TERMS OF REFERENCE

TECHNICAL ASSESSMENT ON ENERGY RESOURCES, TECHNOLOGICAL NEEDS AND CAPACITY REQUIREMENTS FOR AGRICULTURE-PASTORALISM AND FISHING SUBSECTORS IN SOMALIA

1. Background Information

1.1 Introduction to the ACTIVE Project

The Advancing Circular Technologies for Infrastructure and Value-chain Enhancement (ACTIVE) Project is a European Union funded initiative implemented by ADRA, Windle, and READO to strengthen Somalia's economic resilience by integrating renewable energy solutions into agriculture, livestock, and fisheries value chains. The ACTIVE Project is designed to drive economic growth by expanding access to renewable energy, thereby enhancing productivity across key economic sectors. By integrating sustainable energy solutions into agriculture, fisheries, and livestock industries, the project aims to address critical gaps in energy availability, efficiency, and affordability, which currently hinder market competitiveness and economic resilience.

In addition to improving energy access, the project places a strong emphasis on circular economy principles to minimize resource wastage and promote sustainability. By fostering efficient resource utilization, recycling, and regenerative production systems, the initiative will ensure that agri-food value chains operate in an environmentally responsible and economically viable manner. Furthermore, the project seeks to strengthen market-driven approaches within Somalia's agri-food sector, ensuring that renewable energy investments align with actual market demands. By conducting rigorous market assessments and engaging key stakeholders, including MSMEs, investors, and policymakers, the project will facilitate evidence-based decision-making to direct energy investments toward high-impact, commercially sustainable value chains. This strategic approach will not only enhance the economic viability of renewable energy adoption but also create opportunities for job creation, private sector engagement, and long-term economic resilience.

The ACTIVE Project is strategically aligned with Somalia's National Development Goals, the European Green Deal, the Sustainable Development Goal (SDG) 7, and the Somalia National Transformation Strategy (NTA), reinforcing a shared vision for sustainable economic growth, energy access, and market competitiveness. A central focus of the project is to increase access to reliable and sustainable energy sources for productive use, particularly in agriculture, fisheries, and livestock sectors. By integrating renewable energy solutions, the project seeks to enhance energy efficiency, reduce dependency on costly and environmentally harmful fuels, and support climate resilience.

Ensuring equitable and affordable energy access will enable smallholder farmers, agro-processors, and rural enterprises to improve productivity and scale their operations. Beyond energy access, the project is committed to enhancing food security and strengthening market competitiveness through improved processing and storage infrastructure. Somalia's agri-food sector is often constrained by post-harvest losses, inadequate cold storage, and inefficient food preservation methods, which limit economic growth and food availability. ACTIVE will address these challenges by promoting renewable energy-powered storage facilities, processing technologies, and logistics solutions, ensuring that agricultural products retain their quality and fetch competitive prices in domestic and international markets. A key driver of sustainable

economic transformation in Somalia is private sector investment, and ACTIVE aims to stimulate private sector engagement in renewable energy solutions tailored for agri-food businesses. By creating an enabling policy environment, fostering public-private partnerships (PPPs), and identifying investment opportunities, the project will help unlock financing for renewable energy solutions, particularly for small and medium enterprises (SMEs) operating in agriculture and food production. This aligns with the Somalia NTP's goal of strengthening economic diversification and energy security, ensuring that investments in renewable energy directly contribute to job creation, economic stability, and long-term sustainability. By aligning with these national and international frameworks, the ACTIVE Project not only supports Somalia's transition to a greener, more resilient economy but also lays the groundwork for sustainable development, food security, and inclusive economic growth in the country.

The project's implementation will take place across seven regions: Banadir Regional Administration, Hirshabelle State, Galmudug State, Jubbaland State, Southwest State, Puntland and Somaliland. The project's core objective is to strengthen Somalia's energy-food nexus by ensuring that renewable energy investments are demand-responsive, commercially viable, and sustainable in the long term.

1.2 Justification for the Technical Assessment

1.2.1 Rationale for the Study

While Somalia possesses considerable renewable energy potential—particularly in solar and wind energy—its agriculture, livestock, and fisheries sectors remain largely dependent on expensive and environmentally harmful fossil fuels. Limited access to affordable and sustainable energy significantly undermines productivity, profitability, and resilience in these sectors. A strategic intervention in renewable energy requires localized data, technical feasibility assessments, and comprehensive mapping of needs and capacities.

This technical assessment will serve as a critical benchmark for energy planning and implementation under the ACTIVE Project. It will offer a clear understanding of local energy resource availability, productive energy demands, technological gaps, and institutional readiness. Furthermore, the assessment will produce a decision-support tool that enables farmers, cooperatives, and other stakeholders to determine appropriate energy solutions based on site-specific data inputs.

1.2.2 Key Research Questions

i. What is the geographic and technical availability of renewable energy resources (solar, wind, hybrid) in the 10 target communities?
ii. What are the energy demands for productive use in agriculture, pastoralism, and fishing?
iii. What technologies are needed to support key value-chain operations (e.g., irrigation, cold chain, drying, processing)?
iv. What are the capacity, knowledge, and infrastructure gaps hindering clean energy adoption?
v. What are the essential parameters and functions required in the proposed energy sizing tool?

2. Objectives of the Technical Assessment

2.1 Overall Objective

To conduct a comprehensive technical and institutional assessment of energy resources, technological needs, and capacity gaps across the agriculture-pastoralism and fishing subsectors in ten selected Somali communities, and to develop a localized energy decision-support tool for clean technology planning and deployment.

2.2 Specific Objectives

The study will:

- To map the technical feasibility and availability of solar, wind, and hybrid energy sources.
- To identify and quantify productive energy needs in target value chains.
- To assess the availability and adequacy of existing energy technologies and infrastructure.
- To evaluate technical skills, training capacity, and institutional readiness for energy deployment.
- To develop a practical and user-friendly model that matches energy demand with appropriate solutions based on user inputs.
- To provide strategic recommendations on technology choices, training needs, and investment opportunities.
- To provide system sizing and BoQs for the proposed technologies by site/community.

3. Scope of Work

3.1 Geographic Coverage

The technical assessment will be conducted across ten (10) pre-selected communities located in seven Federal Member States and regions of Somalia: Banadir, Hirshabelle, Galmudug, Jubbaland, Southwest, Puntland and Somaliland. These communities represent a variety of agro-ecological zones and economic profiles. Each site presents distinct challenges and opportunities in renewable energy utilization, ranging from coastal fishing towns to dryland pastoral settlements and highland farming zones.

3.2 Thematic Areas of Assessment

3.2.1. Renewable Energy Resource Mapping

This component will involve a comprehensive mapping of solar irradiance and wind speeds across the ten selected communities using satellite data, ground-level resource measurement tools, and GIS analysis. Seasonal and diurnal patterns will be analysed to understand variations in resource intensity, reliability, and risks. The study will evaluate site-specific factors such as elevation, temperature, cloud cover, and wind turbulence to determine the most viable and sustainable renewable energy options for each location.

The mapping exercise will also identify natural and man-made obstacles, environmental sensitivities, and access to infrastructure that may influence the deployment of solar, wind, or hybrid systems. Outputs will be used to inform investment prioritization, technology suitability, and local energy planning.

3.2.2. Productive Energy Needs Analysis

This segment will assess the actual and projected energy demands required to enhance productivity in agriculture, livestock, and fisheries. Focus will be placed on:

- Irrigation systems (manual vs. solar-powered pumps)
- Crop processing (threshers, milling, shelling)

- Livestock watering and milk chilling
- Meat preservation and fish processing (cold storage, drying racks, ice-making units)
- Storage and transport infrastructure

Energy use will be analysed across household, cooperative, and SME levels. Load calculations, peak consumption periods, and future energy demand trends will be mapped using field surveys, equipment audits, and local use case profiling. Findings will enable energy system sizing, investment cost estimation, and productivity impact projections.

3.2.3. Technology Feasibility and Appropriateness

This section will evaluate the technical viability, cost-efficiency, scalability, and user-friendliness of various clean energy technologies suitable for Somalia's rural and coastal contexts.

The study will examine:

- Solar PV systems (standalone, mini-grid, and micro-grid applications)
- Wind turbines (horizontal and vertical axis systems)
- Hybrid systems (PV-wind-battery-diesel configurations)
- Storage solutions (batteries, thermal storage, cold rooms)

Each technology will be reviewed against performance benchmarks, community feedback, maintenance requirements, local supply chain readiness, and climate resilience. This will ensure technology recommendations are not only technically sound but also economically and socially sustainable for long-term adoption. A list of proposed technology based on assessment will be provided for each location.

3.2.4. Institutional and Human Capacity Assessment

A detailed capacity audit will be conducted across local institutions, community cooperatives, technicians, and training centres to assess:

- Availability of skilled personnel for installation and maintenance
- Institutional ability to support O&M (Operations & Maintenance) systems
- Training needs for technicians, extension officers, and cooperatives
- Existence and effectiveness of local service providers
- Opportunities to collaborate with TVET institutions and vocational programs

The goal is to understand existing gaps in energy literacy, technical know-how, and governance structures that may hinder or enable the deployment of renewable energy solutions. The results will directly inform the development of tailored training curricula, public-private partnerships, and capacity-building investments under ACTIVE.

3.2.5. Policy and Regulatory Environment

This area will assess the existing policy frameworks, legal instruments, and institutional mandates governing energy access, agricultural development, environmental protection, and climate resilience. Key focus areas include:

- National Energy Policy and Renewable Energy Action Plans
- Agriculture, livestock, and fisheries development strategies
- Land-use regulations and energy licensing procedures
- Existing subsidies, tariffs, and private investment incentives
- Gender inclusion and environmental safeguards in energy policy

The review will also identify regulatory bottlenecks, overlaps, and gaps that affect energy deployment in rural productive sectors. Recommendations will support evidence-based policy reforms, alignment with national strategies, and donor coordination.

3.2.6. Energy Decision-Support Tool Development

A core deliverable of the assignment is the design and prototyping of a user-friendly, interactive digital model that will allow stakeholders to:

- Input location (via GPS or region selection)
- Choose preferred energy source (solar, wind, hybrid)
- Specify the type of productive activity (e.g., milk chilling, irrigation)
- Enter estimated energy load or usage profile

The tool will automatically generate a system recommendation, including optimal sizing, component configuration, estimated cost, and possible suppliers or technologies. It should be lightweight, offline-enabled, mobile-friendly, and customizable for low-connectivity areas. Piloting and community feedback will inform the tool's refinement, usability, and potential for national or regional scaling.

3.4 Expected Impact of the Study

The findings from this baseline assessment will serve as a foundational guide for designing energy and market-based interventions that are economically viable, socially inclusive, and environmentally sustainable. The insights gained will:

1. Help policymakers, investors, and development partners make informed decisions about energy investments in agriculture.
2. Strengthen Somalia's agricultural resilience by aligning energy solutions with market demands.
3. Unlock new investment opportunities for renewable energy integration in agri-food value chains.
4. Support the private sector in scaling commercially viable energy solutions for smallholder farmers and agribusinesses.

By providing comprehensive market intelligence, the study will ensure that energy investments are demand-driven, financially sustainable, and capable of transforming Somalia's food systems.

4. Methodology

The assessment will adopt a comprehensive mixed-methods approach that integrates both quantitative and qualitative data collection and analysis techniques. This ensures triangulation of findings, contextual accuracy, and evidence-driven insights. The methodology will be participatory in nature, enabling community ownership and stakeholder validation. All fieldwork will be conducted in collaboration with local authorities, community leaders, technical partners, and the ACTIVE Project implementation teams across the ten pre-selected communities.

The methodology will be designed to capture energy needs, map renewable resource availability, analyse technology feasibility, and inform tailored intervention designs through both empirical field data and desktop analyses. The following components will be implemented:

4.1. Literature Review

A structured desk review will be conducted to gather and synthesize existing secondary data, policies, and project evaluations related to renewable energy deployment, agri-food value chains, and climate-resilient energy solutions. Sources will include:

- Somalia's National Energy Policy and Renewable Energy Action Plan
- Agricultural and fisheries development frameworks
- Existing energy feasibility studies from FAO, UNDP, World Bank, IGAD, etc.

- Geospatial datasets on solar irradiance, wind maps, and topographical data
- Academic and peer-reviewed publications on rural energy in fragile states

This review will inform the design of field tools, contextual understanding of policy environments, and identification of knowledge gaps.

4.2. Key Informant Interviews (KIIs)

Semi-structured interviews will be conducted with a wide range of stakeholders across public, private, and civil society sectors. These will provide insight into energy policy implementation, institutional coordination, investment dynamics, and capacity development challenges. Respondents will include:

- Energy ministry and regional energy offices
- Ministries of Agriculture, Livestock, and Fisheries
- Regulatory authorities and investment promotion agencies
- TVET institutions and renewable energy training centres
- Renewable energy service providers (ESPs), local installers, and micro-enterprises
- Development partners and sectoral NGOs involved in energy and livelihoods

Interviews will be tailored to capture institutional perspectives on regulatory readiness, investment constraints, public-private partnerships, and technical knowledge systems.

4.3. Focus Group Discussions (FGDs)

To capture community-level insights, gender perspectives, and use-case scenarios, FGDs will be organized with diverse target groups including:

- Smallholder farmers and agricultural cooperatives
- Pastoralist groups and mobile herder communities
- Fisherfolk associations and fish vendors
- Women's savings groups and female-led agribusinesses
- Youth groups and vocational trainees
- Community elders and traditional energy system users

FGDs will explore energy access challenges, adoption barriers, user preferences, and socio-cultural attitudes toward renewable energy technologies. Gender-disaggregated data will be emphasized to assess inclusive energy planning.

5. Field Energy Audits

Field teams will conduct community-level energy audits to document existing infrastructure, energy consumption patterns, and productivity constraints. Audits will include:

- Inventory of current energy assets (diesel pumps, solar panels, batteries, storage units)
- Measurement of actual energy loads for key activities
- Observations on system conditions, operational challenges, and usage behaviour
- Data collection using structured audit tools and technical assessments (e.g., voltage, capacity ratings)

Findings will be used to estimate energy supply gaps, efficiency levels, and cost implications for transitioning to clean energy.

6. Technical Feasibility Mapping

GIS-based analysis will be conducted to identify high-potential sites for solar, wind, and hybrid energy systems. This will involve:

- Integration of satellite-derived solar irradiance and wind velocity datasets
- Cross-verification with on-the-ground observations and resource readings
- Terrain, environmental, and land use suitability assessments

- Mapping of proximity to roads, grids, water sources, and markets

The resulting geospatial outputs will be used to overlay productive zones with energy potential, guiding future investment decisions.

7. Energy Tool Design and Piloting

A prototype energy system sizing model will be designed based on field data and user needs. The tool will allow users to input:

- Location (GPS coordinates or dropdown selection)
- Type of activity (e.g., irrigation, milk cooling, fish preservation)
- Energy usage requirements (load estimates or appliance list)
- Technology preference (solar, wind, or hybrid)

The tool will generate a recommendation that includes:

- Suggested system size and configuration
- Estimated capital and O&M costs
- Required storage and control components
- Environmental and technical considerations

The tool will be tested and refined in two selected pilot communities, and feedback will be incorporated to improve usability, accuracy, and scalability. The final model will be made available to partners, policymakers, and communities as a decision-support system.

8. Data Analysis and Validation

All quantitative data will be analysed using software tools such as Excel, SPSS, or STATA, while qualitative data will undergo thematic analysis. GIS data will be processed using tools like QGIS or ArcGIS to create layered maps and visual models. A validation workshop will be held to present preliminary findings to stakeholders, ensuring accuracy and community alignment before final reporting.

9. Ethical Considerations and Community Engagement

The assessment will follow do-no-harm principles, ensuring ethical engagement with communities. Informed consent will be obtained, and data privacy, cultural sensitivity, and gender balance will be upheld throughout the research. Local guides and translators will be used to support access and understanding in diverse settings.

10. Key Deliverables and Timeline

Deliverable	Timeline
Inception report including methodology and workplan	Week 1
Finalized data collection tools and enumerator training	Week 2
Field data collection, audits, and interviews	Weeks 3–5
Data analysis and preliminary findings	Week 6-7
Draft technical report and prototype energy sizing tool	Week 8
Stakeholder validation workshop	Week 9
Final report, toolkit, and dissemination	Week 10

11. Expected Impact

This technical assessment will serve as a foundational pillar for the ACTIVE Project's clean energy strategy, equipping stakeholders with the data, tools, and insights necessary to drive transformational change across Somalia's productive sectors. By generating localized evidence, identifying scalable energy solutions, and mapping institutional and technical gaps,

the assessment will deliver a high-impact roadmap for inclusive and resilient energy deployment.

The outcomes of this assignment will enable the ACTIVE Project and its partners to:

- *Catalyze Investment in Renewable Energy:* Provide robust, site-specific evidence to guide strategic investment in solar, wind, and hybrid energy infrastructure aligned with community priorities and economic activities.
- *Deploy Tailored Energy Solutions for Productive Use:* Enable the design and delivery of fit-for-purpose renewable energy systems for agri-food production, processing, storage, and value addition, ensuring higher productivity and reduced operational costs for farmers, pastoralists, and fisherfolk.
- *Shape Policy and Regulatory Reform:* Offer actionable recommendations to strengthen Somalia's energy policy landscape, incentivize private sector participation, and mainstream renewable energy into national agriculture, fisheries, and rural development strategies.
- *Enhance Institutional and Human Capacity:* Identify critical skill gaps and institutional needs to inform the development of training programs, curricula, and technical assistance initiatives that foster local expertise in clean energy systems.
- *Drive Green Enterprise Growth and Job Creation:* Promote new livelihood opportunities through energy-enabled business models, stimulating green entrepreneurship, employment, and MSME competitiveness in the renewable energy value chain.
- *Advance Climate Resilience and Environmental Sustainability:* Support the transition from fossil fuels to low-carbon, climate-smart technologies, contributing to Somalia's climate adaptation goals and international sustainability commitments.

Empower Local Decision-Making through Digital Innovation: Deliver an accessible, data-driven energy sizing tool that enables communities, cooperatives, and planners to make informed, autonomous decisions on energy system selection, design, and deployment.

12. Required Expertise and Qualifications

The assignment requires a highly qualified and multidisciplinary consulting team or firm with proven expertise in the design, execution, and analysis of renewable energy assessments in rural, climate-vulnerable, and resource-constrained environments. The team must be capable of conducting technical diagnostics, community-level consultations, policy analysis, and digital tool development, while ensuring inclusion, contextual relevance, and data integrity.

Minimum Core Competencies:

- *Renewable Energy Systems Engineering:* Demonstrated hands-on expertise in the design, sizing, and deployment of solar PV, wind, hybrid, and off-grid systems, with a deep understanding of system integration for productive applications in agricultural and fishing communities.
- *Energy Access Modelling and Simulation:* Proven ability to conduct demand forecasting, load profiling, and energy systems modelling using tools such as HOMER, PVsyst, or similar software to recommend optimized renewable energy solutions.
- *Sector-Specific Technical Knowledge in Agri-Food Systems:* Experience with energy use cases in irrigation systems, crop processing units, cold storage chains, livestock watering, milk cooling, and fish preservation infrastructure. Understanding how energy solutions enhance resilience and profitability in these value chains is essential.
- *Fisheries and Aquaculture Energy Applications:* Familiarity with energy requirements for coastal and inland fisheries, including solar-powered cold chains, fish drying

techniques, ice-making units, and clean fuel alternatives for fish processors and transporters.

- *Socio-Economic and Value Chain Analysis:* Strong grounding in conducting multi-stakeholder value chain assessments, cost-benefit analysis, and the intersection of energy access with livelihood enhancement, MSME development, and local market integration.
- *Geospatial and Spatial Data Analysis:* Proficiency in GIS-based mapping, satellite data interpretation, and spatial overlay analysis to identify renewable energy potential across terrain, climatic, and infrastructural variables.
- *Digital Tool and Application Development:* Ability to develop, test, and deploy mobile or web-based decision-support tools, preferably using open-source platforms. Tools must function in low-connectivity environments and be tailored for use by non-technical users in rural settings.
- *Community Engagement and Research in Fragile Contexts:* Demonstrated capacity to carry out participatory field research, facilitate inclusive focus group discussions, and gather high-quality data from diverse stakeholders, including women, youth, displaced populations, and informal sector actors. Experience working in fragile and conflict-affected areas is highly desirable.

13. Application Process

Interested applicants must submit:

- Cover Letter (max 3 pages) outlining relevant experience.
- Curriculum Vitae (CV) demonstrating expertise to conduct the assignment
- Technical Proposal (max 7 pages) outlining methodology and work plan.
- Financial Proposal detailing consultancy fees and other costs.

Submission Deadline: 20th May 2025

Submit applications to: hr@adrasom.org for full Terms of Reference (TOR) kindly visit **www.adrasom.org**

Subject line: Technical Assessment on Energy Resources and Technological Needs – ACTIVE Project.

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