efficiency: Key elements of the work plan were delivered with efficient utilization of the available budget against a highly challenging operational environment. A small professional team at the PMU efficiently managed project execution by enlisting external resources to develop the information necessary to deliver project activities. Communication tools were effectively engaged to overcome logistical constraints.

Sustainability: Large-scale RETs delivered by the project will continue without additional support. Small RET adopters will benefit from follow-up and support to obtain services. Capacity building for energy monitoring remains available for future use. While the demand created through awareness and demonstration of RETs and the current policy and economic environment remains favourable for RET growth, attention to strengthening supply and servicing network and financing is necessary to promote for large-scale adoption.

Gender and Social Inclusion: The project took efforts to be inclusive at the operational level by increasing the participation of women and reaching out to farmers located in difficult areas. Opportunities for strengthening gender equity in the use of RETs, for example by modifying them for use by women were untapped.

Project Overall Conclusion:

The Sri Lanka Project managed to raise awareness and demonstrate the promise and feasibility of applying solar and biogas as renewable energy technologies in agriculture compared to the situation before the project's inception, thereby validating the potential of RETs in achieving Sri Lanka's national targets for GHG emission reduction and energy saving. Furthermore, it served as a learning platform for both China and Sri Lanka to engage and cooperate at the international level in renewable energy technology (RET) transfer.

Key achievements of the project at its conclusion under the relevant output areas are as follows:

- Thirty (30) Feasibility Studies and 'Capacity and Training Needs Assessment' were completed confirming the viability of novel RET applications using solar, biogas, and biomass technologies in the agribusiness and small farm sector in Sri Lanka.
- Two hundred and thirty-three (233) including 80 women engaged in agribusiness and/or farming benefitted from novel RET transfers carried out by the project.
    - Eight agribusinesses in the crop, livestock, and fisheries subsectors installed and operated large-scale solar (6) and biogas (2) RET applications with O&M training provided to 35 beneficiaries.

- Two hundred and twenty-five (225) small farm-level solar-powered tools and equipment (solar-powered sprayers, insect traps, and animal repellers) installed and operated in the 5 target provinces with 250 officers and beneficiaries trained on operation and maintenance.
- Capacity building and hands-on technical training supported with a manual on operation and management of solar-powered cold rooms, greenhouse, paddle aerators, and milk chilling centers were delivered for 25 participants and on biogas systems for 10 participants and a training manual.

- Four hundred and thirty-three (433) people were trained in needs assessment, operation, and maintenance of RET equipment.
- A three-day online workshop on 'South-South Cooperation in renewable energy technology transfer, low carbon development, sustainable transition, and green financing' was held involving over 40 participants from Sri Lanka, Ethiopia, and China.
- Provincial Energy Plans (PEPs) estimating the energy used in agriculture and analyzing the green energy potentials in the provinces covering crops, livestock, and fisheries developed for the 5 targeted provinces, validated through stakeholder workshops, and handed over to respective Provincial Heads.
- Trained One hundred and thirty-four (134) officials from the 5 provinces on baseline and post-installation data, development of provincial data collection framework, verification, and inventorizing for 22 RE Technologies in agriculture.
- Supported the development of RET supply and service capacity market by selecting local service providers with technical capacity through a pre-qualification process and assisting in field mobilization.
- Modified and commissioned the Energy Data Management System (EDMS) of the SLSEA supporting improved verification and accounting of energy savings from RETs introduced by the project.
- Refresher training delivered to 44 Provincial Council Officers on the use of the updated EDMS system to enter data on energy savings from RETs.
- A series of training programmes on renewable energy technologies for SMEs and financial institutions were held with objective of improving knowledge of financing RETs.
- Provided IT equipment (laptop computers and tabs) to officers of PCs with training on monitoring energy savings and GHG emission reductions at the provincial level.
- A 'Strategic Plan and Roadmap' developed for the Joint Research and Extension Center (JREC) outlining the institutional arrangement, 'Knowledge Sharing Center' establishment, training needs, and joint research program for collaboration between China Agriculture University (CAU) and the partnering Sri Lankan university.
- A model of bilingual online catalogue of transferrable renewable energy technologies from China and online training courses for capacity building of local stakeholders were developed by ACCA21.

The following are significant project accomplishments toward achieving desired Outcomes:

- The project significantly contributed to raising awareness of the strong potential of RET application in agriculture to contribute to national emission reduction targets and sustainable development by effectively communicating information the government officials and the public.
- Annual Energy Savings equivalent to 81,000 KWh of electricity are generated from the 8 biogas and solar-powered RETs operating at installed capacity. The Annual Estimated GHG Emission Reduction from that is 48.6 tons of CO_2 equivalent.
- Upgrading the Energy Data Management System (EDMS) of the SLSEA enabling accounting of energy savings from new RET transfers taking place in the country.
- SLSEA policy advisory capacity of RET transfer was upgraded with an 'Assessment Report on China-Sri Lanka Renewable Energy Technology Transfer' produced and shared with national counterparts.
- Evidence from the Provincial Energy Plans presented to the Ministry of Agriculture was well received with the Ministry emphasizing the use of RET in agriculture in the new draft agriculture policy for Sri Lanka.
- The coordination arrangement for trilateral cooperation was strengthened by installing a 'National South-South Steering Committee (NSSPC)' mechanism.

As noted, the Sri Lanka Project devised many innovative and reactive procedures through a process of adaptive planning to achieve commendable outputs under the heavily challenging operational environment brought about by the Covid-19 pandemic and economic crisis in Sri Lanka, consolidating these results to achieve outcome-level results including policy and regulatory improvements was hampered by reasons beyond the project's control. The fragile economic and political situation prevailing since Sri Lanka started implementing an economic recovery programme was not very conducive to press on with policy reform in areas not directly connected to the economic recovery. For example, the project was successful in ensuring the transfer of a creditable number of RET equipment to potential entrepreneurs using project funds to overcome the high initial investment cost not affordable by the recipients and develop information on the technical and economic feasibility of RET technologies. However, the timing was not conducive for it to leverage funds from financial service providers for RET systems installation.

The overall Sri Lanka Project performance was assessed considering all the evidence pertaining to project implementation and results achieved, and ratings under key evaluation criteria were determined. The ratings for the project must be interpreted in the context of the unprecedented operational environment under which it had to perform. In January 2020, just months after the project launch, the COVID-19 pandemic impacted Sri Lanka compelling the government to impose strict quarantine measures and multiple 'lockdowns'. As the country was coming out of the pandemic shock, Sri Lanka faced the worst economic crisis since its independence in 1948. In April 2022, the Sri Lankan government announced that it was defaulting on its sovereign debt. The crisis precipitated by the near depletion of foreign exchange reserves and severe depreciation of the currency led to unprecedented levels of inflation, and shortages of essentials such as fuel, food, and medical supplies, and to political instability forcing the sitting president to leave office in July 2022. It took several months before some stability in the economic

environment returned. The fragile investment outlook resulting from rising costs and high interest rates had a dampening effect on any new investments, which was critical in convincing SMIs to undertake RET applications.

To respond to the changing operational environment, major changes in the project implementation arrangements and strategy were introduced, achieving significant transformation in the implementation modality that enabled achieving the results it did. The lost time in terms of achieving the Project Outputs was compensated for by the extension of the project life with the project termination date set to June 2024.

6. Lessons Learned

The following lessons from Ethiopia are learnt from the project implemented.

- Trilateral South-South Cooperation Project initiated by different stakeholder actors that involved UNDP (China and Ethiopia Country Office) and three south-south partner countries (China, Ethiopia, and Sri Lanka). The combination of the experience and knowledge of these actors on the project implementation is a lesson for its innovative modality that fostered joint co-financing, joint design and implementation on both management and technical level, built linkages, strengthened mutual understanding and collaboration among counterparts and guaranteed joint accountability.
- The project implementation on the ground closely involved regional level government structures and project beneficiaries as key factor for project effectiveness. It was learnt that the effect of multi-stakeholder actors caused inefficient decision making on the ground. The need for defining and identifying specific activities for each stakeholder actors in such multi actors is a lesson that should be substantiated during program development and project design.
- The biogas system design, installation, operation & management hosted in Wolaita Sodo University is a new approach for the country to share lessons and build capacity around renewable energy. It is to increase awareness and understanding of researchers on innovation promotion, to create collaborative networking, to help identification of actors and innovation ecosystem builders at public institutions and government sectors. Donors considered the project as a role model to promote and to fund it while the implementers happily and eagerly accepted it to learn the change from small household based monolithic feed for energy production to institutional based mixed feed to generate power.
- International experience sharing visit to the national expertise that has been needs based from the country contexts has guaranteed the beneficiaries hope to promote innovative ideas to the wide public entrepreneurship and ensure country ownership in alignment with the country's priorities. These new ways of resource utilization solar and biogas and knowledge exchange is a lesson.
- To ensure the project's resilience to external shocks, the flexibility of the management team and commitment of the key stakeholders to make flexible plan of work and program adjustments is lesson in bridging success. Similarly, actions taken on need based are a very good satisfaction and peace of mind to the community.
- Last but not least, the Joint Research and Extension Centre (JREC) – said to be established collaboratively by Chinese and local academic institutions in the two partner countries – will cater to capacity-building needs and provide continuous technical support when and where required, including through the adoption of a long-term research agenda. This is an important linkage of research and higher education outputs, research and innovation programs of the two countries from which lessons are drawn and maintain relationship.

The following are lessons learned from Sri Lanka that can be useful in planning and implementing more effective and sustainable South-South Cooperation projects in the future:

- Effective harmonization of project activities with national plans and strategies during the project design stage is critical for gaining the wider support necessary for success in this type of project.
- Closer cooperation with the external partner, i.e. China, on the project design and operation, to understand and integrate their management, governance, and administrative procedures is essential for seamless implementation.
- Strengthening innovative interventions of the form promoted by the project requires in-depth analyses of gender and disability considerations upfront to better understand nuanced needs.
- Consider factor-in - Assist in the development of a trained cadre of service providers by supporting skill upgrading and certification through support to designing accredited vocational technology courses.
- Support the establishment of RET expansion capacity within government such as the Agriculture Department and private sector businesses that provide agricultural technology services.
- Paying closer attention to ways of selecting geographical areas and beneficiaries when piloting innovative technologies is important to maximize awareness raising and demonstrative impact.
- Way Forward to Sustainability of similar projects rests on
    - Catalyzing a long-term national program of Renewable Energy development by building upon the project's results and outcomes into the commercial route.
    - Support the development of job-oriented educational and vocational training programs on RETs in the nationally accredited tertiary and technical education scheme.
    - Formalize the organization and partnerships to encourage more active involvement and ownership of the public and private sector institutions and businesses in the RET community.
- Increase support to small- and medium industries to strengthen their capacity as suppliers of RET systems to widen the supply base and build capacity to effectively service client requirements.
- The TSSC can be an effective approach to acquiring appropriate emerging technology for countries like Sri Lanka when implemented with strong buy-in from national stakeholders and well-integrated into national policies and strategies.

7. Recommendations:

The following recommendations have been identified as key actions for follow-up. As both projects reach their conclusion, these recommendations extend beyond the scope of the current outcomes and impacts. They are intended to inform future projects within similar portfolios, particularly in the context of trilateral or multilateral cooperation and South-South collaboration.

7.1. General Recommendations (3)

1. **Initiate Next Phase of the Project and Strengthen Integration of the Private Sector (linked to Finding#11, Finding#12, and Finding #13[2])**. As indicated by Chinese partners, given the substantial groundwork laid in the previous phases and the encouragement from Chinese partners, there is a compelling opportunity to initiate the next phase of the project. This next phase may focus on leveraging the UNDP's extensive network to deepen the engagement of the private sector, ensuring a robust and dynamic framework for sustainable project development.
    - Responsibility: UNDP, China MoFCOM, and Project Partners
    - Timeline: Immediate and ongoing
2. **Revitalization of Knowledge through Training Effectiveness Monitoring (linked to Finding#7 and Finding#8)**: It is critical to monitor the effectiveness of training outcomes, particularly for practical applications such as good practices in appliance management. Evaluating the real impact of the trainings on beneficiary institutions' management, workers, and user communities will help ensure lasting benefits. Efforts should be made to make this training course more practical and relevant.
    - Responsibility: UNDP
    - Timeline: For this project and future projects
3. **Strategic Support for Women's Participation (linked to Finding#14 and Finding #15)**: Special strategic considerations are needed to deliberately foster the participation of women at both expert and management levels. This should be integrated into project design and implementation processes, with clear accountability for progress in this area.
    - Responsibility: UNDP, China MoFCOM, and Implementing Partners
    - Timeline: For future projects

7.2. Ethiopia Project Segment Dedicated Recommendations (3)

1. **Strengthen Project Ownership (linked to Finding#7 and Finding#12)**: In Wolaita Zone, Boloso Sore District, it is essential to intensify and internalize project ownership by the implementing agency, specifically the district government's education sector office. Continuous support and

[2] Please note that the linkages between recommendations and specific findings in this section are not definitive or exclusive. The entire set of recommendations is informed by a holistic consideration of all findings, including the nuanced interactions and dynamics among them

follow-up from regional, zonal, and district government administrative structures are critical for sustained success.

2. **Ensure Sustainable Management of the Wolaita Sodo University Biogas Project (linked to Finding#12)**: The biogas project at Wolaita Sodo University requires strong oversight to ensure timely completion and practical application. It is recommended that all stakeholders, including donors, UNDP, and the implementing agency, engage in discussions to define a sustainable management structure. Identifying accountable bodies for project operation is essential, along with treating institutional management as a business entity. An initial operational budget and a business feasibility study should be undertaken to ensure the project's long-term sustainability, expansion, and replication.
3. **Enhance Project Utilization in the Harari Region (linked to Finding#7, Finding #9, and Finding#12)**: Special attention is needed for projects in the Harari Region, with the implementing agencies and government structures at the regional and district levels responsible for evaluating the project's short- and long-term programmatic impact. Alternative approaches, such as off-grid installations, should be explored to maximize the plant's utility and community benefits.

7.3. Sri Lanka Project Segment Dedicated Recommendations (3)

1. **Facilitate RET Investment Models (linked to Finding#8, Finding#10, and Finding#17):** Develop and disseminate scalable models for Renewable Energy Technology (RET) investments using technical and economic feasibility data from the project. These models will assist Financial Service Providers (FSPs) such as banks and financial institutions in offering commercial loans for RET ventures. This will foster investment and the expansion of RET projects.
2. **Customize and Scale RET Systems (linked to Finding#5 and Finding#8):** Based on project learnings, adjust RET systems to better suit user needs. Specifically:
   - Scale applications like solar insect traps for different farm sizes.
   - Improve designs for specific crops and farming systems, ensuring RET tools like solar sprayers are more accessible to women.
   - Expand the RET service network across regions, enhancing the supply base for effective technology servicing.
3. **Engage Policymakers and Promote RET Awareness (linked to Finding#5 and Finding#13):** Raise awareness among policymakers on the benefits of incorporating RETs into national climate strategies, including Climate Smart Agriculture (CSA) and mitigation efforts. Additionally, increase user awareness of RET technologies' environmental benefits, emphasizing their contributions to national climate goals. Consider hosting a terminal event to highlight the successes and lessons from the TSSC approach, engaging stakeholders such as donors, provincial departments, and the private sector.

Annex 1. Evaluation TOR

As separately attached and uploaded on ERC.

Annex 2. Project Results Framework

Ethiopia project segment

III. Joint Results and Resources Framework

Intended Outcomes as stated in the respective CPs' RRFs: *China Outcome 3: China expands and improves the effectiveness of its development cooperation with other developing countries through TSSC framework* *Ethiopia Outcome 5: By 2020 key Government institutions at federal and regional levels including cities are better able to plan, implement and monitor priority climate change mitigation and adaptation actions and sustainable resource management.*
Outcome indicators *(as stated in the RRF of CP of respective partner countries, including baselines and targets):* *Ethiopia UNDAF Output 4.3: Technologies and practices, including finance and market mechanisms, that promote a climate resilient green economy introduced and scaled up* *Indicator: Number of green technologies introduced at national level* *Baseline: No/only few number of functional large scale institutional biogas and solar plants* *Target: 4 new large scale institutional biogas and solar systems for demonstration* *China UNDAF: Output 3. The effectiveness of China's engagement in international cooperation is enhanced for the mutual benefit of China and the world.* *Indicator: Increased and effective engagement of China in south-south cooperation OR Number of South-South development cooperation between China and developing countries* *Baseline: Zero (2019)* *Target: 1 by 2020*
Partnership Strategy: *Ethiopia Ministry of Water, Irrigation and Electricity(MOWIE)- Administrative Centre for China's Agenda 21 (ACCA21) - China Agricultural University (CAU)*

Project title and ATLAS Project (formerly Award) ID: Biogas and Solar Trilateral Cooperation - Transitioning to Sustainable Energy Uses in the Agro-Industry in Sri Lanka - China – Ethiopia. Ethiopia Project									
Outcome 1: Capacity for RET transfer built through demonstration of biogas and solar for productive uses									
INTENDED OUTPUTS	OUTPUT TARGETS FOR (YEARS)	INDICATIVE ACTIVITIES	RESPONSIBLE PARTIES	Input Matrix					
				China	MOWIE	Ethiopia UNDP	UNDP China	Funding	
Output 1.1: Enhanced partnerships among key partners through demonstration of biogas and solar for productive uses Country/ Implementing Partner: Ethiopia/MOWIE Indicators: - No of EOIs received - List of 10 sites for energy assessments conducted - No of partnerships established for conducting energy needs assessments - Roadmap for energy needs assessments prepared -No of energy needs assessments reports delivered - No of social and environmental impact assessments delivered - % of steering committee representatives endorsing 3-5 selected sites Baselines: none started /completed	Targets (year 1) MOWIE communication sent 10 sites for energy need assessments identified with end-users' commitment. 3 teams based on multi-stakeholders' partnerships selected to conduct energy need assessments Training on methodology and objectives conducted 10 energy need assessments conducted Short list of 3-5 recommended sites form the listed 10 sites	Activity 1.1.1: Shortlisting potential institutions Activity 1.1.2: Undertake initial energy needs assessments (in ten institutions)	*MOWIE* *MOWIE*	*Support from CAU for methodology* *China TA*	*Facilitation and Coordination*	*Overall QA*	*Overall QA*	*MOFCOM* *MOFCOM*	

Output 1.2 Capacity built through RE demonstration site construction **Country/IP:** Ethiopia/MOWIE **Indicators:** - No of sites selected - No of feasibility studies endorsed - Equipment that meet quality and cost-efficiency standards procured as per the national standard - No of capacity need assessments - Training plan prepared -No of people trained - No of Operation, maintenance and safety manuals developed/updated -%of positive evaluation of training - No of operational RET systems at the end of the project **Baselines: none started / completed**	Targets (year 1) **3-5** feasibility studies delivered One EPC signed and RET systems procured Targets (year 2) 3-5 sites equipped Stakeholders engagement-capacity need assessment and training plan At least one staff per demonstration site/at least 1 staff per MOWIE&REB/ at least 1 staff from local association) trained in operation and maintenance At least 1 Operation, maintenance and safety manual delivered per site Monitoring of systems operation	Activity 1.2.1: Site planning and construction *Feasibility study* *Equipment* Activity 1.2.2 On-site training for operation and maintenance	*MOWIE* *UNDP China* *MOWIE*		*Facilitate and ensure partnership between local stakeholders and Chinese EPC staff for training* *Quality control of equipment*	*QA feasibility studies* *Supervise installation and training*	*QA feasibility studies* *Procurement*	*UNDP Ethiopia/GEF* *Co-financed MOFCOM/UNDP Ethiopia* *MOFCOM*

Outcome 2: South-South Knowledge and Experience Exchanged								
				Input Matrix				
INTENDED OUTPUTS	OUTPUT TARGETS FOR (YEARS)	INDICATIVE ACTIVITIES	RESPONSIBLE PARTIES	China	MOWIE	Ethiopia UNDP	UNDP China	Funding
Output 2.1: Tailored mentorship/traineeship program for exchange with China developed and participants trained	Target (Year 1) Consultation, capacity need assessment, identification of trainees Design training of trainers courses for construction,	Activity 2.1.1 Training of trainers in installation, operation and maintenance Activity 2.1.2: Training on system design	*CAU* *CAU*	*ACCA21 to coordinate and facilitate E-learning course*	*staff for training* *Coordinate with GEF business incubator*	*QA capacity development*	*QA capacity development*	*UNDP Ethiopia/GEF* *UNDP Ethiopia/GEF*

Country/IP: China/CAU - No of capacity need assessment reports - No of participants to training - Training course material - No of participants to system design training -% of positive evaluation of training - number of hands-on training course for design and optimization - number of eLearning course on SSC Centre website -No of views and subscription to online course Baselines: none started / completed	operation and maintenance Training of trainers courses for construction, operation and maintenance in China (At least 1 staff from MOWIE/1 staff from National Biogas Program/ 1 staff from business incubator program under GEF) Capacity need assessment in system design Design training courses on system design and optimization Training courses on system design and optimization held in Ethiopia Target (Year 2) - RE Training curricula added on SSC centre website as E-Learning course				*activities*			
Output 2.2 Energy Stakeholders in China and Ethiopia are exposed to best business practices in the RE industry **Country/IP:** China/ACCA21 **Indicators:** - No of reports produced and presented to best practices workshop - No of participants to best practices workshop	Target (Year 1) Conduct private energy service providers mapping in China (biogas and solar) Online Catalogue of suppliers/appliances developed and regularly updated Target (Year 2) Award designed and hosted Study report finalized and presented to best practices workshop in Ethiopia: - Study Report on business	Activity 2.2.1: Develop and trial Renewable Ethiopia Awards Activity 2.2.2: Facilitate Business Best Practices Forum Activity 2.2.3: Coordinate business match-making platform for energy service providers Activity 2.2.4: Joint Research	MOWIE ACCA21 ACCA21 CAU		*Coordinate with GEF activities*	Review list of participants to business forum, planned site visit and trade fair	Design Award	*UNDP Ethiopia/GEF* MOFCOM MOFCOM MOFCOM

- No of Ethiopia participants to business platform in China - % of participants satisfied with business match-making platform and trade fair - No of consultation of online catalogue - % of users satisfied with online catalogue service Baselines: none	models - Technology assessment report - Investment Plan for biogas and solar - Lessons Learnt from demonstration sites Financial stakeholders mapping in China & Ethiopia. At least 2 representatives of financial institutions involved in renewable energy portfolio invited to best practices workshop Best practices workshop with at least 50 people stakeholders held in Ethiopia At least 10 stakeholders from Ethiopia (private companies, biogas association, government counterparts) invited to workshop and business match-making platform Trade fair hosted/Site visits in China	Projects							
Budget for China (MOFCOM) *(core, non-core, to be mobilized)* **Budget for Ethiopia (Government)** *(core, non-core, to be mobilized)*	1, 000,000 1,000,000								

Sri Lanka project segment

Project title and ATLAS Project (formerly Award) ID: **Biogas and Solar Trilateral Cooperation - Transitioning to Sustainable Energy Uses in the Agro-Industry in Sri Lanka - China – Ethiopia. Sri Lanka Project**								
Outcome 1: Demonstrated use of hybrid RET systems for Energy Savings and GHG emission reduction in small & medium sized agro-industry including farm, agricultural activities and agro-processing								
INTENDED OUTPUTS	OUTPUT TARGETS FOR (YEARS)	INDICATIVE ACTIVITIES	RESPONSIBLE PARTIES	Input Matrix				
				China	SLSEA	UNDP SL	UNDP China	Funding
Output 1.1 Capacity of two Provincial Councils to establish energy savings & GHG emissions reduction targets for the agro-industry **Country/ Implementing Partner:** Sri Lanka/SLSEA-Provincial Councils **Indicators:** - No of sites selected according to project objectives - Data collection system established - No of Provincial Council staff and beneficiaries trained - Number of equipment transferred & tested at demonstration sites -No of monitoring system established **Baselines:** GEF Project/ None	Targets (year 1) 2-5 demonstrations sites to be identified for the project 2-3 Provincial staff and 2-5 beneficiaries trained in data collection Procurement of ICT data collection system Target (year 2) Monitoring system defined (by site or by technology)	Activity 1.1.1: Stakeholders consultation to identify demonstration sites Activity 1.1.2 Develop a monitoring framework and train stakeholders in monitoring energy savings and GHG emission reduction.	*SLSEA* *Provincial Councils*	*CAU Support in defining data collection framework/ Provide technical specialist* *CAU training*	*Staff coordination*	*Overall QA*	*Overall QA*	*UNDP SL/GEF* *UNDP SL/GEF*

Output 1.2 Data consolidated to support formulation of provincial energy plans **Country/IP:** Sri Lanka-China/SLSEA-ACCA21 **Indicators:** - Communication strategy - Data used in ENERGIS - Report on biogas and solar potential in achieving ES and GHG reductions - No of provincial energy plans updated **Baselines:** one province-level energy plan (North Western) among 9 provinces	Targets (year 1) Communication system between technical department for data retrieval established Data on energy consumption and GHG emission in the agro-industry consolidated and transferred into ENERGIS database Targets (year 2) 2 provincial energy plan updated	Activity 1.2.1: Support Provincial Councils in developing a data collection framework Activity 1.2.2 Revision/Inclusion of energy savings targets for agro-industry sector in provincial energy plans	*Provincial Councils* *Provincial Councils*	*CAU Support in defining data consolidation/Provide technical specialist* *CAU review energy plans*	*Staff coordination* *Staff coordination & review energy plans*	*Overall QA* *Review energy plans*	*Overall QA* *Review energy plans*	*UNDP SL/GEF* *UNDP SL/GEF*
Output 1.3: Capacity built through demonstration **Country/ IP:** Srl Lanka/SLSEA-Provincial Councils **Indicators:** - No of sites selected - No of feasibility studies endorsed - Equipment that meet quality and cost-efficiency standards procured -No of capacity need assessment reports - Training plan - No of people trained - % of positive evaluation of the training	Targets (year 1) Technical criteria developed in collaboration with Provincial councils 2-5 Sites shortlisted/2-5 feasibility studies conducted EPC signed and Procurement of RET systems Targets (year 2) 2-5 Sites equipped Targets (year 1) Stakeholders engagement, capacity assessment and training	Activity 1.3.1: Site planning and construction Activity 1.3.2: On-site training for operation and maintenance	*Provincial Councils* *Provincial Councils/SLSEA*	*Technical inputs from China expert* *Technical inputs from CAU*	*Facilitate and ensure partnership between local stakeholders and Chinese EPC Contractor* *Quality control of equipment* *Provincial Council staff*	*QA capacity development*	*Procurement* *QA capacity developm*	*MOFCOM/SLSEA* *MOFCOM*

-No of operation, maintenance and safety manuals - No of operational RETs systems **Baselines:** 0/Current capacity of system operators limited. Systems failure at HH level because of lack of technical capacities to operate and maintain the system.	plan delivered Identify stakeholders to be trained (at least one staff per demonstration site/at least 1 staff per Provincial council) which can take part in the ongoing on-site training Targets (year 2) End users & Provincial Council trained in operation, maintenance & safety; Operation, maintenance and safety manual developed Training evaluated		*Biogas association to provide accreditation*		*for training*		*ent*	*UNDP SL/GEF*

Outcome 2: South-South knowledge and Experience Exchanged								
INTENDED OUTPUTS	OUTPUT TARGETS FOR (YEARS)	INDICATIVE ACTIVITIES	RESPONSIBLE PARTIES	Input Matrix				
				China	SLSEA	UNDP SL	UNDP China	Funding
Output 2.1 Tailored mentorship/traineeship program for exchange with China developed **Country/IP:** China/CAU **Indicators:** -No of capacity need assessment reports - No of participants to training	Target (Year 1) Stakeholders engagement, capacity need assessments, identification of trainees Design training of trainers' courses for construction, operation and maintenance Training of trainers courses for	Activity 2.1.1 Training of Trainers in Installation, operation & Maintenance Activity 2.2.2 Training on system	*CAU*	*ACCA21 to coordinate and facilitate E-learning course*	*Staff for training Coordinate with GEF project activities*	*QA Capacity development*	*QA Capacity development*	*UNDP SL/GEF* *UNDP*

- Training course material - No of participants to system design training - % of positive evaluation of the training - Hands-on training course for design and optimization - E-learning course on SSC centre website - No of views and subscription to online course **Baselines:** 0	construction, operation and maintenance in China (At least 1 staff from Provincial councils/1 staff from SLSEA/1 staff from People in Need/1 staff from biogas association) Capacity need assessment in system design Design training course on system design and optimization held in Sri Lanka Target (Year 2) -Trainings evaluated -Training curricula added on SSC centre website as E-Learning course	design	CAU	*ACCA21 to coordinate and facilitate E-learning course*				*SL/GEF*
Output 2.2 Energy Stakeholders in China and Sri Lanka are exposed to best business practices in the RE industry **Country/IP:** China/ACCA21/CAU **Indicators:** - No of reports produced and presented to best practices workshop - No of participants to best practices workshop - No of FIs attending forum - No of Sri Lanka participants to business platform in China - % participants satisfied with	Target (Year 1) Conduct private energy service providers mapping in China (biogas and solar) Online Catalogue of suppliers/appliances developed and regularly updated Target (Year 2) Award designed and hosted Study reports finalized and presented to best practices workshop in Sri Lanka: - Technology and financial needs	Activity 2.2.1 Develop and trial Sri Lanka Renewable Energy Awards Activity 2.2.2 Facilitate Business Best Practices Forum Activity 2.2.3: Coordinate business match-making platform for energy service providers Activity 2.2.4: Joint Research projects	*SLSEA* *ACCA21* *ACCA21* *CAU*		*Coordinate with GEF activities*	*Review list of participants to business forum, planned site visit and trade fair*	*Design award*	*SLSEA* *MOFCOM* *MOFCOM* *MOFCOM*

Business match-making platform and trade fair - % of users satisfied with online catalogue service **Baselines:** 0	in the agriculture sector in Sri Lanka - Financing model for biogas and solar solutions in the agriculture sector - Provincial Councils to prepare report on potential energy savings and GHG reduction for demonstration sites Financial stakeholders mapping in China & Sri Lanka. At least 2 representatives of financial institutions involved in renewable energy portfolio invited to best practice workshop. Best practices workshop with at least 50 people stakeholders held in Sri Lanka At least 10 stakeholders from Sri Lanka (private companies, biogas association, government counterparts) invited to business match-making platform. Trade fair hosted/Site visit in China							
Budget for China (MOFCOM) *(core, non-core, to be mobilized)* **Budget for SL (Government)** *(core, non-core, to be mobilized)*	1, 000,000 1,000,000							

Annex 3. Evaluation Matrix

3.1 Ethiopia project segment

Evaluation Criteria	Evaluation Questions	Data Sources	Data Collection Methods	Indicators/ Success Standard
Project Strategy (Relevance)	1. To what extent do the intended outcome and relevant outputs address the central purpose of this project? 2. To what extent are these aligned with priorities of key stakeholders of the Governments of Ethiopia and China? 3. Has the project been able to respond to the priority needs in relation to Renewable Energy Technology Transfer in Ethiopia and China, and if so, how? 4. How relevant were the overall design and approaches of the project? 5. To what extent were perspectives of those who could affect the outcomes, and those who could contribute information or other resources to the attainment of stated results, taken into account during the project design processes? 6. Is there a need and demand for the kind of capacity building, knowledge sharing and exchange at the level of communities and institutions offered by this project in the participating countries? 7. To what extent can the research, knowledge products, tools, guidance and practices developed under this project be accepted and replicated at	• Programme/project documents • Programme/project Annual Work Plans • Programmes/projects/ thematic areas evaluation reports • Government's national planning documents • Human Development Reports • SDG progress reports • Government partners • Progress reports • Interviews with beneficiaries • Interviews with UNDP staff • Development partners (UN agencies, international development agencies)	• Desk reviews of secondary data • Interviews with government partners • Interviews with NGOs partners/service providers • Interviews with funding agencies • Interviews with UNDP staff, development partners, beneficiaries, associations, and entrepreneurs	• Project activities in line with the country development and sectoral priorities and project plans • Inputs, activities, and produced outputs according to the project log frame • Lessons learned from previous projects taken into account for implementation • Assumptions and risks identified are effectively managed

Evaluation Criteria	Evaluation Questions	Data Sources	Data Collection Methods	Indicators/ Success Standard
	national and regional levels? 8. To what extent is the intervention aligned with relevant normative frameworks for gender equality and women's empowerment? 9. How consistent and complementary has the project been to other interventions focused on sustainable energy management in Ethiopia? 10. To what extent did the project interventions duplicate existing similar interventions in the targeted areas, and were there any collaboration with similar interventions?	• Government partners involved in specific results/thematic areas		
Progress Towards Results (Effectiveness)	1. Is there a clear implementation logic and theory of change underpinning the project that informs outcome, output and activities under this project? 2. To what extent has or is the planned outcome being achieved? Are there any additional outcome(s) being achieved beyond the intended outcome? 3. To what extent were the project outputs achieved effectively in terms of time and quality? 4. What factors have contributed to achieving or not achieving intended outputs and outcomes? 5. Has partnership strategy between the countries been effective in contributing to the outcome? 6. Is the current set of indicators for both	• Project/programme/thematic areas evaluation reports • Progress reports on projects • UNDP staff, Development partners, Government partners, and Beneficiaries • Programme documents & annual work plans	• Desk reviews of secondary data • Interviews with government partners, development partners, UNDP staff, civil society partners, associations, and entrepreneurs	• Entrepreneurship Development used as project management instrument • The project has partnership strategy and actions taken to promote cooperation between partners

Evaluation Criteria	Evaluation Questions	Data Sources	Data Collection Methods	Indicators/ Success Standard
	outcome and output effective in informing the progress made towards the outcomes? If not, what indicators should be used? Are the progress reports evidence-based and do these track outcomes? 7. Assess the knowledge management platforms and initiatives developed so far, and comment on their contribution to the project outcome. 8. Are the project's objectives and outputs clear, practical and feasible within its frame? 9. To what extent was the project impacted by Covid-19? What measures were taken to tackle the negative influence of the pandemic? 10. To what extend did this project promote women's empowerment and how did this project contribute towards these? 11. In what ways did the project engage with national stakeholders to deliver on this action? Were there any challenges? 12. What actions were taken to ensure no one was left behind? 13. Did the M&E system operate as per the M&E plan? Probe for the plan undergo revision in the course of the project implementation an, comment on the timeliness of the revisions. 14. Were the resources allocated for M&E			

Evaluation Criteria	Evaluation Questions	Data Sources	Data Collection Methods	Indicators/ Success Standard
	sufficient?			
Project Implementation & Adaptive Management (Efficiency)	1. To what extent was the project management structure as outlined in the project document efficient in generating the expected results? 2. Were programme resources/funds efficiently applied? What internal factors (design, management, human and financial resources, field delivery capacity etc) and what external factors are affecting achievement of planned results? 3. To what extent has there been an economical use of financial and human resources? Have resources (funds, human resources, time, expertise, etc.) been allocated strategically to achieve outcomes? 4. The project has several 'customers'/primary stakeholders whose active participation and engagement is central to the success of the initiative. Does the project have a system of seeking feedback and views to help it tailor its offerings to different customer needs? 5. To what extent have project funds and activities been delivered in a timely manner?	• Programme documents • Annual Work Plans • Annual Progress Reports • Evaluation reports • Government partners Development partners • UNDP staff (Programme Implementation Support Unit)	• Desk reviews of secondary data • Interviews with government partners and development partners	• Project implementation within the original timeframe and budget • Annual work plans elaborated according to the logframe • Implementation issues solved, monitoring tools in place and used • Financial controls established and used for feedback • Activities prioritized for achievement of results • Quality and effectiveness of communication
Sustainability	1. To what extend did the project interventions contribute towards	• Implementation modality	• Desk reviews of secondary data	• Implementation within the original

Evaluation Criteria	Evaluation Questions	Data Sources	Data Collection Methods	Indicators/ Success Standard
	sustaining the results achieved by the project? 2. Are there any social or political risks that may jeopardize sustainability of project results? 3. Are there any financial risks that may jeopardize the sustainability of project outputs? 4. What is the level of capacity and commitment from the Governments and other stakeholders to ensure sustainability of the results achieved? Has partnership strategy enabled integration and embedding of programme implementation in the government system? 5. Does the project have an exit strategy? What will happen at the end of the project with assets such as the demonstration sites and key structures established such as the Joint Extension Research Centre? What could be done to strengthen sustainability?	assessment and analysis • Programme documents • Annual Work Plans • Annual Progress Reports • Evaluation reports • Government implementing partners • Development partners • UNDP staff (Programme Implementation Support Unit)	• Interviews with government partners and development partners • Discussion with the beneficiaries • Discussion with implementing partners	timeframe and budget • Annual work plans elaborated according to the logframe, participants involved and ownership • Monitoring tools in place and effectively used • Financial controls established and used to provide feedback on implementation • Activities prioritized for achievement of significant results • Quality and effectiveness of internal communication
Cross-Cutting Issues	**Gender** 1. To what extent have gender considerations integrated into the design, implementation, and monitoring of the project? 2. Is the gender marker data assigned	• Project document, Project stakeholders, • Gender action plan,	• Documentary review • Interviews and focus group discussions	• Project implementation structures, procedures, and involvement of actors

Evaluation Criteria	Evaluation Questions	Data Sources	Data Collection Methods	Indicators/ Success Standard
	to this project representative of reality? 3. To what extent has the project promoted positive changes in gender equality and the empowerment of women? Were there any unintended effects? 4. Does the project use sex-disaggregated data and gender-equality indicators to track and measure the change in women's social and economic status, as well as the structural aspects such as social norms and barriers? 5. To what extent was gender mainstreamed into the project cycle? a. At design phase? – 1 to the least extent and 5 to a great extent b. During implementation: – 1 to the least extent and 5 to a great extent c. During monitoring and evaluation: – 1 to the least extent and 5 to a great extent 6. Have there been any unintended effects on women, men and vulnerable groups? **Disabilities** 1. To what extent have the improvised people, the indigenous and disabled people and other vulnerable and marginalized groups benefited from the project?	• Results framework • Progress reports	• with beneficiary groups and stakeholders, • Observation	• Project implementation within the original timeframe and budget • Annual work plans elaborated according to the logframe, participants involved and ownership • Implementation issues solved, monitoring tools in place and effectively used • Financial controls established and used to provide feedback on implementation • Activities prioritized for achievement of significant results • Quality and effectiveness

Evaluation Criteria	Evaluation Questions	Data Sources	Data Collection Methods	Indicators/ Success Standard
	2. Were people with disabilities consulted and meaningfully involved in project planning and implementation? 3. What barriers did the project face in this process and what actions were undertaken by the project **Social and Environmental Safeguards** 1. Does the project integrated social and environmental safeguards into the design, and implementation of the project? Does the project considered Environment and Social Management Plan (ESMP) and adequate measures and controls to minimize and mitigate the potential environmental and social risks and impacts identified during the project implementation? 2. Is social and environmental impacts and risks being successfully managed, tracked and monitored? 3. Is grievance mechanism available to project-affected people and are grievances addressed to ensure any perceived harm is effectively mitigated? (available GRM at project level, if any complaints raised and resolved)?			
Impact	1. In your view what are the long-term impacts of this project? Probe for at	• Project document,	• Documentary review	• Project implementation structures,

Evaluation Criteria	Evaluation Questions	Data Sources	Data Collection Methods	Indicators/ Success Standard
	individual, community, and at national level. 2. Are there any negative or unintended consequences of this project at any of these levels? Please explain.	• Project stakeholders, • Action plan, • Results framework • Progress reports • Observation	• Interviews and focus group discussions • with beneficiary groups and stakeholders, • Observation notes • Monitoring and evaluation notes	procedures, and involvement of actors • Project implementation within the original timeframe and budget • Annual work plans, participants involved and ownership system • Implementation issues solved, monitoring tools in place and effectively used • Financial controls established and used • Activities for achievement of significant results • Quality and effectiveness
Lessons learned and recommendations	1. In your view, what are some of the lessons that can be learned from this project? 2. Please kindly explain how knowledge management took place in this project.	• Project document, Project stakeholders, • Gender action plan,	• Documentary review • Interviews and focus group discussions	• Project implementation process, procedures, and involvement of actors

Evaluation Criteria	Evaluation Questions	Data Sources	Data Collection Methods	Indicators/ Success Standard
	3. How did the project share its results and lessons? 4. What are your recommendations for the future?	• Results framework • Progress reports	• with beneficiary groups and stakeholders, • Observation	• Action vs. plans as elaborated according to the logframe, participants ownership • Established system and feedback on implementation

3.2 Sri Lanka project segment

Evaluation Criteria	Key Evaluation Questions	Indicators	Source of Data	Tools
Relevance:	To what extent are the project outcomes and outputs aligned with the priorities of key stakeholders of the Governments of Sri Lanka and China?	• GOSL and GOC policies • GOSL priorities for CC management	• GOSL Planning documents • GOSL policies, plans, and strategies	• Desk review • Interviews of senior officials
	To what extent do the intended outcome and relevant outputs address the central purpose of this project	• Problem diagnosis • Needs assessment	• Project document • Key implementing partners	• Desk review • FGDs • KI Interviews
	Has the project been able to respond to the priority needs concerning Renewable Energy Technology Transfer in Sri Lanka and China, and if so, how?	• Country plans and strategies • Project design elements	• UNDAF priorities • GOSL, GOC objectives	• Desk review • KI Interviews
	How relevant were the overall design and approaches of the project?	• Project rationale • Causal relationships	• Project log frame • Project progress reports	• Desk review • Interviews
	To what extent were perspectives of those who could affect the outcomes, and contribute to the attainment of stated results, taken into account during the project design processes?	• Project rationale • Details of consultations • Design reviews	• Project document • Policy documents	• Desk review • KI Interviews

Evaluation Criteria	Key Evaluation Questions	Indicators	Source of Data	Tools
	Is there a need and demand for the kind of capacity building, knowledge sharing, and exchange at the level of communities and institutions offered by this project in the participating countries?	• Project design steps • Needs assessment	• Project document • Joint activities undertaken • Technology transfer	• Desk review • Interviews • FGDs with PCs
	To what extent can the research, knowledge products, tools, guidance, and practices developed under this project be accepted and replicated at national and regional levels?	• Relevant National plans and strategies PC needs and priorities	• Project progress reports • Project results	• KI Interviews
	To what extent is the intervention aligned with relevant normative frameworks for gender equality and women's empowerment?	• Consultations during project design • Alignment with social sector priorities	• Project log frame • Beneficiary selection	• Interviews • Desk review • FGDs with PCs • Beneficiary interviews
Effectiveness:	Is there a clear implementation logic and theory of change underpinning the project that informs the outcome, output, and activities under this project?	• Intervention logic • Design considerations	• Project documents • Project log frame	• Desk review

Evaluation Criteria	Key Evaluation Questions	Indicators	Source of Data	Tools
	To what extent has or is the planned outcome being achieved? Are there any additional outcome(s) being achieved beyond the intended outcome?	• Project progress • Achievement against log frame indicators • Partner views • Support to PCs • Best practices documented	• Project progress reports • Field observations • PMU staff	• Desk review • Beneficiary interviews • KI Interviews
	To what extent were the project outputs achieved effectively in terms of time and quality?	• Performance records • Progress against key planned activities	• Project progress reports • Meeting minutes • No of good practices/failures	• Desk review • Beneficiary Interviews
	What factors have contributed to achieving or not achieving intended outputs and outcomes?	• Risk logs and management • Reported problems	• Project progress reports • Other public records • Project management committee reports • Project staff	• Desk review • KI Interviews • FGDs
	Has the partnership strategy between the countries been effective in contributing to the outcome?	• Planning documents • Joint project reviews	• Project Board/Steering Committee meeting records • Joint monitoring reports • SS Cooperation activities	• Desk review • Interviews

Evaluation Criteria	Key Evaluation Questions	Indicators	Source of Data	Tools
	Is the current set of indicators for both outcome and output effective in informing the progress made towards the outcomes? If not, what indicators should be used?	• Project reviews •	• Progress Reports • Any project reviews/evaluations	• Desk review • KI Interviews
	Are the progress reports evidence-based and do these track outcomes?	• Project reports • Project reviews and evaluations (Internal/external)	• Progress Reports • Progress reviews	• Desk reviews • Interviews
	Assess the knowledge management platforms and initiatives developed so far, and comment on their contribution to the project outcome.	• Project capacity building activities • Communication strategy	• Project results • Beneficiary selection processes • Partnerships	• Interviews • FGDs • Beneficiary interviews • Field Observations
	Are the project's objectives and outputs clear, practical, and feasible within its frame?	• Soundness of design • Lessons from prior projects	• Project planning documents • ProDoc	• Desk review • KI Interviews
	To what extent was the project impacted by Covid-19? What measures were taken to tackle the negative influence of the pandemic?	• Risk logs • Implementation changes • Project staff	• Project reports • Progress reviews • Project management decisions • Public Records	• Desk review • Interviews with PMU, UNDP

Evaluation Criteria	Key Evaluation Questions	Indicators	Source of Data	Tools
	To what extent did this project promote women's empowerment and how did this project contribute towards these?	• Design considerations • Lessons considered • Planning elements	• Project log frame • Reviews of project results	• Desk reviews • Consultations • Beneficiary interviews
Efficiency:	To what extent was the project management structure as outlined in the project document efficient in generating the expected results?	• Project planning elements • Resources	• Timeliness of project results and progress reports	• Desk review • Interviews
	Were programmme resources/funds efficiently applied? What internal factors (design, management, human and financial resources, field delivery capacity etc) and what external factors are affecting the achievement of planned results?	• Project budget • Staff TORs/Staffing •	• Financial and physical progress reports • Staffing plan	• Desk review • Interviews
	To what extent has there been an economic use of financial and human resources? Have resources (funds, human resources, time, expertise, etc.) been allocated strategically to achieve outcomes?	• Project planning documents • Progress reviews and amendments • Project staff	• Progress reports • Implementation reviews • Collaborative activies	• Desk reviews • KI Interviews

Evaluation Criteria	Key Evaluation Questions	Indicators	Source of Data	Tools
	The project has several 'customers'/primary stakeholders whose active participation and engagement is central to the success of the initiative. Does the project have a system of seeking feedback and views to help it tailor its offerings to different customer needs?	• Project review meetings • External communications	•	• Desk reviews • Interviews of implementing partners & beneficiaries
	To what extent have project funds and activities been delivered in a timely manner?	• Project progress reports • Progress reviews	• Project budget and financial progress • UNDP CO	• Desk review • Interviews
Sustainability:	To what extent did the project interventions contribute towards sustaining the results achieved by the project?	• Project achievements Capacity building • Partner follow up •	• Documented lessons • Project staff • PC staff	• Interviews • FGDs
	Are there any social or political risks that may jeopardize the sustainability of project results?	• Planning • Risk assessments	• Risk Management Plan	• Desk review • Interviews
	Are there any financial risks that may jeopardize the sustainability of project outputs?	• Partner capacity building • National contributions (co-funding)	• Replication of lessons	• Interviews
	What is the level of capacity and commitment from the	• Partner capacity building	• Joint working groups • PC follow up activities	• Interviews • FGDs

Evaluation Criteria	Key Evaluation Questions	Indicators	Source of Data	Tools
	Governments and other stakeholders to ensure the sustainability of the results achieved?	• PC Working groups/Liaison officers	• Best practice demonstrations	
	Has partnership strategy enabled integration and embedding of programme implementation in the government system?	• Plans to internalize results within PCs	• PC policy and strategy	• Interviews
	Does the project have an exit strategy? What will happen at the end of the project with assets such as the demonstration sites and key structures established such as the Joint Extension Research Centre? What could be done to strengthen sustainability?	• Project agreements • Implementing partner follow up • Consultations held • Alternative arrangements launched • Partner commitment	• ProDOc • Project management committee meetings • Agreements reached with partners • Capacity building to take over	• Desk review • FGDs
Cross-Cutting Issues:	To what extent have gender considerations integrated into the design, implementation, and monitoring of the project?	• Project planning and design elements • Lessons from past projects • Alignment with national plans	• Project results framework • Workshops and other consultations	• Interviews • Desk reviews •
	Is the gender marker data assigned to this project representative of reality?	• Progress Indicators • Consideration of gender In planning	• Planning documents • Progress reports	• Desk reviews • Interviews

Evaluation Criteria	Key Evaluation Questions	Indicators	Source of Data	Tools
		• Women's participation in decision-making		
	To what extent has the project promoted positive changes in gender equality and the empowerment of women? Were there any unintended effects?	• Progress reports • Project communications • Inclusion of women among beneficiaries	• Progress reports • Media and Communication • Lessons reported • External members • Examples of women empowerment	• Desk review • Interviews • FGDs
	Does the project use sex-disaggregated data and gender-equality indicators to track and measure the change in women's social and economic status, as well as the structural aspects such as social norms and barriers?	• Progress indicators • Expressed project concerns	• Results reporting • Lessons reported • Special reports, if any	• Desk reviews • Interviews
	To what extent have the impoverished people, the Indigenous, and disabled people and other vulnerable and marginalized groups benefited from the project?	• Project planning • Independent assessments	• Progress reports • Gender specialists • Child labour	• Interviews • Desk reviews
Impact	To what extent the project initiatives indicate that intended impact will be achieved in the future?	• Empowerment of beneficiaries • Provincial capacity building	• Beneficiaries • Implementing partners	• Interviews

Annex 4. Mission Itinerary

Sri Lanka project segment

Date/s	Equiv. Work-days	Activity/Deliverable	Locations
14 Feb 2024 - 19 Feb 20248	2	Document review, Consultation with project staff, Mission preparation and Inception Report	• Home-based
21 Feb 2021	13	Meetings with project stakeholders	• Ministry of Power and Energy, SLSEA • *Ministry of Environment, CC Secretariat (Prov. Mitigation planning)* • *MOEnv., GGGI NAPRS Project*
22 Feb 2024 23 Feb 2024		Meetings with project Stakeholders	• Ministry of Agriculture • Professional Org. – SLEMA, • UoM – RE Technology Team • *Lanka Biogas Association*
26 Feb. 2024 (am)		Mission Briefing Meetings- UNDP	• UNDP (Sri Lanka and China) and PMU - Colombo 07

26 Feb 2024 (pm) – 27 Feb 2024		Field Mission to NWP	• Kamal Shrimp Farm, Chilaw
			• Solar Powered Greenhouse, Dankotuwa, Chilaw
			• RET adopters - Solar-powered farm tools in NWP
			  ○ ***Overnight Stay 26Feb: Kurunegala***
			• NW Provincial Council – Key collaborating staff
			• Rasoda dairy, Kadugamuwa, Polpithigama
			• Cargils Milk Chilling plant, Dorathiyawa
			• (RET adopters - Solar-powered farm tools in NWP)
			  ○ ***Overnight Stay 27 Feb: Kilinochchi***

Date/s	Equiv. Work-days	Activity/Deliverable	Locations
28 Feb 2024		Field Mission to Northern Province	• University of Jaffna, Kilinochchi campus, Biogas plant, R&E collaboration • RET adopters - Solar-powered farm tools in NP • NP Collaborating staff – via Zoom ○ ***Overnight stay 28Feb: Trinco.***
29 Feb 2024 1 March 2024		Field Mission to Eastern Province -Day1	• Solar PV Biogas facility, DAPH, Uppuweli • Solar Chilling center- Labaan dairy, Palampoddaru • RET adopters - Solar-powered farm tools in Eastern Prov. ○ ***Overnight stay 29Feb: Batticaloa*** • Eastern Provincial Council – Key collaborating staff • Eastern University – JREX participation • RET adopters - Solar-powered farm tools in Eastern Prov. ○ ***Return to Colombo***
4 March 2024 - 5 March 2024		Field Mission to Uva and Southern Provinces	• Uva Provincial Council – Key collaborating staff • Uva Province – Jewelex Farm, Thanamalwila • RET Adopters - Solar-powered farm tools in Uva Prov ○ ***Overnight stay 4 Mar: Matara*** • Southern Provincial Council – Key collaborating staff • RET adopters - Solar-powered farm tools in Southern Prov. ○ ***Return to Colombo***

Date/s	Equiv. Work-days	Activity/Deliverable	Locations
6 March 2024 –		Follow-Up Meetings with other Stakeholders identified during field mission	○ Colombo & Western Province • Follow-Up Meetings with other Stakeholders identified during field mission • RET-Technology service providers
7 March 2024 – 8 March 2024	2	Presentation on Initial Findings - Debriefing with the Country Office	○ • UN Compound- Colombo 07
22 March 2024	4	Draft Final Report	• Home-based
30 March 2024	4	Final Report	• Home-based
Total Work-Days	25		

Annex 5. List of Document Reviewed

Sri Lanka Project Segment

A. Documents

Project Documents;

1. MOFCOM-UNDP TRC on Renewable Energy, Sri Lanka Signed ProDoc, April 2019
2. Sri Lanka TRC on Renewable Energy Technology Transfer: ProDoc, Final. 15 March 2019
3. Minutes of the Local Project Appraisal Committee, 09 Nov. 2016, UNDP Colombo

Annual Workplans/Joint Action and Planning Documents:

4. Revised AWP 2029-2023
5. Revised AWP 2021-2022
6. Project Beneficiary List

Project Progress Reports;

7. TRC Progress Report, May 2022-Dec 2022, Jan 2023
8. TRC Progress Report, Jan 2021-Apr 2022, May 2022
9. TRC Progress Report, Jan-Dec, 2020, Jan 2021
10. TRC Progress Results & Monitoring Pathway Tool, 2020
11. Combined Delivery Report (CDR) by Activity, 2019 & 2022

Expert Reports and Consultancies:

12. Provincial Energy Plans, 5 Provincial Reports, Sep-Nov 2021
13. Inception Report for Selection of Rets, Sep 2021
14. Feasibility Studies for RETs- 31 Feasibility Reports, Mar. 2022
15. Beneficiary Selection Report for RETS, Feb 2022
16. RET Feasibility Reports for Biogas systems, UOJ- Mar 2022
17. RET Feasibility Reports for Biogas systems, DAPH Uppuveli - Mar 2022
18. RET Technical Reports for Biogas Systems, UOJ - Nov 2022
19. RET Technical Reports for Biogas Systems, DAPH Uppuveli- Nov 2022
20. Updating the EnerGIS System for 22 Identified New Technologies – Phase 1 & 2
21. Report of the training workshop on data collection, entry & management framework, 5 Provincial Reports- July 2022
22. Criteria for Site / Host Selection for Pilot / Demonstration Projects under TSSC Project, 6 Feb 2021

23. Technology Application Priorities: Sri Lanka, 24 March 2020
24. Report on Training on Operation, Maintenance, and Handover Document: Paddle Aerators, Oct 2022
25. Report on Training on Operation, Maintenance, and Handover Document: Cold Room, Mar 2022
26. Report on Training on Operation, Maintenance, and Handover Document: Green House, Nov 2022,
27. Concept note on UoJ's action plan with TSSC biogas project
28. JREC: Strategic Plan and Roadmap, 2021

Communication Products:

29. Communication Plan & Knowledge Products, May 2019-May 2023
30. Exposure and Human Interest Stories, 3 Products –
31. TSSC Video Series, Video 1-5,
32. South-South Cooperation Day, 2021

UN Evaluation Documents:

33. UNDP Evaluation Guidelines © IEO UNDP June 2021, Web: http://www.undp.org/evaluation
34. DAC Network on Development Evaluation (2018), OECD DAC Evaluation Criteria: Summary of Consultation Responses (November 2018)
35. Better Criteria for Better Evaluation: Revised Evaluation Criteria Definitions and Principles for Use
36. OECD/DAC Network on Development Evaluation (November 2019)
37. UNEG Code of Conduct for Evaluation in the UN System, UNEG, March 2008

Other Relevant National Reports:

38. Appropriate Mitigation Actions: Energy Generation and End-Use Sectors Sri Lanka. (Energy NAMA). Project Inception Report, UNDP Sri Lanka, October 2015
39. Carbon Net Zero 2050 Roadmap and Strategic Plan, Ministry of Environment: November 2023
40. Sri Lanka-Updated Nationally Determined Contributions, July – 2021. Ministry of Environment
41. The National Climate Change Policy of Sri Lanka (Draft), March 2024
42. Nationally Determined Contributions Implementation Plan (2021-2030), Ministry of Environment: July 2023

B. Communication Materials Produced by the Project:

Exposure Human Interest stories:

i. Fresh, green and Sustainable: https://undpsrilanka.exposure.co/fresh-green-and-sustainable
ii. Paddling Towards a Sustainable Future: https://undpsrilanka.exposure.co/paddling-towards-a-Sustainable-future
iii. Cooling down the energy bills: https://undpsrilanka.exposure.co/cooling-down-the-energy-bills

iv. (a few more TSSC stories will be published in the coming weeks)
v. Link to all Human-Interest Stories (HIS) of the TSSC project.
vi. https://drive.google.com/drive/folders/1KejNrkSPnZgPBQtCtpUayMtj7EyCzzEl?usp=sharing
vii. Magazine-https://drive.google.com/file/d/1TmvXB4EMpgB-oFdKPReLa1WPwfxQRqyx/view?usp=sharing

Video Series:

a. Video 1: Fresh, green and sustainable
b. Video 2: Resilience in renewables
c. Video 3: Paddling towards a sustainable future
d. Video 4:KILINOCHCHI BIOGAS UNIT Final Video.mp4
e. Video 5:UPPUVELI LIVESTOCK FARM Final Video.mp4
f. Video 6: Summary video

Beneficiary Stories – Featured large RETs as well as farm-level RET equipment – Reliability and economics of solar power as an energy source

Newspaper Clips -

- Newspaper inserts: https://www.undp.org/srilanka/publications/tssc2023

Human Interest Stories -

- International Day for South-South Cooperation 2023, SEPTEMBER 12, 2023 - FRESH, GREEN, AND SUSTAINABLE -Jewelex Agri-kumaragama, UNDP Sri Lanka
- Paddling Towards a Sustainable Future - Enabling shrimp farmers to reduce their energy costs and carbon footprint, UNDP Sri Lanka - July 10th, 2023 – Solar Paddle Aerators
- Cooling Down the Energy Bills - Assisting rural entrepreneurs in the dairy industry to stay ahead of rising energy costs. UNDP Sri Lanka – Rasoda Dairies – Milk Chilling- June 9th , 2023

Annex 6. Stakeholders Map

Ethiopia project segment

Name	Type	Specialization	Role in the Project
Ministry of Water and Energy of Ethiopia (MOWE)	Government Agency	Water resources, management, water supply and sanitation development and electricity resources management	• Local Financial and Technical project partner • Partner for development of detailed project plans, including needs assessment, and project monitoring and evaluation • Assist with the identification and selection of Chinese technical experts or consultants, where applicable • Provide feedback to quarterly progress and final reports • Represented on the Project Board.
The Energy Study and Development Follow-up Directorate (ESD)	Government Agency	Energy planning and development programming.	• Local technical project partner • Partner for development of detailed project plans, including needs assessment, and project monitoring and evaluation • Provide feedback to quarterly progress and final reports • Responsible for R&D activities
Rural Energy Development and Technology Promotion Directorate (REDTPD)	Government Agency	Renewable energy technology projects implementer	• The project implementing partner (agency and beneficiary) • Partner for development of detailed project plans, including needs assessment, and project monitoring and evaluation • Provide feedback to quarterly progress and final reports • Responsible for demonstration and implementation activities
UNDP China	International Development Organization	Donor, Mobilize Resources	• Member of the Project Board (PB) • Overall project coordinator and quality assurance • Collaborate with UNDP Ethiopia office to ensure project objectives are met • Liaison with GoC /MOFCOM officials and other Chinese institutions (i.e., MOA-MOST) • Collect and consolidate inputs from partners to produce and deliver quarterly progress and final reports

Name	Type	Specialization	Role in the Project
			• Organize and conduct monitoring trips with MOFCOM and UNDP Ethiopia • Share quarterly and annual progress reports with MOFCOM (and translate into Chinese) • Produce, in collaboration with UNDP Ethiopia, final assessment of project for MOFCOM
UNDP Ethiopia	Development Organization	Donor, Mobilize Resources	• Coordinates project and partners in Ethiopia • Project monitoring and evaluation, quality assurance • Member of the Project Board • Produce and deliver inputs for quarterly progress and final reports
Ministry of Science and Technology, Administrative Centre for China's Agenda 21 (ACCA21)	Government Agency	Donor, Mobilize Resources	• Local Chinese project partner • Liaison with UNDP China • Partner for development of detailed project plans, including needs assessment, and project monitoring and evaluation • Assist with the identification and selection of Chinese technical experts or consultants, where applicable • Provide input and feedback to quarterly progress and final reports • Represented on the Project Board
China Ministry of Agriculture	Government Agency	Technical Service Provision	• Technical partner • Assist with the identification and selection of Chinese technical experts or consultants, where applicable
China Agricultural University	Public Institution	Technical Service Provision	• Local Chinese project partner • Liaison with UNDP China • Provide designing and training capabilities • Talent cultivation

Name	Type	Specialization	Role in the Project
			• Partner for development of detailed project plans, including needs assessment, and project monitoring and evaluation. • Provide input and feedback to quarterly progress and final reports • Represented on the Project Board
National South-South Task Force	Government Agency	Project Management	• Implementing partner /execution responsibility and accountability • Global Environmental Facility(GEF) and Trilateral South-South Cooperation (TSSE) coordinator
The Horn of Africa Regional Environment Centre	Partner Organizations	Higher Learning Institutions	• Manages a network of 40 higher learning institutions and research centers, civil society and community-based organizations. • Facilitates, strengthens and advocates for initiatives related to environmental conservation and natural resource management.
Ethiopia Ministry of Education (MoE)	Government Agency	Service Provider	• Responsible for all matters related to technology transfer, education, • University-industry linkages, and • General preparation of university graduates to the labour market
Ethiopian Ministry of Science and Technology	Government Agency	Service Provider	• Education and science and technology management
World Bank Group	Development Organization	Financer	• Financing of major power sector projects (e.g. universal electricity access program), • Support for assessment of renewable energy resources (national wind resource mapping), • Promotion of energy efficiency (CFL distribution project), and investment facility to build capacity of clean energy SMEs

Name	Type	Specialization	Role in the Project
USAID Power Africa	Development Organization	Financer & Service Provider	• Promotes the utilization of Africa's renewable energy resources including wind, solar, geothermal, hydropower and biomass. • Provide strategic support to the energy sector.
SNV: National Biogas Program of Ethiopia (NBPE)	Development Organization s	Service Provider	• Provide technical support/advice to the NBPE
GIZ	Partner Organizations	Service Provider	• Provide service to improve domestic biomass cook stove, solar systems for institutions (health centres) and more recently micro hydropower for community electrification
BIOMA: The Chengdu Biogas Scientific Research Institute	Partner Organizations	Service Provider	• Research in the development of the theory and process of biogas fermentation, including advanced research on micro-biology.
The Department of Environment Protection and Rural Energy (DEPRE)	Partner Organizations	Service Provider	• Execution of biogas programs, • Provide additional technical support through their network of biogas experts and private companies

Sri Lanka Project Segment

Partner Agency	Main Functions	Specific Project Responsibilities
Main Implementing partners:		
UNDP Sri Lanka	UN agency based in Sri Lanka that functions as Sri Lanka Executing Agency ensuring coordination and quality assurance, Stakeholder coordination, and support linkages with the collaborating Chinese partner agencies.	• Coordinates the project and partners in Sri Lanka and implements activities within Sri Lanka using the National Implementation Modality • Oversees the project by providing administrative and technical support, performing quality assurance, and conducting project monitoring and evaluation. • Manage the project and the budget by Controlling project financing and managing international procurement • Member of the Project Board • Produce and deliver inputs for quarterly progress and final reports (in English)

Partner Agency	Main Functions	Specific Project Responsibilities
UNDP China	UN agency that functions as China Executing Agency, ensuring coordination and quality assurance in the project.	• Overall project coordination • Collaborate with UNDP Sri Lanka office to ensure project objectives are met • Liaison with GoC/MOFCOM officials and other Chinese institutions (i.e., MOA - MOST) providing support to engage energy stakeholders to assess capacity and needs, and formulate responses • Organize and conduct monitoring trips with MOFCOM and UNDP Sri Lanka • Channel funds to the project through UNDP Sri Lanka CO. • Collect and consolidate inputs from partners to produce and deliver quarterly progress and final reports • Share quarterly and annual progress reports with MOFCOM (and translate them into Chinese) • Produce, in collaboration with UNDP Sri Lanka, the final assessment of the project for MOFCOM
Ministry of Power and Renewable Energy of Sri Lanka (MOPRE)	Main Ministry of the GOSL responsible for implementing the Government of Sri Lanka's policies and regulations related to the energy sector, encompassing renewable and non-renewable conventional energy. Serves as Sri Lanka project executing agency.	• Serve as the Project Executing Agency for Sri Lanka • Function as Co-Project Director on the Project Board of TSSC
Sri Lanka Sustainable Energy Authority (SLSEA)	The apex body that is charged with powers to regulate and facilitate sustainable energy development by guiding national efforts to develop domestic energy resources and conserve energy through exploration,	• Local Financial and Technical project partner • Liaison with UNDP Sri Lanka and Provincial Council • Partner for the development of detailed project plans, including needs assessment, and project monitoring and evaluation • Assist with the identification and selection of Chinese technical experts or consultants, where applicable • Provide feedback for quarterly progress and final reports

Partner Agency	Main Functions	Specific Project Responsibilities
	facilitation, R&D, and knowledge management. Local technical partner of TSSC.	• Represented on the Project Board
Ministry of Commerce (MOFCOM) of China	Chinese government Ministry responsible for domestic and foreign trade, overseeing investments, and formulating strategies, guidelines, and policies for trade and international economic cooperation and foreign aid activities.	• Project Authorizing Agency from the Government of China • Assist with the identification and selection of Chinese technical experts or consultants, where applicable • Technical partner that functions as Co-Project Director in the Project Board for TSSC
China Agricultural University (CAU)	Support capacity development and develop training materials on biogas systems; Transfer expertise for technology adaptation for the modernization of energy production, waste management, and integrated practices in the agriculture sector; Guide agroindustry carbon footprint assessment and adapting technology to meet energy needs; Partner in facilitating joint research studies with Sri Lankan university.	• Local Chinese project partner • Liaison with UNDP China • Provide designing and training capabilities • Talent cultivation • Partner for development of detailed project plans, including needs assessment, and project monitoring and evaluation • Provide input and feedback to quarterly progress and final reports • Represented on the Project Board
The Ministry of Science and	Support to developing business models and facilitate the	• Local Chinese project partner • Liaison with UNDP China

Partner Agency	Main Functions	Specific Project Responsibilities
Technology Administrative Center for China's Agenda 21 (ACCA21).	development of linkages and business partnerships with Chinese technology partners through its network of suppliers; Develop and manage knowledge and experience platforms through the SSCC; Provide access to technical information through E-learning courses and Technology manuals. Serves as a Chinese project partner.	• Partner for development of detailed project plans, including needs assessment, and project monitoring and evaluation • Assist with the identification and selection of Chinese technical experts or consultants, where applicable • Provide input and feedback to quarterly progress and final reports • Represented on the Project Board
Provincial Councils (5) of Sri Lanka	Partner in the implementation of project activities in the Provinces per the powers entrusted to legislate and plan energy, agriculture and agrarian services; Partner in the development of Provincial Energy Plans; Select and arrange for the conduct of capacity-building programmes.	• Local technical project partner • Partner for development of detailed project plans, including needs assessment, and project monitoring and evaluation • Assist with the identification and selection of Chinese technical experts or consultants, where applicable • Provide feedback to quarterly progress and final reports
Supporting Implementing Partner Organizations:		
Ministry of Agriculture, China	Responsible for implementing the guiding principles, policies, and decisions on work related to agriculture, rural areas; and farmers; Preparing and implementing strategies, plans, and major policies: Drafting laws	• Technical partner • Assist with the identification and selection of Chinese technical experts or consultants, where applicable

Partner Agency	Main Functions	Specific Project Responsibilities
	and regulations on agricultural and rural affairs, and related law enforcement;	
BIOMA- Chengdu Biogas Scientific Research Institute	The lead research institution in the development of the theory and process of biogas fermentation, including advanced research on micro-biology; Operates International Training and Research Center conducting training biogas professionals;	• Provide technical inputs to the project on biogas
The Department of Environment Protection and Rural Energy (DEPRE)	under the China Ministry of Agriculture: Responsible for the execution of biogas programs; Network of biogas experts and private companies;	• Provide additional technical support through their network of biogas experts and private companies • Support to business model formulation • Capacity development to reinforce the development of the energy service industry and technology dissemination modalities (incl. financial aspects).
Climate Change Secretariat, Ministry of Environment, Sri Lanka	National Focal Point for the UNFCCC and Kyoto Protocol under the preview of the Ministry of Environment	• Support to project implementation representing the Ministry of Environment.
People in Need/ Janathakshan	A non-governmental organization with experience in developing and implementing biogas systems; Engaged in training and developing a network of skilled workers for biogas construction	• Support to project design by sharing expertise and experiences relating to the development of renewable energy including biogas.

Partner Agency	Main Functions	Specific Project Responsibilities
	and operation managers of biogas digesters.	
Lanka Biogas Association	Established by practitioners of biogas to promote the triple benefits of biogas; management of bio-degradable waste, produce clean energy, and provide valued inputs to organic agriculture.	• Support to project design by sharing technology and information on biogas development.
Local Service Providers:		
Sri Lanka Energy Managers Association (SLEMA)	Serve as a forum for information exchange, encourage, and promote Energy Management practices; Extend Government and private assistance for Energy Management equitably and effectively; Provide adequate and up-to-date information on effective Energy Management techniques;	• Provide consultancy services for a data collection framework preparing 5 Provincial Energy Plans • Conduct capacity-building training for the provincial staff on developing baseline & post-installation data collection forms for the 23 RETs • Conduct 5 training programs to collect baseline & post-installation data, and develop data collection framework support.
Industrial Services Bureau (ISB)	Accelerating the industrial development within the NW Province; Providing industrial and business development services encompassing nationally and internationally as a consulting business.	• Carry out feasibility analyses on the various RET technologies (31) shortlisted to be piloted • Conduct the feasibility study to identify the beneficiaries and locations for citing RETs in the 5 Provinces • Develop criteria for the selection of large RET beneficiaries • Prepare specifications for selected RETs

Partner Agency	Main Functions	Specific Project Responsibilities
SAW Engineering (Pvt) Ltd. (SW Solar)	Engineering company providing solutions to agriculture and other sectors in areas including renewable energy, waste to energy, smart greenhouses, and telecommunication	• Develop specifications, sourcing of equipment, installation, and commissioning of large RET applications • Providing after-sales service to beneficiaries
Sri Lanka Ministry of Agriculture	The Provincial Ministries are responsible for implementing agricultural production programmes in collaboration with the national Ministry. Work to ensure food security through support to food production programmes and farmer assistance including advisory services.	• Selected areas and carried out the selection of farmers for the distribution of small farm-level RET applications, i.e. Solar-powered sprayers, Animal repellers, and Insect traps • Selected field officers to undergo training in the operation and management of the RETs • Responsible for monitoring the performance of RETs under farmer conditions

Annex 7. Project Achievements Against Output Indicators

Ethiopia Project Segment

Indicator	Expected Targets	Achievement at TE	Rating
Output 1.1 Enhanced partnerships among key partners through demonstration of biogas and solar for productive uses			
Indicator 1.1.1: Short listing potential institutions	Call for Expression of Interest (EOI)	Seven out of 17 seats, has been selected	**Achieved**
Indicator 1.1.2: Undertake 10 initial energy needs assessments	10 initial energy needs assessments	One energy need assessment report developed	Underachieved
Output 1.2: Capacity built through RE demonstration site construction			
Indicator 1.2.1: Site planning and construction	Site plan & construction	Four selected demonstration sites	**Achieved**
	Construction	Construction on process	Underachieved
Indicator 1.2.2: On-site training for operation and maintenance	Training on operation and maintenance	Technical training and commissioning for one 300m^3 biogas system and four solar PV systems and appliances was completed	**Achieved**
Output 2.1: Tailored mentorship/traineeship program for exchange with China developed and participants trained			
Indicator 2.1.1: Training of trainers in installation, operation and maintenance	Training on installation, operation and maintenance	Skill-Building Training and Training Module on RET System produced and circulated,	**Achieved**
Indicator 2.1.2: Training on system design	Training on system design	50 government officials and experts provided practical knowledge and skills on renewable energy systems design, and symposium attended.	**Achieved**
Output 2.2: Energy stakeholders in China and Ethiopia are exposed to best business practices in the RE industry			
Indicator 2.2.1: Develop and trial Renewable Ethiopia Awards	Develop and trial Renewable Awards	Excellence Award Scheme developed	**Achieved**
Indicator 2.2.2: Facilitate business best practices forum	Business bet practice	Renewable energy transfer on technology assessment, business models and investment plan	**Achieved**

Indicator	Expected Targets	Achievement at TE	Rating
Indicator 2.2.3: Coordinate business match-making platform for energy service providers	Business match-making platform for energy	Capacity building provided and RE training curriculums added on SSTC centre website	**Achieved**
Indicator 2.2.4: Joint research projects	Joint research projects created	Research agenda has been identified, on mainstreaming biogas and solar potential, transition to sustainable energy produced	**Achieved**
Project Management: Coordination mechanism			
Coordination mechanism further regularised and enhanced	Set-up project management structures at all levels	Effectiveness of the project	

Source: Annual, project progress reports.

Sri Lanka Project Segment

Outputs/Indicator	Baseline	EOP Values		Observations
		Target	Actual	
Outcome 1. Demonstrated use of hybrid RET systems for energy savings and GHG emission reduction in small & medium-sized agro-industry including farm, agricultural activities, and agro-processing				
Output 1.1: Capacity of two Provincial Councils to establish energy savings & GHG emissions reduction targets for the agro-industry				
▪ Biogas and Solar data Collection system established ▪ Provincial Council staff and beneficiaries trained	▪ 0	▪ 01 database ▪ 125 PC staff ▪ 30 beneficiaries	▪ Database established ▪ 134 and 25 trained	▪ Achieved, 100% ▪ Achieved, 102%
Output 1.2: Data consolidated to support the formulation of provincial energy plans				
▪ Agriculture sector energy-related data feeding to ENERGIS/ EDMS established ▪ Provincial energy plans developed and updated	▪ 0	▪ 01 system ▪ 04 New plans, ▪ 01 Updated	▪ System established ▪ 5 PEPs developed	▪ 100% ▪ 100%

Output 1.3: Capacity built through demonstration				
▪ Feasibility studies on the appropriate technology for the demo projects prepared ▪ Demonstration sites selected covering all the provinces according to project objectives ▪ Number of technologies transferred & tested ▪ End users trained on technology applications, O&M, and safety ▪ Number of operational RETs systems	▪ 0	▪ 20 Reports ▪ 15 sites ▪ 03 technologies ▪ 30 end users trained) ▪ 15 RETs	▪ 30 reports ▪ 08 ▪ 03 sites ▪ 35 Trained ▪ 08 RETs	▪ 150% ▪ 53% ▪ 100% ▪ 116% ▪ 53%
Outcome 2. South-South Knowledge and Experience Exchanged				
Output 2.1: Tailored mentorship/traineeship program for exchange with China developed and participants trained				
▪ Capacity needs assessment reports prepared ▪ No. of participants training ▪ No. of participants in system design training ▪ % of positive evaluation of the training ▪ Hands-on training course for design and optimization ▪ Regional technology support centers established ▪ No. of participants received training on e-learning course on SSC center website	▪	▪ 01 Report ▪ 30 trainees ▪ 30 trainees ▪ 80% ▪ 02 courses 30 participants ▪ 02 Centers ▪ 50 participants	▪ 01 ▪ 30 ▪ 30 ▪ 89% ▪ 02 courses 30 participants ▪ 0 ▪ NA	▪ 100% ▪ Achieved, 100% ▪ 100% ▪ 100% ▪ 100% ▪ 0% ▪ NA
Output 2.2: Energy stakeholders in China and Sri Lanka are exposed to best business practices in the RE industry				

▪ No. of reports produced on best business practices workshop ▪ No. of participants in best practices workshop ▪ No. of Financial Institutions attending forum ▪ No. of Sri Lanka participants to Business platform in China	▪ 0	▪ 3 for the three sectors ▪ 10 ▪ 05 ▪ 10	▪ 03 ▪ 0 ▪ 05 ▪ 10	▪ 100% ▪ 0 ▪ 100% ▪ 100%

Annex 8. List of Key Informants Interviewed

Ethiopia project segment

No	Organization	Name of Coordinator
1	**UNDP China -**Project Coordinator	Youxie Fang
2	China Agricultural University -Professor,	Renjie Dong
3	China Agricultural University-Associate Professor,	Jianbin Guo
4	Ministry of Science and Technology of China, Administrative Centre for China's Agenda 21-Project Coordinator	Fu Yan
5	Ministry of Science and Technology of China, the Administrative Centre for China's Agenda 21 -Project Coordinator,	Liu Xin
6	MoWE -Senior Expert	Tesfaye Alemayehu
7	MoWE - CEO, REDTP	Birehanu Weldu
8	MoWE- Senior Expert	Dereje Yilma
9	MoWE -Senior Expert	Yimeslal Tefera
10	MoWE -Senior Energy Advisor	Gosaye Mengistie
11	UNDP - Team leader for CRES Unit	Wubua Mekonnen
12	UNDP- Programme Specialist	Yu Ding
13	UNDP- Procurement Specialist	Ermias Wosenyeleh
14	Harari- Investment Mines and Energy Office	Abdi Has
15	Harari- Education Bureau	Hamdogn Hayderu SHerief
16	Harari- Kebbele Denaba Primary School -Director	Yohanis Semenew
17	Harari- Kebbele Denaba Primary School -Beneficiary	Ramadan Mohammed ali
18	Harari -Kebbele Denaba Primary School -Beneficiary	Jayir Muktar
19	Harari- Kebbele Denaba Primary School -Beneficiary	Zuber abdi
20	Harari- Karra Primary School- Teacher	Mohammed Ibrahim

No	Organization	Name of Coordinator
21	Harari- Karra Primary School- Community Committee member	Iftu Yusuf
22	Harari- Karra Primary School- Community Committee member	Mohammed Sultan
23	Vice president for Research and Community Services, Wolaita Sodo University	Dr. Zewudin Thomas
24	Director for Community service and Engagement, Wolaita Sodo University	Dr. Dawit Dalga
25	Focal point of biogas plant for Trilateral Cooperation Project, Wolaita Sodo University	Ashenafi Abebe
26	Focal point of biogas plant for Trilateral Cooperation Project, Wolaita Sodo University	Abyot Gebremedhin
27	South Ethiopia Regional State Water, Mines and Energy Bureau	Olade Ole
28	Wolaita Sodo -Boloso Sore Woreda Administration	Ayanu Birega
29	Wolaita Sodo –Newasie Primary School	Bergene Bekele

Sri Lanka Project Segment

Sri Lanka Sustainable Energy Authority
• Wickramasinghe, Harsha Eng. (Deputy Director General, Demand Management)
• Wimal Nadeera, H A Eng. (Deputy Director General, Operations)
United Nations Development Programme, Colombo
• Hettiarachchi, Dr. Buddhika. (Programme Analyst)
Project Staff
• Ranasinghe, Sampath Mr. (Project Coordinator)
• Karawita, Suranga Mr. (Programme Assistant)
• Premaratne, Dasitha Mr. (Project Assistant)
• Alwis, Thilanka Mr. (Project Assistant)
• Herath, Pabasara Ms. (Project Assistant)
MINISTRY OF ENVIRONMENT
• Randeni, Leel Mr. (Director, CC)
• Wickramasinghe, Hasula Ms. (Deputy Director)
• Nimalsiri, Mr. (Asst. Director)

UNIVERSITY OF JAFFNA, KILINOCHCHI CAMPUS
• Kannan, N. Dr. Head, Ag Engineering, FOA, UOJ
• Sinniah, J. Prof. Head, Dept. Animal Science, FOA, UOJ
• Pakeernathan, K. Prof. Head/Ag. Biology
• Vasantharuban, S. Prof. Dean/FOA, UOJ
• Prabaharan, S. Mr. Snr. Lecturer, Fac. of Engineering, UOJ
• Sritharan, S. Mr. Farm Manager, UOJ
EASTERN UNIVERSITY, CHENKALADI, BATTICALOA
• Prabaharan, T. Dr. Deputy Vice Chancellor
• Sugartharan, M. Prof. Focal Point, JERC, Faculty of Agriculture
• Alagaratnam, V . Mr. Coordinator, IAD
• Premanandarajah, Punitha. (Ms) Prof/ Dean, Faculty of Agriculture
• Nafees, M S M. Dr. Head, Dept. of Animal Science
• Tennakoon, T M S A. Dr. Senior Lecturer, Faculty of Technology
NORTH-WESTERN PROVINCIAL COUNCIL
• Sriyalatha, K P P. Ms. - Director (Engineering)
• Weerasooriya, W A W Dr. (Ms.) – Provincial DAPH
• Sisira Kumara. Mr. – Provincial Director of Agriculture
• Karunapala. Mr. (M&E Officer) JSB Project
EASTERN PROVINCIAL COUNCIL, TRINCIMALEE
• Fazi, M A M. Dr., Provincial Director, DAPH
• Gunesekeran, R. Dr. Director/Planning, Eastern PC
• Sathyaseelan, G. Dr. Deputy Director/DAPH, Eastern Prov.
• Gawan, A S. Eng. Chief Engineer, Local Govt. Eastern Province
NORTHERN PROVINCIAL COUNCIL
• Ms. Senthikumaran, S. Ms. Provincial Director of Agriculture, Northern P.
• Anchanadevi, S. Ms. Deputy Director of Agriculture, Jaffna
• Vijayan, S. Mr. Head Quarters AI, DDA Office, Kilinochchi

UVA PROVINCIAL COUNCIL, BADULLA
• Jayalath, L. Mr. Prov. Director of Agriculture, Uva Province
• Gurusinghe, K A. Mr. ADA, Dept. of Agriculture, Badulla District
• Dhanapala, Ravindra. Eng. Chief Engineer, Buildings Department, Uva Province.
SOUTHERN PROVINCIAL COUNCIL
• Vidura Kariyawasam. Mr. Secretary, Min. Fisheries & Environment, Southern Prov. Council, Galle
• Welaratne, A U. Mr. Secretary, Min. Agriculture, Southern Prov. Council, Galle
• Suriyarachchi, B R. Mr. Deputy Director, Fishery and Environment, SP, Galle
• Kodituwakku, Ajith. Technical Officer, Ministry of Fisheries, SP, Galle
• Chithra Sanatharam W G. (Ms). Development Officer, Ministry of Fisheries, SP, Galle
SRI LANKA ENERGY MANAGERS' ASSOCIATION
• Perera, T F Nimal. Eng. (Past President)
PROJECT BENEFICIARIES
INDUSTRIAL SCALE RETs
KAMAL SHRIMP FARM, CHILAW -
• Dharmasiri, Nimal, Mr. General Manager
CARGILLS MILK COLLECTION CENTER, DORATIYAWA, KURUNEGALA
• Gunawardena, Sunil, Mr. General Manager
RASODA DAIRIES (PVT) LTD, KALUGAMUWA, KURUNEGALA
• Perera, Dhaminda Mr. Proprietor
• Perera, Ishara Ms. Operations Manager
• Kumara, Sisira Mr. Asst. Maintenance Manager
JEWELEX AGRIKUMARAGAMA FARM, THANAMALWILA
• Gurusinghe, Duminda, Farm Manager,
LABAAN DAIRY, PALAMPODDARU, TRINCOMALEE
• Rinzan, Mohamed Zaroon Mohamed Mr. Proprietor

AGRICULTURE FARM, UNIVERSITY OF JAFFNA, ARUVIYAL NAGAR, KILINOCHCHI
• Vasantharuban, S. Prof. Dean, Faculty of Agriculture
• Kannan, N. Dr. Head, Ag Engineering, FOA, UOJ
• Sinniah, J. Prof. Head, Dept. Animal Science, FOA, UOJ
• Pakeernathan, K. Prof. Head/Ag. Biology
• Vasantharuban, S. Prof. Dean/FOA, UOJ
• Prabaharan, S Mr. Snr. Lecturer, FOEngineering, UOJ
• Sritharan, S. Mr. Farm Manager, UOJ
DAPH FARM, UPPUVELI, TRINCOMALEE
• Ratnayake, Iresha, Dr. Vet. Surgeon, Regional Livestock Farm, Uppuveli
• Devadasan, Mayurali, Dr. Deputy Director, DAPH, Eastern Prov.
• Shifaaya, Nushad. Dr. Vet. Surgeon, DD Office/Trincomalee, DAPH, EP
FARM LEVEL SMALL RETs
• Rajakaruna, Gayan- Kirimatiyawa, Nawagattegama
• Sasanka Sandruwan Mr., Pansiya Yaya, Karulankadawala
• Palitha Buddhika, R M Mr, Halmillewa, Dummiya
• Pushpakumara, Priyantha P D Mr, Mahapitiya
• Ajith Priyashantha, W D Mr. Kurumbankandu Yaya, Mahapitiya
• Kumohan, Kulali Ms. AI, DATC, Vaddakkachchi, Kilinochchi
• Kapila Raj, M. Farm Manager, FMTC, Vavuniya
• Jayanthan, S. Mr. Gopallapuram, Nilaweli, Trincomalee
• Siyam, M K M. Mr. Themaraivillu, Nilaweli, Trincomalee
• N. Sathyaseelan, Mr. DATC/Trincomalee, Anpuvelipuram, Trincomalee
• Thangarasa, V, Mr. Mullamunai, Kalmunai West, Batticaloa
• Hettiarachchi, S, Sgt. Unichchai Farm, 4BN Gamunu Watch, Batticaloa

• Rekha, S. Ms. Ariyampathy, Manmunaipattu, Batticaloa
• Rothinathan, Mr. Ariyampathy, Manmunaipattu, Batticaloa
• Hennayake, H M S M, (Ms.) AI, Farm Training Center, Serankada, Ampara
• Ravihari, J A A D, (Ms.) TA, Farm Training Center, Serankada, Ampara
• Kumara, T M D K Mr. Thalapita, Padiyathalawa
• Rajapa1a, S W L, Mr. Ag. Instructor, Thalapita, Padiyathalawa
• Lalani Sajani, H P (Ms). Kivulara, Thanamalwila
• Sisira Kumara, Mr. Kubukkana, Wellawaya
• Sumedha, R M Mr. Gonaganara, Buttala
• Nandasena, S. Mr. Gonaganara, Buttala
• Wijesinghe, Kasun, Mr. AI, Gonaganara, Buttala
• Ilangeshwaran, K. Ag. Instructor, Goradiyawaka, Springvalley, Badulla
• Siriyawathi, R A. Ms. Nilgoda, Kottagoda, springvalley, Badulla
• Dhananjaya, M L. (Mr.) Field Asst., Government Farm, Labuduwa, Galle
• Mohan Rasika, M K. Mr. Ensalhena, Ihala Keembiya, Galle
• Gunathilake, Rasanga, Mr. TA, Government Farm, Poddiwela, Galle
• Tharindi, Nishara. Ms. TA, Government Farm, Thelijjawila, Matara.

Annex 9. SMART Analysis of Objective and Outcome Indicator

Ethiopia project segment

TE Evaluator completed the analysis and concluded whether targets have already been compliant to SMART criteria colouring green; questionably compliant for partially meet (colouring orange); and non compliant for not meeting the SMART criterion (colouring red)

Indicators	Project Target Attained	Terminal Evaluation SMART analysis					Evaluator Feedback
		S	M	A	R	T	
Project Objective: To build a successful case for medium scale biogas and integrated energy system through demonstration projects for the productive use.							
Outcome 1: Capacity for RET transfer built through demonstration of biogas and solar for productive uses							
Indicator 1.1 (Output 1.1): Enhanced partnerships among key partners through demonstration of biogas and solar for productive uses							
Indicator 1.1.1: Short listing potential institutions	• Call for Expression of Interest (EOI) to the public institutions has been conducted. • A long list of potential institutions/sites, in which 7 out of 17 seats, has been selected						Fully compliant
Indicator 1.1.2: Undertake ten initial energy needs assessments	• One energy need assessment report developed. • Joint Research Extension Centre (JREC) was established • One Training Module on Energy Needs Assessment produced, and 30 Government officials and experts at the country and region levels were trained. • Three Separate Feasibility Study Reports and one compiled Site Selection Report for Feasibility and RET Demonstration Report developed.						Questionably compliant to SMART criteria. One out of 10 energy-need assessment studies completed. But, there is a discrepancy between the indicator and the targets.
Indicator1.2 (Output 1.2): Capacity built through RE demonstration site construction							
Indicator 1.2.1: Site planning and construction	The feasibility study biogas and solar PV pilot demonstration projects were completed for four selected demonstration sites.						Fully compliant (feasibility study

							completed in a planned range)
	Construction on process /construction not yet completed.						Questionably compliant to SMART criteria
Indicator 1.2.2: On-site training for operation and maintenance	• The procurement for supply, installation, technical training and commissioning for one 300m^3 biogas system was completed.						Fully compliant
	• Procurement of supply, installation, technical training and commissioning of Solar PV systems and appliances for 4 selected demonstration sites has been completed						Fully compliant
	• Civil construction of solar systems and appliances commenced on February 01, 2024, and extend beyond financial closure of the project						Questionably compliant
Outcome 2: South-South knowledge and experience exchanged							
Indicator 2.1 (Output 2.1): Tailored mentorship/traineeship program for exchange with China developed and participants trained.							
Indicator 2.1.1: Training of trainers in installation, operation and maintenance	• Capacity needs assessment of trainers' capacity and level of information on installation, operation & maintenance, and system design was completed. • The four-day SSTC Skill-Building Training with the topic of 'RET System Design, Installation, Operation, and Maintenance' was hosted. • The Training Module on RET System Design, Installation, Operation, and Maintenance was produced and widely circulated with all government officials and experts from MoWE and regional energy bureaus capacity.						Fully compliant
Indicator 2.1.2: Training on system design	• Around 50 government officials and experts at the country and region levels were provided practical knowledge and skills on renewable energy systems						Fully compliant

	design, installation, operation, and maintenance/ facilitate the construction of the upcoming solar PV and biogas pilot demonstration projects. • Forum on Renewable Energy Promotion in Developing Countries and 2022 Great Cycle - International Symposium on Agricultural and Rural Carbon Neutralization-Contribution of Biogas Project were successfully organized in September 2022, and more than 50 government officials and experts from Ethiopia and Sri Lanka attended the workshop.						
Indicator 2.2 (Output 2.2): Energy stakeholders in China and Ethiopia are exposed to best business practices in the RE industry							
Indicator 2.2.1: Develop and trial Renewable Ethiopia Awards	• A three-day online workshop was held, gaining practical knowledge on South-South Cooperation in renewable energy technology transfer, low carbon development and sustainable transition as well as green financing (for more than 40 participants) • A three-day best practice workshop organized, in China to discuss renewable energy solutions, and low-carbon development for about 50 participants involved, 8 reports produced and presented to workshop and 1 site visit (of successful demonstrations sites in China using biogas/solar & other RE technologies) was conducted. • RET best practices, the Excellence Award Scheme was developed and the preparation and selection process for RET Best Practices is underway						Fully Compliant Awarding the local RET private sector reprogrammed to public institutions capacity building up on request.
Indicator 2.2.2: Facilitate business best practices forum	• Assessment Report on China-Ethiopia Renewable Energy Technology Transfer for Production produced and validated for renewable energy transfer in terms						Fully Compliant

	of 1) technology assessment of RETs for productive uses; 2) business models for long-term viability; 3) investment plan in Ethiopia						
Indicator 2.2.3: Coordinate business match-making platform for energy service providers	• As per the local needs, the bilingual (Chinese and English) private energy service providers mapping in China (biogas, biomass and solar), as well as the online catalogue of transferrable renewable energy technologies from China and online training courses for capacity building of local stakeholders developed which can be accessed through the SSTC centre website link http://ttssc.ustb.edu.cn/. • 5 RE training curriculums added on SSTC centre website as E-Learning course, and 5 E-Learning courses uploaded on SSTC centre website, and 30 views and subscription to online courses.						Fully Compliant
Indicator 2.2.4: Joint research projects	• Research Agenda has been identified as an effective way to exchange knowledge and experience on RETs, • The research agenda on mainstreaming biogas and solar potential for a Transition to Sustainable Energy was produced through a set of collaborative research and consultations Activities initially developed laid the ground foundation for the next steps of the Research Agenda, include: • Identification of the research topic/need, • Exchanging program for young Ethiopian researchers, • Seeking joint research grants for a short or long term, and • Hosting the domestic or international academic symposium						Fully Compliant
Outcome 3: Project Management							

Indicator 3.1 Coordination mechanism further regularised and enhanced	• The National South-South Project Steering Committee (NSSPSC) meetings in Ethiopia was convened by Ethiopia CO on the yearly basis, with the participation of the State Minister of MOWE, mainly discussed major project progress, outstanding challenges, lessons learnt and the way forward. • In China, ad-hoc ExO meeting convened by China CO on regular basis, during which key issues were discussed concerning progress being made, non-cost extension and next steps. • Led by PMUs regular monthly meetings as well as ad-hoc meetings were held with Chinese and local experts at the total of 20 sessions throughout the reporting period through multiple communication channels, ensuring smooth communications and timely implementation and problem-solving.						Fully Compliant

Legend

SMART criteria compliant	Questionably compliant to SMART criteria	Noncompliant to SMART criteria

Remarks:

In Ethiopia: Completion of the remaining two demonstration sites construction (1 biogas and 1 solar water pump) is ongoing.

In China: Communication materials to distil and demonstrate project milestones, development results and impact are under planning.

Annex 10: Project Risks Status at TE and Implemented Mitigating Measures

Ethiopia project segment

No	Risk description Category /	Risk Category	Rating (R) at		Mitigation Measures Taken
			Design	TE	
1	The complexity of the in-house procurement portal, and the system glitches due to the migration of procurement system (ATLAS to QUANTUM).	Operational	Unforesee n	High	Contributed to delays in project implementation or project postponement but UNDP Senior Management called for a meeting with HQ Quantum Procurement Team and the PMU and CO procurement officer continuously consulted and communicate with HQ Quantum Procurement Team for addressing the problems.
2	The spreading of COVID-19 globally at the beginning of 2020 causing huge impacts on health, economics, work, communication, travel constraints etc	Social and Environment al	Unforesee n	High	Contributed to delays in project implementation and postponement of project leverage expertise and technologies from local partners, especially with Chinese partners through online technologies/communication platforms and exploring virtual/cloud based joint missions utilized.
3	Political instability in pilot project country	Political	Moderate	High	The PMU worked closely with local partners, suppliers and other stakeholders to boost coordination and minimise delays to implementation by rescheduling of project activities and annual work plans.
4	Insufficient maintenance of equipment provided	Operational	Moderate	Moderate	On-site training in the demonstration sites on operation, and safety to build a pool of experts. Finally, each demonstration sites provided with manual and information material.
5	Inappropriate selection of technologies/ providers	Operational	Low	Low	Preliminary activities have been defined around technology selection for a specific use to ensure adapted technology. Furthermore, UNDP China and UNDP Ethiopia closely monitored and undertook QA activities.

No	Risk description Category /	Risk Category	Rating (R) at		Mitigation Measures Taken
			Design	TE	
6	Inappropriate selection of pilot demonstration sites and end-users	Operational	Low	Low	Sites were selected based on consistent criteria and feasibility study conducted, TV stations and official websites loaded and official letters sent to the targeted institutions. Furthermore, UNDP china and UNDP Ethiopia took close monitoring and QA activities.
7	Differences among member countries in the Project Board	Political	Low	Medium	UNDP Senior Management called for a bilateral meeting with Minister and State Minister to jointly review UNDP's interventions and current collaboration in Ethiopia at the strategic level and introduced the project status and the need for support to the project implementation.
8	Socio-environmental impact for the demonstration project not properly assessed	Operational	Low	Low	Socio-environmental impact assessment implemented and supervised in collaboration between MOWE and UNDP.
9	Local stakeholders in China do not want to engage in project led initiatives leading to limited technology and Know-how transfer	Operational	Moderate	Low	An initial stakeholder meeting with all partners held in Ethiopia. The responsible partner ACCA21 was already engaged as a South-South cooperation partner and had a direct interest in embedding additional projects to institutionalize the South-South Cooperation Centre. The MoA was also in biogas research and technology transfer.
10	Lack of Coordination between implementing partners	Operational	Moderate	Moderate	A communication and reached at the start of the project to ensure coordination and facilitate communication among the partners. UNDP supervised the development of these strategies and ensured consistency and the use of lessons learnt from past projects.
11	Change in UNDP's approach to South-South cooperation.	Organizational Strategic	Low	Low	MoU signed between China and UNDP and South-South Cooperation aligned with UNDAF/UNSDCF.

No	Risk description Category /	Risk Category	Rating (R) at		Mitigation Measures Taken
			Design	TE	
12	Budgeting delays in project beneficiary country	Organizational Strategic	Low	Low	The project was designed as incremental support to existing projects in Ethiopia, for example GEF project on rural energy access. Incremental activities to existing projects co-financed through these projects.