POLICY BRIEF 2

SESA
Smart Energy Solutions for Africa

Agri-food Systems

Image: Erin Hill

Introduction

Despite Africa's vast renewable energy potential – particularly in solar – more than 600 million people, or approximately 43% of the population in sub-Saharan Africa, still lack access to electricity (IEA, 2022). This enduring energy gap compels millions to rely on polluting and expensive fuels such as kerosene and biomass. These fuels not only strain household finances but also pose serious health risks and contribute significantly to environmental degradation (WHO, 2024) with women, girls and the most vulnerable people being disproportionally affected by energy poverty (UN Women, 2021).

At the current pace of electrification, coupled with rapid population growth, the number of people without access to electricity is projected to remain largely unchanged in the coming decades (IEA, 2022).

Africa holds vast untapped potential to drive inclusive, clean energy-based development. Realising this potential requires equitable policy frameworks, community-driven innovation, and financing models that empower local actors. The **AU-EU Innovation Agenda** and the **EU's Global Gateway Africa–Europe Investment Package**, which aim to mobilise up to €150 billion in strategic investments, place innovation and energy access at the heart of the bi-regional partnership.

Realising Africa's clean energy future demands more than infrastructure; it calls for inclusive innovation ecosystems, fit-for-purpose financing models, and targeted support for small and medium-sized enterprises (SMEs). It is within this context that a new generation of business models is emerging – designed to overcome affordability barriers, strengthen local ownership, and scale decentralised energy access.

This policy brief shares key insights on Agri-food systems emerging from the EU funded project **Smart Energy Solutions for Africa (SESA)**. It draws on lessons from technology demonstrations in Living Labs in Kenya, Ghana, Malawi, as well as from the replication actions that took place in Rwanda, Nigeria

and Tanzania. This brief identifies key policy challenges and opportunities relevant to future EU development cooperation, particularly in support of the AU-EU Innovation Agenda and the Global Gateway strategy. It seeks to inform evidence-based policymaking by identifying replicable models, priority areas for regulatory reform, and targeted recommendations for supporting an inclusive and sustainable energy transition across Africa.

This policy brief is one out of three. The other policy briefs, in line with the SESA project scope of work, explore the following topics:

1. Green Electric Infrastructure: this brief presents policy insights on e-mobility, decentralised solar systems, as well as e-waste and second-life batteries (SLBs).

2. Acceleration of Sustainable Growth through Innovation, Education and Awareness Raising: this brief provides recommendations to foster innovative business models, and mobilise targeted financial support to drive a low-carbon, inclusive transformation.

How to Read This Document

This policy brief presents a synthesis of key findings, policy barriers, and regulatory insights emerging from the **Smart Energy Solutions for Africa (SESA) project**. It builds on a combination of evidence drawn from in-country technology demonstrations, stakeholder engagement, and the project's broader policy roadmaps.

While the brief highlights a range of thematic areas, **it does not aim to provide a comprehensive or exhaustive overview of all technologies for all country contexts. Not all participating entities have engaged with every technology or regulatory issue in equal depth**. Instead, the document focuses on consolidated insights, mature practices, and illustrative examples where relevant information was functional to the project logic.

For further insights on the recommendations outlined in this brief, you can refer to relevant SESA documents, such as country policy barrier analyses and country policy roadmaps, on our **project website**.

By centring innovation, community ownership, and financial inclusion, these efforts align closely with the **United Nations 2030 Agenda for Sustainable Development**, the **African Union's Agenda 2063**, as well as with the ambition of the **AU-EU Innovation Agenda** to co-develop solutions that address shared challenges. However, barriers such as limited consumer awareness, constrained access to finance, and underdeveloped supply chains continue to impede broader adoption and scale-up.

Finally, no policy or technology can succeed without the engagement of local communities and the leadership of local authorities. A just and inclusive energy transition depends on trust, participatory design, and local ownership. These are not secondary to infrastructure; they are fundamental to impact and scale.

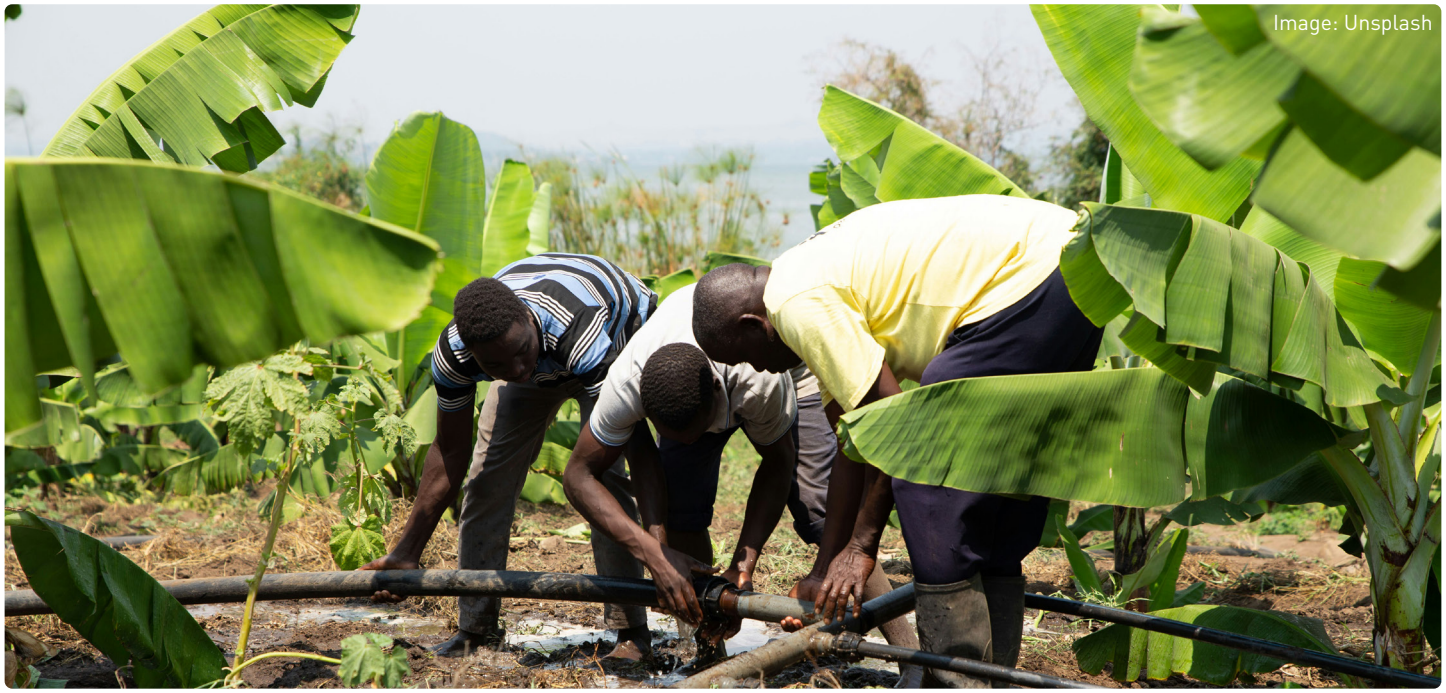
Image: Unsplash

Agri-food systems

The agri-food system in Africa is under increasing pressure from the impacts of climate change. Rising temperatures, shifting rainfall patterns, shorter but more intense rainy seasons, and prolonged dry spells are placing immense strain on African farmers – particularly the 60% of the population employed in agriculture – many of whom rely on subsistence farming (Africa Development Bank, 2019). These climate-related stresses directly threaten food security and the well-being of millions of households.

Yet, there is significant potential to improve agricultural resilience. Currently, only about 6% of Africa's cultivated land is irrigated (FAO, 2024), and most of it depends on diesel-powered pumps, which impose high and recurring costs on farmers.

In parallel, urgent action is needed to transform cooking practices. Despite growing awareness of the health, environmental, and economic harms of traditional cooking methods, over 950 million people in Sub-Saharan Africa still depend on wood or charcoal (United Nations Climate Change, 2021). More than two-thirds of the population use open fires or inefficient stoves, often with deadly consequences for women, children, and other vulnerable groups (UN Environment Programme, 2024).

Clean energy solutions, such as solar-powered irrigation and clean cooking technologies, are essential to addressing both agricultural and household energy challenges, building resilience, and improving livelihoods across the continent.

Clean cooking

Access to clean cooking remains a major challenge across many African countries, with serious health, environmental, and gender-related impacts. Affordability and limited access to alternatives have kept over half of the population in many regions reliant on polluting fuels. Women and children are disproportionately affected, spending hours collecting firewood and facing significant health risks from indoor air pollution (Jagoe et al., 2020), (Health Effects Institute. (2024).

This is the case in both, Ghana and Malawi, where clean cooking solutions have been tested. In Ghana, for example, more than 54% of households still use firewood or charcoal, contributing to deforestation, severe indoor air pollution, and an estimated 28,000 premature deaths each year (World Bank Group, 2022a), (Clean Air Fund, n.d.). Unsustainably sourced biomass was estimated to account for 90% of the fuel mix in Malawian urban areas, and 98% in rural areas (World Bank, 2023). Similar trends are seen across Sub-Saharan Africa, where non-renewable solid fuels dominate household energy use.

To incentivize the swich from cooking fires fuelled by wood or charcoal – the most common way of cooking in Malawi – to less polluting means, in 2021 the national government committed to distributing another 2 million energy-efficient cookstoves by 2026, whilst promoting liquefied petroleum gas (LPG) in urban areas and biomass briquettes in rural sites (World Bank Group (2022b).

In 2024, further progress was made with the publication of the Malawi Electric Cooking Roadmap (Government of Malawi, 2024). The distribution of improved cookstoves — with 1 million planned in addition to the 2.5 million already distributed — has also been organized by the Ghanaian government, which, since spring 2025, has been in the process of defining the National Clean Cooking Policy (NCCP), a coherent strategy to enhance clean cooking technologies across the country. The diversification of the clean cooking energy mix is at its heart, supporting LPG (50% by 2030), electric, biogas and improved cookstoves.

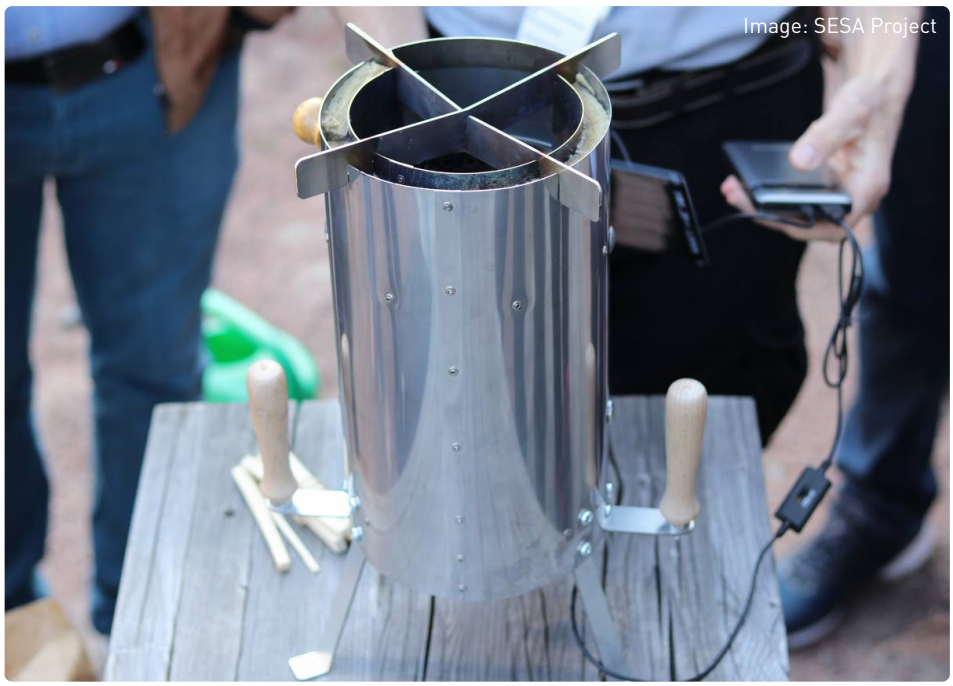
Image: SESA Project

Countries such as Rwanda and Nigeria have introduced national clean cooking policies and set ambitious targets to accelerate the transition to cleaner cooking fuels, primarily by promoting the use of liquefied petroleum gas (LPG). In Rwanda, the National Strategy for Transformation (NST-1, 2017–2024) set a bold target to reduce the population's dependence on biomass for cooking from 82% to 42% by 2024. To support this goal, the government introduced a dedicated subsidy programme - **Clean Cooking Results-Based Financing** - to incentivize the adoption of LPG. While these efforts have led to progress, results remain below expectations.

Similarly, Nigeria has launched a Nigerian Gas Expansion programme (NGEP) aiming at increasing the adoption of LPG in the country. Among others, it includes the objective to encourage 30 million citizens to transition to LPG by 2025. This policy framework is part of a broader strategy to reduce reliance on biomass, improve health outcomes, and cut greenhouse gas emissions.

Despite these advancements, progress remains slow due to persistent affordability barriers, infrastructure gaps, and underinvestment. Promising alternatives – including biodigesters, ethanol stoves, and improved cookstoves – can reduce emissions and lower long-term costs. However, SESA project activities have shown that without stronger policy support, targeted subsidies, and increased investment to enable widespread adoption, these solutions remain out of reach for many low-income households.

POLITICAL AND INSTITUTIONAL

Institutional coordination around clean cooking remains fragmented, both horizontally across ministries, and vertically between national and subnational levels. This misalignment hinders effective policy implementation and effective resource allocation. Both Ghana and Malawi created transversal committees on clean cooking; respectively the Ghanaian Clean Cooking Inter-Agency Coordinating Committee and Malawi's National Clean Cooking Steering Committee (NCCSC).

The nomination of **clean cooking focal points** within relevant ministries and agencies can streamline coordination, enhance accountability, and foster integrated planning. Importantly, these focal points should have more than an advisory function, contributing also to practical implementation. A successful example of this engagement has been demonstrated in Uganda, where a dedicated taskforce responsible for coordinating standardisation is also involved in ensuring the implementation of policy (SESA 2025).

A comprehensive, cross-sectoral clean cooking strategy – backed by a robust monitoring and evaluation system – is essential for tracking progress, ensuring accountability, and avoiding the fragmented efforts that currently hinder impact at scale.

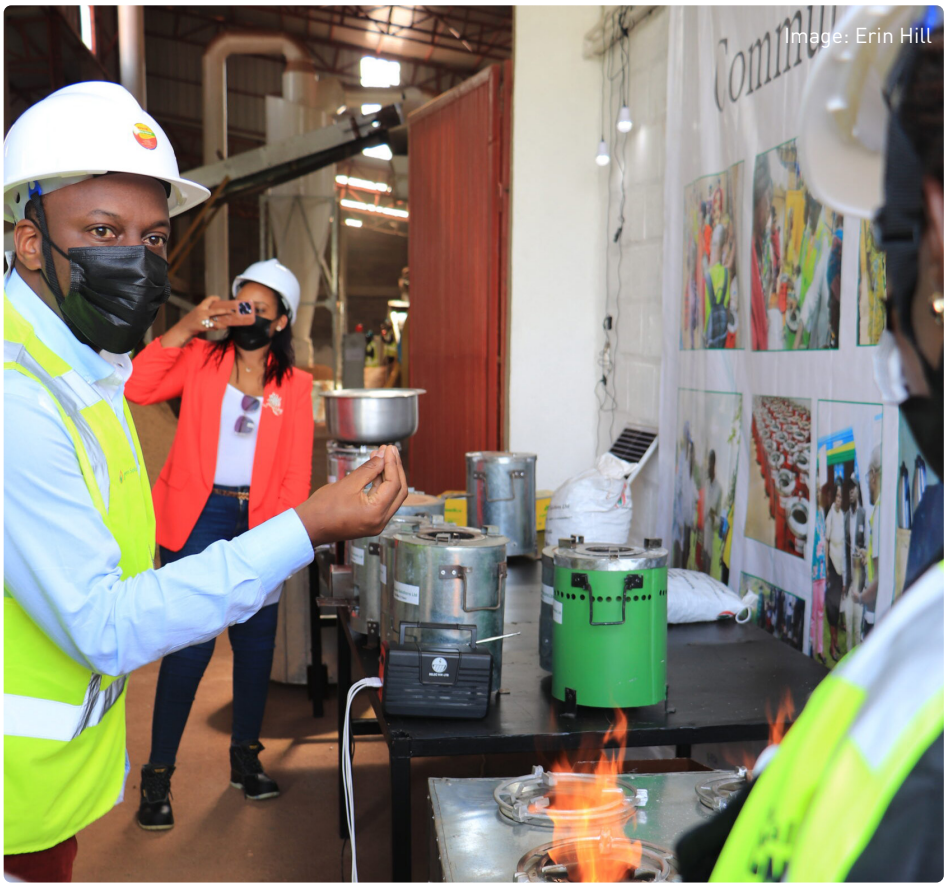
Image: Erin Hill

TECHNOLOGICAL

In recent years, **international standards for cooking stoves** have been developed and continue to be finetuned by the International Organization for Standardization (ISO), however the absence of widespread adoption of technical standards and quality control mechanisms undermines consumer confidence and market stability for clean cooking solutions. The Malawian Government should establish and enforce **minimum standards (ICS) and testing methods** for improved cookstoves and eCooking appliances, including **regulation of installation and maintenance** services. Technical oversight will promote market trust and facilitate long-term adoption (SESA, 2024).

Solar irrigation

Irrigation is vital for agricultural productivity, yet its effectiveness is often undermined by water scarcity, poor conservation practices, and inadequate infrastructure. These challenges are especially urgent in countries where large populations depend on agriculture for their livelihoods. As food prices rise, populations grow, and climate impacts intensify, governments must prioritize irrigation development.

Rwanda has taken notable steps by launching its first Irrigation Master Plan in 2010, offering tools for sustainable management of soil and water resources (The Government of Rwanda, 2010). The plan has since been updated to include modern irrigation technologies, including the promotion of solar-powered irrigation systems starting in 2019 (SESA, 2024).

Despite such efforts, water scarcity continues to limit productivity in countries like Tanzania and Namibia, where smallholder farmers remain dependent on unpredictable rainfall. In Malawi, only 15% of arable land is irrigated, even though agriculture contributes one-third of GDP and employs 80% of the population (SESA, 2024). Similarly, in Kenya, just 6% of farmland is irrigated, (National Irrigation Authority, 2023).

POLITICAL AND INSTITUTIONAL

Strong institutional and political commitment is essential to accelerate the adoption of solar irrigation. Rwanda offers a promising example via its national program for small-scale irrigation technologies, which provides subsidies to individual farmers, groups, and cooperatives (SESA, 2024). The program reflects effective collaboration between national government, development partners and the private sector. The government has played a central role by developing supportive policies and regulations, providing subsidies, incentives and ensuring institutional coordination. Development partners have contributed through technical and financial support, while the private sector has been instrumental in supplying and installing irrigation technologies.

In contrast, other countries have shown limited government support for renewable irrigation solutions, often due to scepticism and lack of exposure to successful models. In Malawi and Tanzania, the other countries in which SESA tested solar irrigation, **sustained engagement between national and regional policymakers** – alongside site visits to operational solar irrigation projects – is needed to build trust, demonstrate impact, and drive policy momentum (SESA, 2024).

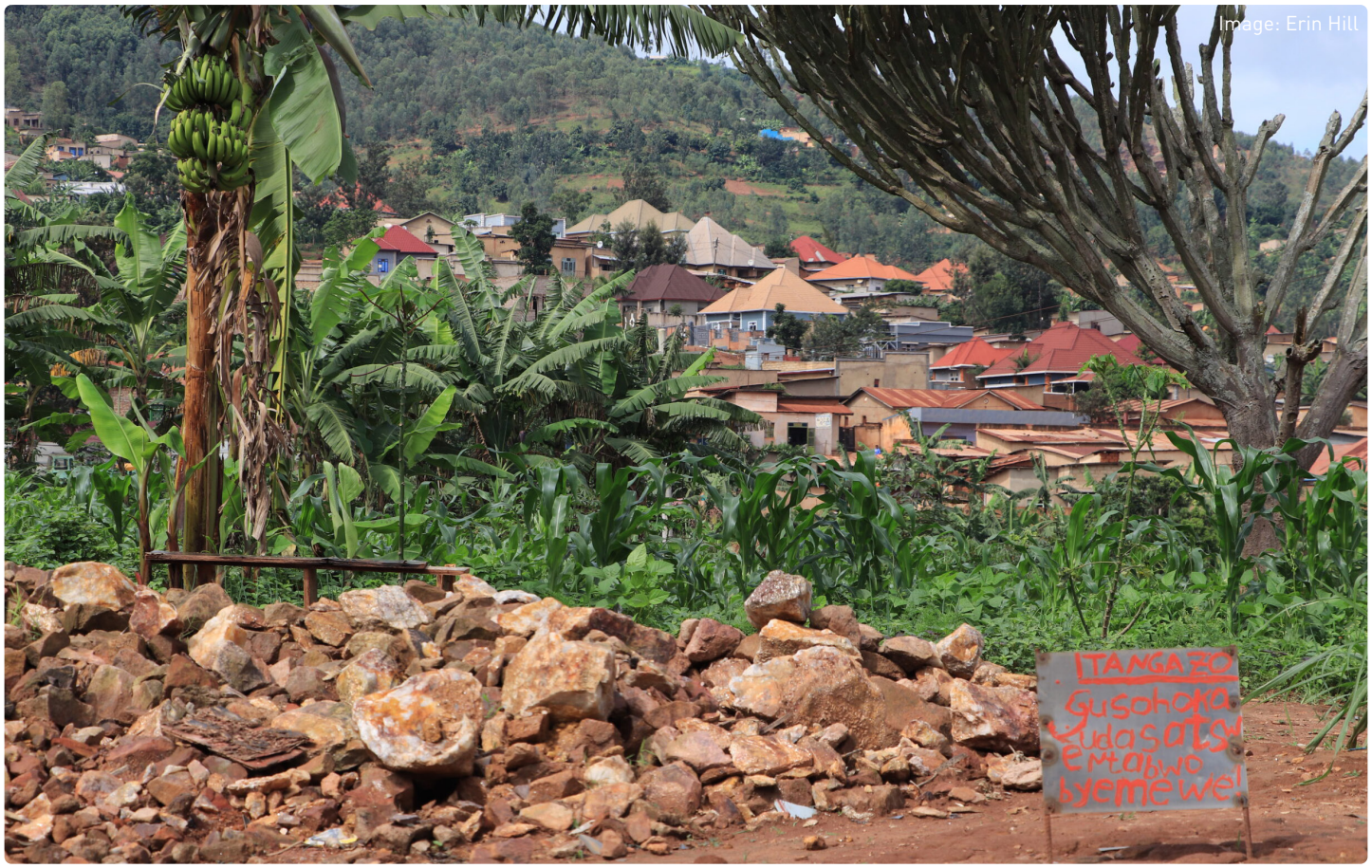

Image: Erin Hill

ENVIRONMENTAL

Water availability remains the primary environmental barrier to scaling solar irrigation technologies. Farmers often face limited access to water due to uneven distribution, ineffective conservation practices, and increasing overexploitation. This challenge is especially acute for smallholder farmers who rely on unreliable, seasonal rainfall and lack the infrastructure to store or manage water effectively (UNEP DTU, 2022). As a result, agricultural productivity is constrained, and harvest losses are common.

One promising solution is the introduction of water harvesting systems to expand irrigable land. In Rwanda, for example, recommendations include installing at least one water harvesting system per district, while encouraging banks – especially microfinance institutions – to offer loan schemes for broader uptake. Over time, locally produced water storage systems should be promoted, and farmers trained in their installation and maintenance.

However, water harvesting must be paired with effective conservation practices. In Rwanda, for instance, farmers struggle with high evaporation rates from stored water. To address this, policies should include technical guidelines for water conservation and mandate regular audits to ensure implementation.

At the same time, solar-powered pumps, while reducing the cost of water extraction, pose a risk of overuse. In Kenya, increased solar irrigation has led to groundwater overexploitation, highlighting the need for control mechanisms such as groundwater metering (International Water Management Institute, 2025). Metering enables enforcement of usage limits, monitoring, and data collection to inform evidence-based policies. Additional measures – such as water use quotas or pricing schemes – should be adapted to local conditions to ensure the sustainable use of water resources while protecting farmers' livelihoods (Global Alliance for Climate-Smart Agriculture, n.d.).

TECHNOLOGICAL

Proper sizing of solar irrigation systems is essential to meet the specific water needs of different crops and terrains, while avoiding energy waste or shortages. In Rwanda, where expertise in system sizing is limited, it is recommended to develop technical guidelines that account for terrain variability. This process should begin with expert-led terrain mapping (SESA, 2024), followed by the creation of user manuals to guide system sizing. Additionally, as noted in the section on decentralized solar systems, certification schemes for PV modules should be established to ensure quality and reliability (SESA, 2024).

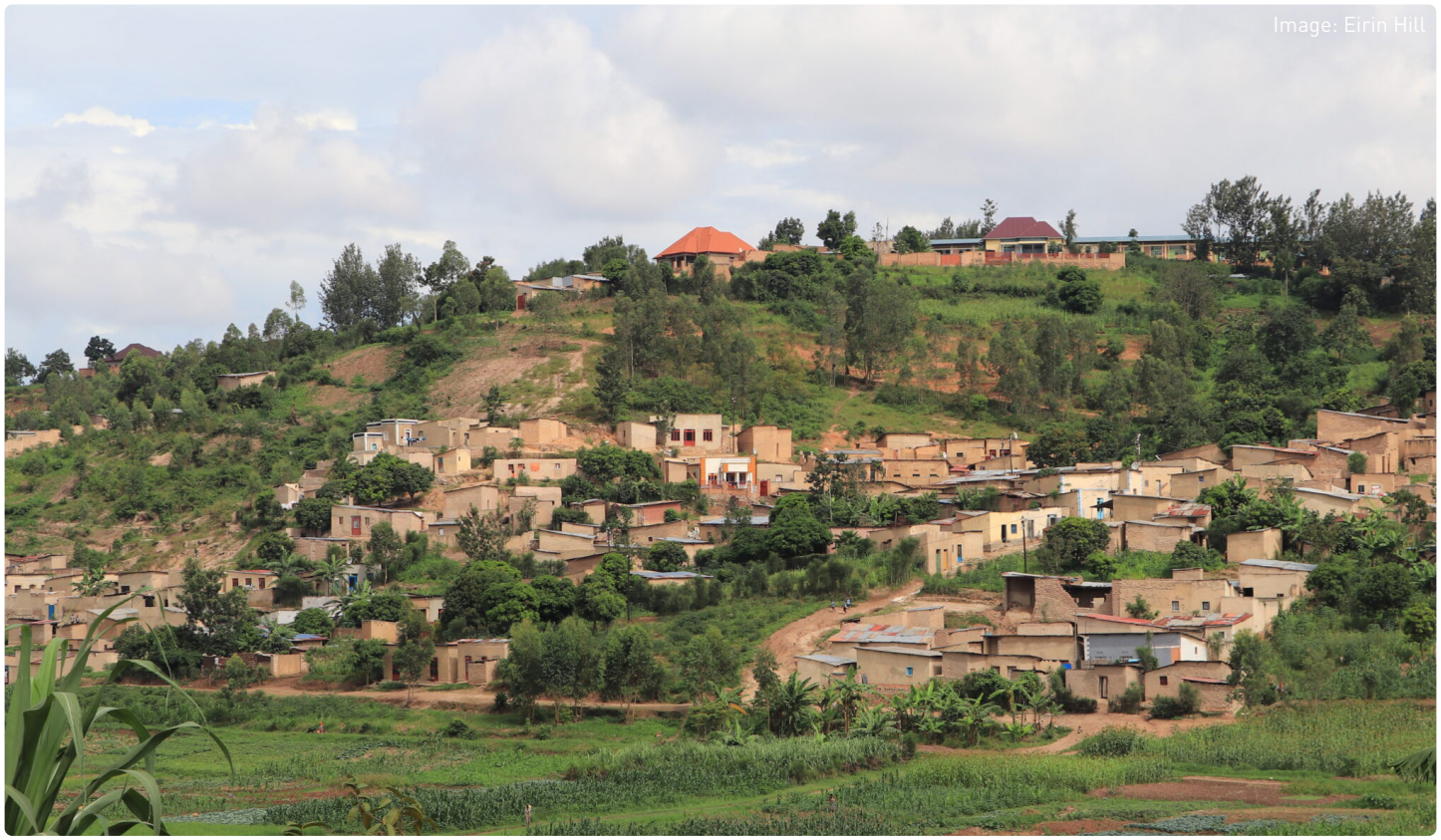
Image: Eirin Hill

Policy suggestions that support the EU's Global Gateway strategy

- Promote vertical and horizontal institutional alignment to streamline coordination, enhance accountability, and foster integrated planning for clean cooking.
- Establish a comprehensive, cross-sectoral clean cooking strategy – backed by robust monitoring and evaluation system for tracking progress, ensuring accountability, and avoiding the fragmented efforts.
- Enforce minimum standards (ICS) and testing methods for improved cookstoves and eCooking appliances, including regulation of installation and maintenance services to promote market trust and facilitate long-term adoption.
- Strengthen coordination between national governments, development partners, and the private sector to advance enabling policies, subsidies, and incentives for scaling up solar irrigation technologies.
- Promote institutional and political commitment for the adoption of solar irrigation technologies.
- Promote the adoption of water harvesting systems alongside training in their installation and maintenance to strengthen water conservation and reduce overexploitation.
- Promote groundwater metering to limit and monitor water usage, and generate data for evidence-based policies to ensure the sustainable use of water resources while safeguarding farmers' livelihoods.
- Develop technical guidelines for solar irrigation systems' sizing to meet the specific water needs of different crops and terrains, while avoiding energy waste or shortages.
- Establish certification schemes for PV modules to ensure quality and reliability.

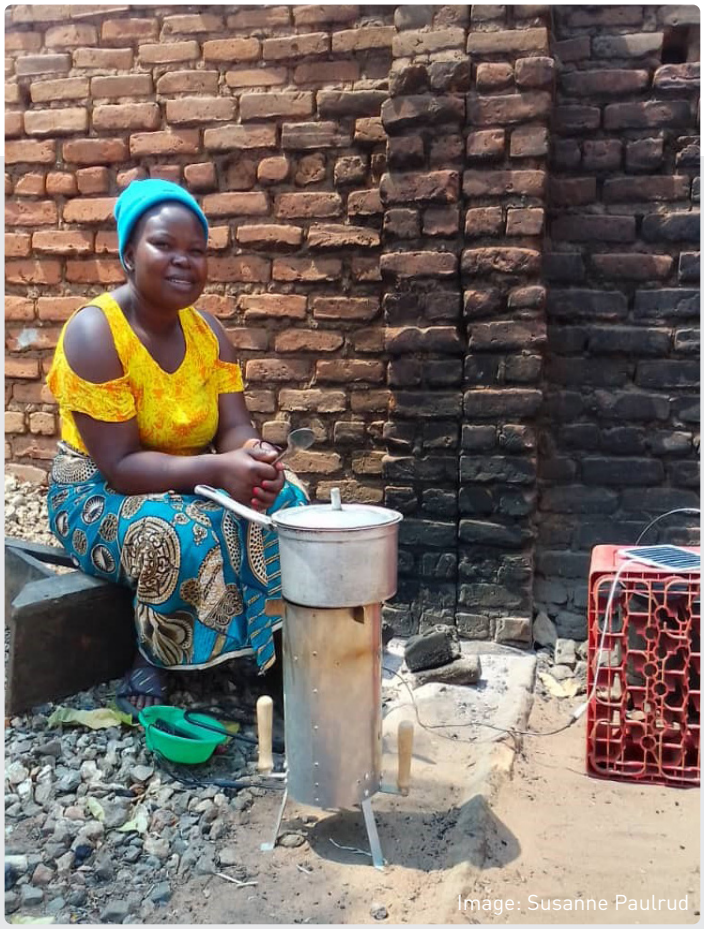
Image: Susanne Paulrud

This Policy Brief is part of a collection. Be sure to check out our other Policy Briefs on **Green Electric Infrastructure** and **Innovation, Education and Awareness Raising**. All Policy Briefs are available on the **SESA website**.

About SESA

In response to Africa's urgent need for sustainable energy access and climate resilience, the Smart Energy Solutions for Africa (SESA) project aimed to mitigate climate change and avoid carbon lock-in, while ensuring energy remained accessible, affordable, and reliable. Through close collaboration with local partners and sister projects, SESA co-developed and piloted innovative, replicable solutions that delivered essential energy services and created business opportunities for African entrepreneurs. Guided by a five-pillar approach – Inform, Inspire, Initiate, Implement and Impact – SESA strengthened knowledge, fostered partnerships, supported implementation, and worked to embed clean energy innovations into long-term policy, financing, and decision-making processes.

References

Africa Development Bank. (2019). *Feed Africa*. https://www.afdb.org/en/annual-report/financial-report/bank-group-operations-through-high-5-lens/feed-africa

Clean Air Fund. (n.d.). *Air pollution in Ghana*. Retrieved from: https://www.cleanairfund.org/geography/ghana/

FAO. (2024). *World Food and Agriculture – Statistical Yearbook 2024*. Retrieved from Food and Agriculture Organization of the United Nations: https://openknowledge.fao.org/handle/20.500.14283/ (2019). Energy System of Morocco - Emissions. Retrieved from: https://www.iea.org/countries/morocco

Health Effects Institute. (2024). *State of Global Air 2024*. Special Report. Boston, MA: Health Effects Institute. ISSN 2578-6873 © 2024 Health Effects Institute

IEA. (2022, June). *Africa Energy Outlook 2022*. Retrieved from: https://www.iea.org/reports/africa-energy-outlook-2022

International Water Management Institute. (2022). *Exploring agricultural water challenges and opportunities in West Africa as climate change signals a new normal.* Retrieved from: https://www.iwmi.org/blogs/exploring-agricultural-water-challenges-and-opportunities-in-west-africa-as-climate-change-signals-a-new-normal/

International Water Management Institute. (2025). *IWMI and climate tech startup SunCulture establish landmark partnership to advance sustainable solar irrigation in Kenya.* Retrieved from: https://www.iwmi.org/news/iwmi-and-sunculture-partnership-advances-solar-irrigation-in-kenya/

Jagoe K., Rossanese M., Charron D., at al. (2020). *Sharing the burden: Shifts in family time use, agency and gender dynamics after introduction of new cookstoves in rural Kenya.* Energy Research & Social Science. Volume 64. 2020, 101413, ISSN 2214-6296, https://doi.org/10.1016/j.erss.2019.101413

National Irrigation Authority. (2023). *Irrigation News.* Retrieved from: https://www.irrigationauthority.go.ke/wp-content/uploads/2024/01/19TH-ISSUE-NEWSLETTER-2_compressed.pdf

SESA. (2024). SESA D5.3 *Policy roadmaps and policy briefs to remove barriers for specific technologies*.

SESA 2025. (n.d.). D 2.4. *Regional trainings and capacity building centers.*

The Government of Malawi. (2024, March). Malawi E-Cooking Roadmap. https://www.energy.gov.mw/download/27/policies-and-strategies/2840/malawi-ecooking-roadmap-digital-version-v9

The Government of Rwanda. (2010). *Rwanda Irrigation Master Plan.* Retrieved from: https://docslib.org/download/33575/rwanda-irrigation-master-plan

UN Environment Programme. (2024, May 14). *Creating a market for off-grid e-cooking in Africa.* Retrieved from: https://unepccc.org/creating-a-market-for-off-grid-e-cooking-in-africa/

UNEP DTU. (2022). The Growth of Small-Scale Irrigation in Kenya - The Role of Private Firms in Technology Diffusion. Retrieved from: https://unepccc.org/wp-content/uploads/sites/2/2020/10/temarin-irrigation-report-exe-sum-final-web.pdfp

UN Women. (2021). Progress on the Sustainable Development Goals: the gender snapshot 2021. Retrieved from: https://www.unwomen.org/en/digital-library/publications/2021/09/progress-on-the-sustainable-development-goals-the-gender-snapshot-2021

United Nations Climate Change. (2021, June 14). *Too Many Cooks.* Retrieved from: https://unfccc.int/news/too-many-cooks

WHO. (2024, October 16). *Household air pollution.* Retrieved from World Health Organization: https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health

World Bank Group. (2022a, November). *Analysis of the woodfuels sector in Ghana.* Retrieved from: https://documents1.worldbank.org/curated/en/099200001102313104/pdf/

World Bank Group (2022b). MALAWI CCDR, Clean Cooking Sector Background Note. The World Bank Group. Retrieved at: https://documents1.worldbank.org/curated/en/099545210272215738/pdf/

World Bank. Energy Sector Management Assistance Program. (2023). Clean Cooking Planning Tool (CCPT). Retrieved at: https://energydata.info/cleancooking/planningtool/mecs/MWI

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Agri-food Systems

SESA Smart Energy Solutions for Africa

Authors:

Magdalena Sikorowska, Alina Mures, Silvia Assalini, Alice Tuberoni, Inés Casamitjana (ICLEI ES)

Contributing Partners:

Claudia Schroder (ICLEI AS), Kanak Gokarn (ICLEI WS), Elisabeth Biber (Siemens), Alemu Belay, Aaditya Dandwate (SIN), Alphonse Nkurunziza, Jean Marie Vianney Bikorimana, Gasore Geoffrey (UR), Frank Labunski, Thomas Adisorn, Julia Rocha Romero (WI)

Peer Review:

Heinrich Wyes (European Commission, DG INTPA), Winnie Mitullah (Institute for Development Studies, University of Nairobi), Hyungju Kim (National Institute of Green Technology Korea), Oliver Lah (TUB), Edmund Teko (UEMI), Lakshmi Bhamidipati, Mathilde Brix Pedersen (UNEP CCC), Stefanie Holzwarth (UNH)

Contact:

https://sesa-euafrica.eu https://twitter.com/sesa_project https://sesa-euafrica.eu/contact-us

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