

technology also has great potential for replication in other SIDS, in particular those located in the Pacific, where the required large differences between surface water temperature and deep-water temperature exists.

### 3.1.9. Action for Rural Women's Empowerment: women-led energy cooperatives as a pathway to a just energy transition in Uganda

**Participating country:** Uganda

**Partners:** Women Engage for a Common Future, GIZ

**Start of technology uptake process:** 2018

**Climate technology:** Decentralized and cooperative renewable energy system

**Contribution to NDC implementation:** Improving energy generation, access and utilization from renewable energy sources and promoting the use of energy-efficient technologies and improved efficiency of charcoal production and cooking stoves

Further information:  
Project website: <https://www.aruweug.org>.

**Climate technology:** ARUWE works with communities to provide access to a decentralized and cooperative renewable energy system that places energy production and distribution close to the consumers, enabling households, small businesses and health centres to access energy supplies. Decentralized energy systems use reliable and cost-effective technologies to close the access gap to sustainable and renewable energy for the most vulnerable, including members of rural or Indigenous communities and women. Decentralized energy systems require that people are not only consumers but are also responsible for energy production, distribution and commercialization and therefore enable those who are affected by the energy transition to meaningfully and effectively participate.

**ARUWE works with three climate technologies:** charcoal briquettes, photovoltaic solar panels and biogas. Decisions on which technology to implement and how to share its benefits are taken by the communities as a whole.



Charcoal briquettes are biomass fuels that can be used for both cooking and heating. To make the briquettes, women members of cooperatives mix charcoal dust and organic waste with water and a binder, such as starch, molasses or paper. The materials are compressed by hand or mechanically pressed into a uniform solid form. The briquettes are used in stoves that are emission-free, energy-efficient and economical. These stoves are easy to make and repair and are portable.

Photovoltaic solar panels are installed on house roofs to convert sunlight into electricity. In the rural communities in which ARUWE works, solar technology is used in households, health centres and cooperative warehouses for lighting, irrigation, drying and agricultural production. ARUWE has a partnership with a solar panel developer in Uganda to provide training and capacity-building to women in the installation and maintenance of solar panels.

Biogas is a colourless, odourless, inflammable gas, produced from organic waste and biomass decomposition (fermentation). Biogas can be produced from animal, human and plant waste, weeds, grasses, vines, leaves, aquatic plants and crop residues and hence is suitable to be produced by smallholder farmers and grazers. ARUWE built a 3 m<sup>3</sup> biogas plant at the ARUWE agroecology centre, where community members can learn about the technology. This technology has been adopted by some cattle-owning households in the community.

**Uptake of the climate technology:** ARUWE works with energy cooperatives in three districts in Uganda. The country is one of the most biodiverse in Africa but also one of the most climate-vulnerable. Owing to its biophysical characteristics, Uganda has large energy resources (hydropower, biomass, solar, geothermal, wind, oil and gas); however, the country does not have a sustainable and reliable national electricity network, and 67.2% of the rural population does not have access to electricity.

In rural areas, women are responsible for providing households with firewood for cooking and heating. For this, partly owing to deforestation, they must walk long distances each day. In this context, ARUWE works with energy cooperatives led by women to install and use renewable energy technologies. ARUWE has three technologies that are presented to the cooperative members for them to select the choice that best suits their needs. After choosing the technology, the cooperative defines the roles of its members for the project (e.g. installation and maintenance, production and commercialization, and dissemination). For each of the roles, a trainer-of-trainers methodology is used for knowledge transfer and capacity-building; for example, ARUWE holds training days for women to learn how to build charcoal stoves and briquettes, and on the installation and maintenance of solar panels.

ARUWE is an organization of rural Ugandan women who recognize and have experienced gender barriers based on patriarchal structures that limit their access to land and opportunities for entrepreneurship and economic independence. ARUWE recognizes that in order to build a safe environment for women and a commitment from



the whole community, the process of technology deployment requires engagement with men. Thus, ARUWE holds strategic meetings with men to talk about its projects and the benefits they bring to households and community development. The cooperatives it works with have formed an advocacy network to engage with district and national government and to demonstrate the co-benefits of decentralized energy technologies in climate change mitigation, compliance with climate policies and the sustainable development of the country.

The mission of ARUWE with regard to the distribution and implementation of decentralized energy technologies is to build the socioeconomic capacities of rural women in Uganda. Women make decisions regarding the entire value chain of the technologies used. The application of the gender action learning system methodology,<sup>25</sup> a community-led empowerment methodology to analyse and overcome gender-based barriers and inequalities, is intended to improve the economic and food security of the most vulnerable populations in a gender-equitable way. Women within the cooperative structure play decisive roles, which has contributed to them having greater self-esteem, autonomy and independence, and being recognized within the communities as agents of change.

**Financing:** The project is financed from international cooperation funds and the income obtained from the sale of charcoal briquettes. The GIZ office in Uganda has supported the project with financial resources for the purchase of solar panels installed at health centres. Women Engage for a Common Future works with ARUWE in financing solar panels and charcoal briquette equipment for the cooperatives and training and pedagogy for the use, appropriation and dissemination of technologies. Indigenous knowledge and practices have also been of great help to reduce costs since the communities themselves have suggested organic and local materials for the manufacture of the briquettes.

**Contribution to NDC implementation:** Uganda's NDC (submitted in 2022) aims to develop and promote a clean and resilient energy system, including by improving energy generation from, access to and utilization of renewable sources and by promoting the use of energy-efficient technologies and the improved efficiency of charcoal production and cooking stoves. ARUWE contributes to the implementation of Uganda's NDC by supporting energy cooperatives in access to, use of and appropriation of climate-resilient technologies. The implementation of the technologies not only involves its purchase but also requires the training of women to build, install and maintain the technologies. This guarantees local ownership and a greater acceptance of clean energy sources.

**Other impacts and results:** In addition to the contribution to the reduction of deforestation, ARUWE's energy technologies have helped to reduce the 'time poverty' of rural women.<sup>26</sup> Thus, the time they no longer need to spend on household chores is invested in the production and sale of briquettes, the installation and maintenance of solar panels, and training other women. The technologies also reduce the pollutants to which women are exposed in their domestic work; for example, the use of emission-free briquette cookers reduces the risk of respiratory diseases.

Decisions on access, control and management of land in Uganda are normally made by men. For this reason, in its training and awareness-raising work towards a just energy transition, ARUWE carries out political advocacy and capacity-building to ensure that women are made aware of their rights and have the tools to claim their role as land managers. In the political trainings, women have partnered with other ecofeminist movements and social organizations, including the Uganda National Renewable Energy and Energy Efficiency Alliance, to strengthen the network of rural women who work at the district and national level for an energy transition that takes into account their needs and demands. The community-based and locally owned climate technologies foster a decolonial and participatory approach to democratizing power. The decision to implement one of the climate technologies is not imposed by the government or national and international actors; rather, the decision is taken through a consultative process in which women express their needs and barriers to accessing sustainable, reliable and affordable technology. ARUWE purchases only from local suppliers of technology. The implementation of the climate technologies has brought about changes in behaviours, patriarchal norms and the mindset of the population.

**Challenges and lessons learned:** The main challenge presented by women to access, use and disseminate technology is cultural. The rural dynamic in Uganda remains deeply patriarchal, and women are still relegated to housework and animal care. ARUWE is aware of this challenge, which is why within its advocacy activities it includes men from the communities to dismantle beliefs and fight disinformation. This ensures that women will feel safe to participate in the activities and take an active and proactive role in land management.

The second challenge is financial. ARUWE is a local and rural initiative and its capacity for networking and partnerships is limited. Owing to the scheme of ambassadors and trainer-of-trainers, the organization has grown in recent years and has received further requests from women who want to access technology. However, external

<sup>25</sup> [https://uganda.oxfam.org/policy\\_paper/gender-action-learning-system-methodology](https://uganda.oxfam.org/policy_paper/gender-action-learning-system-methodology).

<sup>26</sup> According to the Ugandan Economic Policy Research Centre, women in Uganda provide up to 20 hours per week of unpaid care work, which is twice as much time as men (see <https://uganda.oxfam.org/latest/press-release/programme-tackles-unpaid-care-and-domestic-work-closes-learning-meeting-kampala>).

financial resources are needed to make an initial investment in the technologies, since the lack of economic independence and savings of women farmers prevents them from paying an initial fee for the purchase of machines and materials. For this reason, the challenge to scale up and disseminate technologies is financial.

In the trainings for the development and use of technologies, ARUWE has learned that local and ancestral knowledge is a crucial tool to achieve the acceptance and adoption of climate technologies and to ensure their sustainability over time. In the case of briquettes, during the trainings women have suggested using organic materials that are available to everyone; for example, they suggested using anthill wax as a material for compacting the charcoal briquettes. The decentralized energy model is a great alternative for climate change mitigation that has different co-benefits in the economic and social development of rural communities, and especially for women. This model allows the participation of all actors in decision-making regarding the access, use and distribution of energy. Moreover, since the choice of technology is made democratically, it is ensured that the needs of women are taken into account.

The access, use and appropriation of climate technology cannot be addressed without resolving land property rights. If women cannot have ownership of the land and the management of it continues to be in the hands of men alone, it is difficult for the energy transition to be fair, equitable and just, since women would not have access to its benefits or be able to engage with their differentiated knowledge and expertise, and, in many cases, it would create more work and a greater burden for women.

**Long-term sustainability, replicability and potential for scaling up:** The decentralized nature of ARUWE's climate technologies allows them to be replicable and easily accessible to everyone. These technologies are a reliable and cost-effective energy alternative that contributes to closing the access gap to renewable energy. Owing to their characteristics, the three technologies promote energy democracy; that is, the energy produced stays in the community and is distributed among all members. In addition, at the time of participatory consultations to choose the technology, the specific needs of the population are considered, especially those of women.

ARUWE is clear that the long-term sustainability of technology is only achieved if it is implemented through a participatory approach. Before the purchase and installation of the technology, ARUWE presents the options, scope and benefits to the members of the cooperatives so that they can make an informed decision, taking into account their needs and preferences for the technology they want to use. This has been crucial for the success of



the projects because considering the vision and context of rural communities ensures technology acceptance and appropriation.

ARUWE has a communication and dissemination strategy to support the replicability of the technology. Some of the women of the cooperatives apply to be ambassadors and visit local communities to promote the creation of energy cooperatives and the installation and use of renewable technologies.

This strategy of ambassadors has generated important inputs for the scaling up of technologies. In the community meetings, during the pedagogy and training days the communities propose new uses or actors who may be interested in them. For example, although the use of solar panels and briquettes began as a project for the energy security of homes, health centres now use the panels to guarantee energy for their maternity services, and restaurants use briquettes in their kitchens. In this way, the technologies have many opportunities for expansion.

The decentralized and cooperative energy model of ARUWE has generated co-benefits for social and economic development, especially of rural women. Women are the decision-makers regarding the energy value chain; likewise, for the production and commercialization model of briquettes. This has allowed them to gain economic independence and start small businesses that are supported by the village savings and loans associations initiative, a rotating financial mechanism, created by the same cooperatives, that supports their members with liquidity for their agricultural projects or to respond to emergencies or household needs. The income generated by the commercialization of climate technologies also enables their scaling up; for example, each cooperative decides the percentage of the income that will be saved to reinvest in machinery and supplies, and the percentage to be invested in marketing, awareness and advocacy. Women ambassadors use the income to finance travel, workshops and meetings with stakeholders.

### 3.1.10. Pioneering triangular cooperation on renewable energy technology transfer in Ghana and Zambia, with China and the United Nations Development Programme

**Participating countries:** China, Denmark, Ghana and Zambia

**Partners:** UNDP country offices in China, Ghana and Zambia, Danish International Development Agency, Energy Commission of Ghana, Ministry of Energy of Zambia, Administrative Centre for China's Agenda 21 at the Ministry of Science and Technology of China, China Agricultural University

**Start of technology uptake process:** 2015

**Climate technology:** Solar and small hydropower, biogas and biomass cooking stoves

**Contribution to NDC implementation:** Reduction of energy sector emissions in Ghana and Zambia through the uptake of renewable energy technologies

Further information:

China–Ghana–UNDP project website: <https://www.undp.org/china/projects/china-ghana-south-south-cooperation-renewable-energy-technology-transfer>.

China–Zambia–UNDP project website: <https://www.undp.org/zambia/projects/china-zambia-south-south-cooperation-renewable-energy>.

**Climate technology:** The project supported the development of enabling environments in Ghana and Zambia and the transfer of renewable energy technologies for solar energy, small hydropower, biogas and biomass cooking stoves under the framework of South–South cooperation, fostering the uptake of those technologies in different local contexts.

**Uptake of the climate technology:** The China–Ghana/Zambia–UNDP triangular cooperation project resulted in the transfer of renewable energy technologies and in national policies and private sector partnerships that continue to facilitate the scaling up of renewable energy technologies in Ghana and Zambia. In addition, the project strengthened China's capacity for South–South cooperation on renewable energy technology transfer.

The project contributed to fulfilling the demands of Ghana and Zambia to increase universal energy access, increase the share of renewable energy in the national energy mix and promote the productive uses of renewable energy by enhancing the exchange of expertise and technology. The project also helped experts from China, Ghana and Zambia to work together towards the achievement of the SDGs and their respective NDC targets.

The project derived from the need to disseminate renewable energy technology and to scale up for climate-resilient growth. It supports access to energy and sustainable resource consumption through trials and demonstrations of biogas, biomass and solar energy for productive uses. Given that the project involves China,