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GRÜNE BÜRGERENERGIE
(GREEN PEOPLE'S ENERGY)
SYNTHESIS REPORT

Best of GBE Small Projects Fund

Selected Approaches for Energy Access

Imprint

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Introduction

The global commitment to achieving Sustainable Development Goal (SDG) number 7, "access to affordable, reliable, sustainable and modern energy for all", has remained steadfast for years. Progress is mixed, however. Though access rates recently started to surpass population growth, sub-Saharan Africa remains the world region with the largest access deficit, with only 49 % of the population having electricity.

This translates to 570 million people, a large majority of them in rural areas, without access to electricity. The International Energy Agency (IEA) estimates that, under the Stated Policy Scenario, this number will not have changed by 2030. Effective approaches to address this deficit are therefore still urgently needed.

In many remote areas, energy is generated using fossil fuels, which tend to be expensive and of limited availability. A decentralised energy supply through stand-alone systems would often be the least-costly way to ensure electricity access. The Green People's Energy initiative (GBE) aims to improve the conditions for such decentralised solutions in selected sub-Saharan African countries with the participation of citizens as well as small and medium enterprises.

Through its Small Projects Fund (SPF), GBE provided financial support for third-party project ideas in the field of decentralised renewable energy. Between 2018 and 2021, the SPF received a total of 314 project applications from various organisations, 51 of which were selected for funding.

The selection process paid attention to a clearly defined local need, innovative technological solutions, and a holistic and sustainable project design. It was inspired by the FIETS (Financial, Institutional, Environmental, Technical, and Social) sustainability framework of the Dutch WASH (water, sanitation, and hygiene) Alliance. Most of the projects demonstrated particular strength in one or two of the sustainability categories.

The present synthesis report decontextualises the most promising elements from individual SPF-financed projects and reframes them into more general and scalable approaches. Clustered into the five sustainability categories, this compilation of approaches aims to inspire practitioners both while designing new energy access projects and when in search of a solution for a certain sustainability challenge.

Each approach also provides a link to a concrete project example in the appendix of this report, which features a total of 47 selected projects with individual fact sheets.

1 Financial Sustainability

An important prerequisite for the long-term success of renewable energy projects is their financial sustainability. Investment in off-grid renewables from both the public and the private sector has grown significantly but there is still a large financing gap to bridge. Covering high up-front installation costs or financing **long-term operation and maintenance** of a system can present seemingly insurmountable hurdles, especially for economically disadvantaged target groups in remote regions. The ultimate aim of financial sustainability is to establish **financing models that are able to carry themselves** without foreign subsidies and are managed and financed locally in the long run.

As the approaches below demonstrate, this can be achieved by engaging local financial institutions and putting in place innovative financing mechanisms that facilitate access to capital and increase customers' ability to navigate the financial markets of their country.

Approaches

1.1 Solar PV equipment market linkages through Saving and Credit Cooperative Organisations (SACCOs)

This approach creates access to suppliers of solar PV equipment for members of SACCOs. Members pay a contribution (e.g. one-time minimum entrance deposit or purchase shares) and thereby become eligible to receive cost-effective loans from the SACCO. In addition, the SACCO is able to procure solar PV products for the members through usage based PAYGO systems or regular instalments, which members need to pay for the usage of equipment.

ADVANTAGES

- This approach creates a strong sense of ownership and trust among SACCO members.
- The SACCOs are locally established and managed, which makes them more likely to persist when subsidies end.
- This is particularly useful where external financial intermediaries such as banks are not available or affordable.
- SACCO members can leverage their membership numbers and combined finances to increase their bargaining power and reduce transaction costs for supplier companies.
- Payments by members can be aligned with their income patterns (e.g. farming cycle).

SUCCESS FACTORS

- Rules for possible loan defaults within SACCOs must be clearly defined.
- The SACCO has to be well established, active and committed.
- Assessment of existing loan and credit mechanisms within the target cooperatives and level of uptake, before introducing new ones.
- Project initiators should support the selection and initiation of links with trusted suppliers and products.
- Tendering should include criteria such as after-sales support, quality products (e.g. Verasol listed) and potentially special conditions such as payment flexibility or discounts.
- Capacity building measures for management and relevant staff of cooperatives can be undertaken to help them become multiplicators of off-grid electricity services and financial products.
- Awareness campaigns can be organised by the equipment supplier.

PROJECT EXAMPLE:
Increasing Access to Clean Energy and Microfinance Products for Small-Producer Organisations, Uganda

1.2 Demand stimulating incentive vouchers for the adoption of productive use of energy (PUE) applications

Under this approach, the demand for selected productive use of energy (PUE) applications is stimulated through vouchers. Demo units are set up at existing businesses in order to introduce community members to these technologies and to familiarise them with the functioning of the systems. Following the demonstration phase, physical incentive vouchers for certain systems are distributed in high numbers. With these vouchers, interested customers can purchase the promoted systems at a reduced price, e.g., at a 20 % discount. This is done on a "first come, first served" basis. Once the limited stock of systems is sold, suppliers will stop accepting the vouchers.

ADVANTAGES

- Physical vouchers can act as a promotional tool for Renewable Energy (RE).
- The voucher model raises awareness by supporting first movers with financial benefits.
- This system incentivises the purchase of high-quality products.
- After-sales services become more efficient as the customer base created through the vouchers is located in one region only.

SUCCESS FACTORS

- A market assessment should be conducted before setting voucher limits (e.g. define maximum size and price for the product to be supported).
- Clear communication of the limited number of discounts available in the municipalities helps to avoid dissatisfaction among those who do not redeem their voucher in time.
- When tendering, priority should be given to suppliers of quality products (e.g. Verasol listed).
- The selection process for the demonstration unit sites should be conducted in a fair and transparent manner.
- It is important to sign a Memorandum of Understanding with suppliers to ensure after-sales services.

PROJECT EXAMPLE: Maa Green Energy Project, Kenya

1.3 Lease-to-own model with market and production support

This approach combines the lease-to-own model – an acquisition model for larger equipment – with an offtake agreement between the owner and the farmer. Based on the agreement, the owner provides technical training to support the farmer in increasing the quality and quantity of their outputs and acts as an intermediary seller to serve larger, more lucrative markets. The rent is then deducted (to a previously agreed percentage or amount) from the profits, the rest is shared with the renter. After the system is paid off, the renter becomes the owner and is free to choose their own marketing model or to continue the sales relationship with the previous owner.

ADVANTAGES

- Lease-to-own addresses the high upfront cost of equipment, which could otherwise discourage farmers from purchasing.
- This model reduces the default risk for the technology supplier.
- It also increases the owner's interest in the farmer's success.
- Asset acts as collateral to reduce the farmers' risk of getting into debt.
- Included after-sales services ensure functioning of the equipment.

SUCCESS FACTORS

- The system owner must be a private entity to act as a market player.
- The owner has to be a professional in the produce market (e.g., grains, vegetables) to be able to create market links.
- This entails having market knowledge of where to find and negotiate the best prices.
- The system owner further needs to provide training and support for the farmers.
- The system owner has to have transport and post-harvest measures available for marketing.

PROJECT EXAMPLE: **Renewable Energy for Agriculture, Malawi**

1.4 Sustainable and cost-effective solution for chlorine production

In this approach, health facilities receive solar PV systems for lighting and cooling as well as chlorine production. Chlorine plays an indispensable role in improving water, sanitation, and hygiene (WASH) at healthcare facilities and at a community level. The production and sale of excess chlorine can create avenues for supplementary income (e.g., for maintenance and repair), ensuring the financial viability of the installed PV system.

ADVANTAGES

- The approach secures a sustainable revenue stream for the maintenance, expansion, and repair of solar systems.
- By enabling solar-powered chlorine production in remote areas where electricity is not available, WASH conditions can be improved.
- Increased access to affordable chlorine leads to a reduction in waterborne and hygiene-related diseases in the community.

SUCCESS FACTORS

- A demand assessment of the chlorine value chain should be undertaken beforehand – even one unit's chlorine production usually exceeds the needs of small rural health facilities or communities.
- A potential buyer market with a reasonable price for chlorine is required for the sale of excess production.
- A fund for the regular maintenance of the system needs to be established and managed over time.
- Linking chlorine production units to local health structures facilitates efficient distribution.

PROJECT EXAMPLE: **Solar for Improved Rural Health Systems, Zambia**

1.5 Shared first loss guarantee systems with market assessment and quality assurance

The acquisition of renewable energy equipment is facilitated through a tripartite setup between a customer, a supplier and a (non-profit) intermediary organisation. To purchase an asset, the customer must pay a small share of the total investment cost upfront, e.g. 10%. To reassure the supplier and stimulate sales even in remote regions with low purchasing powers, the intermediary organisation advances another 50% of the costs directly to the supplier. In total, the supplier thus receives 60% of the costs at once. The supplier then issues the equipment to the customer, providing a supplier credit for the remaining 40%. This supplier credit is backed by the intermediary organisation, who assumes any defaults.

The customer then pays back the 90% over a defined period. Once the supplier credit is satisfied, the intermediary organisation can then on-lend the incoming instalments for the 50% direct advance to other customers.

ADVANTAGES

- This approach reduces the barrier of high upfront acquisition costs for customers.
- Suppliers receive a significant portion of the installation costs in advance and therefore have a limited credit default risk.
- More people benefit from the financial support due to the revolving loan mechanism.

SUCCESS FACTORS

- Due to the complexity of the mechanism and the multitude of stakeholders, it is important to offer thorough guidance to all parties involved.
- Financial resources of the intermediary organisation must be guaranteed in order to bridge liquidity problems on the customer's side or to accommodate potential payment defaults.
- The intermediary organisation needs to have both the technical expertise to ensure the quality of installations and the financial expertise to monitor and enforce repayments.

PROJECT EXAMPLE: **Women and Youths Take Off, Senegal**

1.6 Pay-as-You-Go (PayGo) model in combination with informal savings groups

This approach provides access to renewable energy equipment through informal savings groups (also called village saving and loan associations) using a lease-to-own approach. Savings groups are self-managed groups of 15 to 25 people who meet regularly, with the main purpose of saving money and lending it to each member in turns. The group assumes responsibility for making timely instalments on behalf of its members to a solar supplier or microfinance institute using the pooled funds of the group and taking care of reclaiming the funds from their members.

ADVANTAGES

- Group lending mitigates the problem of payment defaults and allows for flexible payments between the group and its members.
- Microfinance institutions are more likely to grant additional funds.
- As they only deal with the group, supplier companies face less bureaucracy.
- The approach incentivises suppliers to enter volatile markets, e.g., refugee settlements.

SUCCESS FACTORS

- Savings groups must be selected carefully to ensure that they are reliable and well established, including a history of significant pooled funds.
- For the saving groups, assistance in selecting and initiating relationships with trusted suppliers of quality products is needed.
- The power of the group setting can allow for discounts by third-party organisations on capital intensive acquisitions, such as solar pumps, which should be leveraged.

PROJECT EXAMPLE: **Solar Solutions for Refugees and Host Communities, Uganda**

2 Institutional Sustainability

Strong institutions are key to the long-term sustainability of renewable energy projects because they **define framework conditions and provide access to resources** such as knowledge, networks, and financing. Achieving sustainable institutional practices can be challenging, however. While longstanding institutions might show resistance to change due to rigid processes and structures, newly established institutions often face a lack of ownership and accountability. Especially in remote areas, the limited presence of both public and private institutions leads to underrepresentation and a lack of opportunities for the local population.

Multi-stakeholder approaches and targeted capacity building can help foster institutional sustainability. The needs of local communities, especially those of underrepresented groups, such as women, must be advocated for. Strong institutions are indispensable in achieving energy access for all, as the following approaches show.

Approaches

2.1 Market stimulation through lead farmers

This approach focuses on promoting the use of solar water pumps for irrigation and enhancing local technical capacity in rural areas. Existing lead farmers (community leaders and model farmers in their own communities) are selected and trained in operation and good farming practices. Their farms can then be used as practical demonstration venues to make awareness and training events for other farmers more effective.

ADVANTAGES

- Local lead farmers act as role models and increase the target group's confidence in solar technology.
- By demonstrating the new technology on their own land, lead farmers can reduce barriers to the adoption of new technology for other farmers, as they provide a familiar environment.

SUCCESS FACTORS

- It is important to select lead farmers who are recognised in the community.
- Access to and the supply of quality water pumps and access to financing through credit providers should be facilitated alongside the training.
- Additionally, implementing organisations can host farmer field days at the lead farmer's location to help potential suppliers showcase their products.

PROJECT EXAMPLE: Access to Solar-Powered Water Pumps in Laikipia, Kenya

2.2 Cooperative/Association for Solar Industry Growth

The aim of this approach is to form a cooperative of local small and medium solar companies. The cooperative setting allows member companies to mitigate risks, access new markets, learn, leverage each other's strengths, and achieve mutual benefits. Furthermore, the cooperative provides central services to its members, including capacity-building measures.

ADVANTAGES

- Through the creation of a cooperative, existing local capacities can be leveraged by creating synergies between member companies.
- The cooperative can use its bargaining power to obtain low-cost loans and larger contracts.
- Members benefit from better information on funding opportunities, capacity building, lobbying and bulk orders.

SUCCESS FACTORS

- The cooperative needs to identify and proactively approach potential member companies.
- Clear communication of all benefits to (potential) cooperative members is needed.
- There must be strong statutes for the cooperative and its members.
- It is important to select suppliers with differing technological and/or geographical focuses to avoid competition among member companies
- It can be helpful to bring in coaching support from an established cooperative.

PROJECT EXAMPLE: Strengthen Sendea: An innovative cooperative of local solar SME for energy access, Uganda

2.3 Women Role Models for the Public Energy Sector

This approach combines capacity building and awareness measures to increase the participation of young women engineers in the public energy sector. The female trainees intern in one or more institutions of the (public) energy sector. During that time, they are accompanied by a mentor, receive professional training, and partake in site visits to relevant energy infrastructure – all to increase their practical knowledge. Representatives of the host institutions take part in regular exchange sessions.

Towards the end of their traineeship, the female trainees become multipliers by organising energy-related workshops for schoolgirls.

ADVANTAGES

- By working with political institutions, an impact can be made at national level.
- The visibility of female engineers is increased.
- Decision-makers in the host institutions become sensitised to the issue and the importance of gender equality in the sector.
- Through female role models, schoolgirls become aware at an early age of the topic of energy and the potential role of women in technical professions.

SUCCESS FACTORS

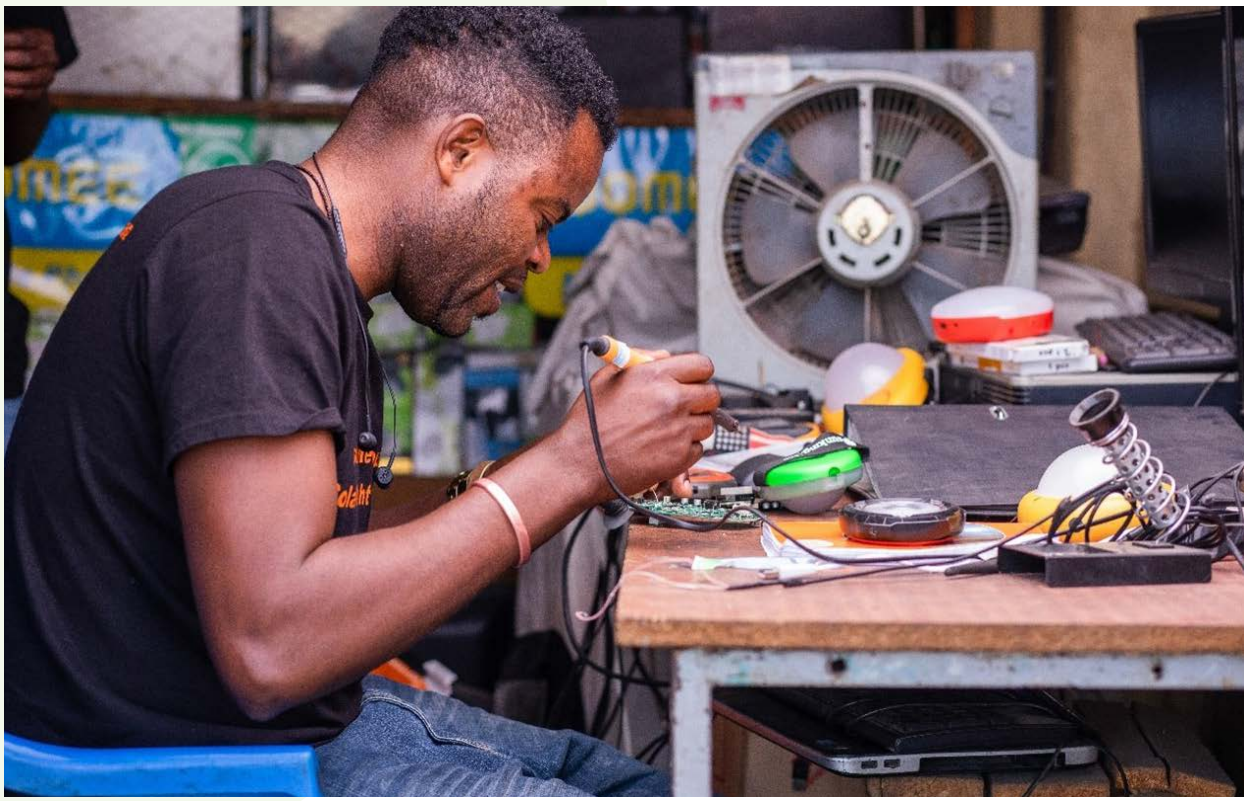
- Each participating institution needs to appoint a mentor to explain the programme internally and act as a focal point for trainees.
- It is important to have a communication strategy targeting relevant stakeholders within and outside the institution (e.g., MoE and agency officials, mentors, the public).
- Active involvement of the trainees should be ensured through defined individual tasks and responsibilities during the placements.

PROJECT EXAMPLE: **Traineeships for Young Women Engineers in Benin's Public Energy Sector, Benin**

3 Environmental Sustainability

Environmental sustainability requires the development and implementation of effective measures to **minimise negative impact of projects on the environment**. However, assuring environmental sustainability throughout and beyond the project implementation cycle can be challenging as it is often weighed against various other factors. Budgetary constraints as well as limited availability of resources – both in terms of equipment and knowledge – can strongly limit a project's environmental sustainability.

Successful approaches focus on reconciling these challenges, e.g. by reducing carbon emissions, conserving natural resources through repairing instead of buying new, using non-harmful local materials to lower supply chain impacts or managing waste effectively. The following project approaches demonstrate how green energy projects can put an **enhanced focus on the protection of the environment**.



Approaches

3.1 Repair and reuse solar products in rural communities

Through this approach, an environment is created that allows the reuse and repair of solar products in rural communities. To facilitate this, it is essential to establish a robust supply chain of quality spare parts, develop repair manuals, provide training to technicians, distribute specific tools, and raise awareness among communities regarding the cost-saving and environmental benefits associated with the repair and reuse of solar products. Similarly, organising public repair days, where skilled technicians are available to offer inspection and perform repairs in locations close to the users, can serve as an effective way to raise awareness.

ADVANTAGES

- The reuse and repair of solar-powered products help reduce waste and minimise the environmental impact.
- Repairing is often the only option to keep appliances running when new purchases are not affordable.
- Public repair events create awareness and strengthen the technicians' local networks.

SUCCESS FACTORS

- The capacity building measures need to be tailored to the actual job requirements of the technicians so that they are provided with the necessary expertise.
- Organisations need to bring in their expertise on identifying and procuring cost effective, high quality spare parts where these are not provided by the manufacturer.
- Only well-established and qualified technicians should be selected.
- The organisation responsible for the training concept also needs to have extensive technical knowledge to produce a technical manual or guide.

PROJECT EXAMPLE: Solar Saver: Second Generation Lights, Zambia

3.2 Mitigating ecological threats by promoting household biogas plants

In communities, invasive plants can present significant economic and ecological burdens. However, these plants can be harnessed as feedstock in small-scale biogas plants to generate energy, thereby helping to meet household cooking energy needs. Additionally, the by-product derived from biogas production serves as a valuable fertiliser, enhancing agricultural yields and therefore contributing to an income improvement for families. This approach employs similar measures by using biogas for cooking and using ecologically harmful material to feed the biogas plant.

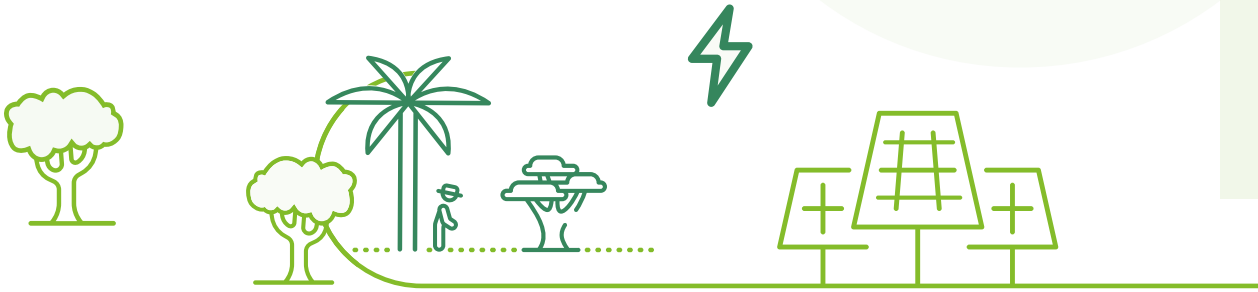
ADVANTAGES

- This approach combines the provision of clean energy with the reduction of invasive plants and the production of fertiliser (as a by-product of the biogas plants).
- The system can be adapted to process other biodegradable resources as well and is therefore adaptable to different contexts.

SUCCESS FACTORS

- Prior to the intervention, it is essential to conduct a market and demand assessment for the biogas cookstoves.
- The invasive plants should be co-digested with fish waste or cow dung to ensure biogas quality.
- On-farm training on co-digestion needs to be provided.

PROJECT EXAMPLE: Using Water Hyacinth Blend for Biogas and Fertiliser Production, Ethiopia



4 Technical Sustainability

Another crucial factor for the long-term success of renewable energy projects is their technical sustainability. It aims at the **long-term viability of systems and infrastructure** and is closely linked to other sustainability factors. A technologically sustainable project design pays special attention to the longevity of the technological solution within a project and takes account of the **local maintenance and repair of the system**. In the case of RE systems, however, such measures may be met with scepticism due to the associated acquisition or operating costs. Additionally, **well-trained technicians** are rare in rural areas, as they are usually drawn to more densely populated regions.

As the following approaches show, technical sustainability can be promoted through a robust technological design, the rehabilitation of existing systems as well as user-centred maintenance services.

Approaches

4.1 Specialised repair network for PV systems in rural areas

This approach focuses on the comprehensive training of solar system technicians in installation, maintenance, and repair. It is important to facilitate hands-on training opportunities and encourage rural youths to participate in internships with solar companies to gain practical experience with their products. By actively involving them in these initiatives, youths are empowered to acquire value skills and knowledge that foster their professional growth. Such training also serves as a solid foundation for the technicians to garner in-depth knowledge and skills, enabling them to provide crucial repair services to their respective local communities.

ADVANTAGES

- Youth technicians are specially trained and have specific knowledge of the systems used and potential problems.
- Youth technicians can take over after-sales support for companies they have interned with.
- Employment in a sustainable sector is provided for local youth.
- Rural communities gain access to a repair network and receive maintenance support.

SUCCESS FACTORS

- A number of solar companies that are open to training the interns needs to be available in the area.
- The technicians need at least some prior technical experience.
- Technicians have to be willing to stay in the community to be able to provide this service in more rural areas.

PROJECT EXAMPLE: **Promoting Renewable Energy Use in Uganda (ProREU), Uganda**

4.2 Locally financed water pump maintenance

To ensure prolonged functionality, this approach actively involves end-users in the upkeep of water infrastructure and fosters a sense of ownership and responsibility. Following the equipping of rural boreholes with solar water pumps, new piping and improved water storage, end-users established a water point committee to regulate water usage. Each household pays a small fee that is calculated proportionally to the amount of their wealth, e.g., measured by the size of their cattle herd. The water point committee saves these contributions for future maintenance. This collaborative approach ensures the sustainable operation and maintenance of the solar water pump systems.

ADVANTAGES

- Focusing on maintaining and improving existing structures ensures the long-term sustainability of the system.
- Involving the community through small payments for system maintenance increases local ownership.

SUCCESS FACTORS

- Local water committees need to be established in order to create self-governance structures and assign responsibilities for maintaining the system.
- This approach requires a transparent and tiered cost model, tailored to the economic situation of the target group.

PROJECT EXAMPLE: SolarCent, Namibia

4.3 Finance maintenance of PV systems on social infrastructure

The aim of this approach is to create a separate repair and maintenance fund for PV systems installed on rural social infrastructure such as schools. The solar PV system can be coupled up with additional PUE such as setting up a dedicated computer room equipped with a printer, available to members of the community for a nominal fee. The fee pays for the upkeep and maintenance of the solar PV and computer system.

ADVANTAGES

- Community members gain access to digital facilities.
- The fee allows for a small income which sustains the repair and maintenance fund managed by the school.
- Digital literacy is improved and spread.

SUCCESS FACTORS

- Teachers must be provided with training on new IT equipment and the PV systems to promote effective use and longevity.
- The community must be willing to pay for using the IT equipment; this can be enhanced by also providing access to the internet.

PROJECT EXAMPLE: e-Education: Energy for Schools, Zambia

4.4 Solar-powered dryers using natural ventilation

This approach comprises developing, piloting and upscaling solar dryers designed for a specific value chain using air ventilation only. By designing a solar dryer that is tailored to local requirements and constructed using locally available materials, the approach supports the local economy and promotes sustainability by minimising the carbon footprint. Then, the systems efficiency in the local context should be tested through installing pilot systems. Specialised technicians are trained so that they have the necessary skills and knowledge to install, maintain and troubleshoot the dryer effectively.

ADVANTAGES

- The long-term sustainability of the products is ensured because they are developed in line with national research to meet local needs.
- The incomes of the farmers are improved by reducing drying time from an average of 14 days to just five.
- The efficiency of the system can be determined by pilot tests which can help to adapt it locally.

SUCCESS FACTORS

- To make this approach sustainable, it is key to build the dryers using locally available materials.
- The temperature inside the dryer needs to be managed carefully as the quality of the coffee depends on it.
- It is important to recruit skilled technicians willing to learn how to use the technology.
- Extensive testing of pilot systems with the target group is required to adjust the dryers to their needs.

PROJECT EXAMPLE: SOLARED Coffee Project, Kenya

5 Social Sustainability

Social sustainability in RE projects is characterised by the fact that their implementation promotes **equitable access to resources, fosters inclusive, healthy, and diverse communities** and ensures that local needs are met. This can be challenging due to a lack of representation and limited financial resources – which disproportionately affects women and children. It is thus important to base these initiatives on real demands within the community and assess them with local stakeholders to create ownership and ensure long-term success.

Through the approaches below, **communities are formed and strengthened**, support networks are fostered, and disadvantaged groups gain energy access and thereby opportunities. Furthermore, **social infrastructures** that benefit the community are equipped with energy access and can expand their services.

Approaches

5.1 Low energy costs fund medical care

Health facilities of all operating models can benefit enormously from the installation of solar PV systems. The system needs to be sized to fit the energy needs of the facility. This then increases the health centre's energy independence and broadens the type of service that it can provide. At the same time, the ongoing energy costs are reduced. Part of these savings is then used to subsidise medical treatments, such as surgeries, for people who otherwise could not afford them, thereby facilitating improved access to healthcare services to those people. Another part of the savings is put aside for maintenance and future repairs of the solar PV system.

ADVANTAGES

- This approach increases access to healthcare for people on low incomes.
- A reliable energy supply improves the range and quality of medical services.
- The hospital's attractiveness for potential staff is increased.

SUCCESS FACTORS

- Both the technical and medical staff need technical training to operate and maintain the PV system.
- It is important to set up a savings fund in order to finance future maintenance and repairs.

PROJECT EXAMPLE: Securing Health Care with Solar Power, Benin

5.2 Empowering communities through productive use

This approach strengthens communities through centrally installed productive use of energy facilities. The exact PUE equipment needed is identified in discussion rounds that engage a wide range of stakeholders, e.g. the local women's group, the local authorities, other community members, etc. Then, a centrally located building is fitted with a solar PV system and equipped with the chosen PUE equipment (e.g. a grain mill, a refrigerator, or outlets for charging cell phones). A small user fee is retained to cover maintenance, repairs, and the acquisition of additional equipment. The measure is also accompanied by capacity building to ensure long-term operability and self-management.

ADVANTAGES

- The village community is empowered to manage and maintain the PUE site autonomously.
- The needs-based selection of equipment ensures acceptance and regular use by the local population.
- The generated income permits scaling of the system.

SUCCESS FACTORS

- Many stakeholders and interest groups in the community need to be willing to collaborate and develop ownership of the system.
- There needs to be a joint account to manage the funds collected.

PROJECT EXAMPLE: **Solar Power Lights up a Village and Enables Productive Use, Benin**

Annex
Project Fact Sheets

Agrivoltaics for Sustainable Development

SUMMARY

Country	Benin
Implementer	Centre Regional Songhaï
Co-implementer	Electriciens sans frontières (ESF)
Target groups	Farmers
Duration	06/2022 – 07/2023
Type of energy use	Electrification

CHALLENGE

Agriculture is very important for the economy in Benin. Around two thirds of the population earn their living from this sector, and it provides 80 % of the country's export goods. Despite its significance, the development of the agricultural sector is subject to numerous challenges. One of these is the lack of reliable electricity, which leads to the continued prevalence of diesel generators in many agribusinesses. Another challenge are the effects of climate change, which are also increasingly felt among farmers. These include a decrease in off-season crops due to unfavourable climatic conditions or irrigation problems due to limited water availability.

IMPACT LOGIC

Centre Songhaï is a training institution promoting agricultural entrepreneurship and sustainable farming practices in West Africa. ESF is a voluntary organisation supporting sustainable access to electricity and water worldwide. For this project, both organisations combine their individual expertise in agricultural practices and renewable energy technologies to design and install two dual-use PV systems (agrivoltaics). The aim of the project is to showcase the benefits and economic potential to farmers.

The first system, comprised of two distinct solar PV layouts (15 kWp each), is installed at the premises of Centre Songhai in Porto-Novo. It is used to experiment with different crops and serves as a demonstration site for the thousands of visitors that the centre receives every year. A second system (10 kWp) is installed at one of Songhaï's flagship farms in Agbangnizoun, in Benin's Zou region. Throughout the project, the implementing organisations collect data to determine the conditions for replication and scale-up.

The potentials of the approach are
(1) to decrease competition around arable land;
(2) to lower the water demand for cultivation of crops by providing shade and powering efficient solar irrigation systems;
(3) to decrease the dependence on fossil fuels and support energy autonomy; and
(4) to increase agricultural productivity and thereby income.

INNOVATIVE PROJECT ELEMENTS

The two agrivolatics systems installed in the course of this project are among the first in Benin and therefore display a strong pilot character. With some experience, agrivoltaics creates the potential of using one piece of land twice – for the production of renewable electricity as well as for agricultural use. Centre Songhaï, with its network of 5,200 farmers and numerous apprentices each year, ensures that the knowledge gained on this technology reaches as many people as possible. The potential of replication and further dissemination of agrivoltaics in the region is high.

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Benin Energy Plus Project

SUMMARY

Country	Benin
Implementer	ICLEI - Local Governments for Sustainability e.V.
Co-implementer	ANCB – Association Nationale des Communes du Bénin
Target groups	Local governments
Duration	12/2021 – 03/2023
Type of energy use	Other

CHALLENGE

Like many Sub-Saharan African countries, Benin faces the dual challenge of providing its population with affordable and reliable energy while mitigating the environmental impacts of its economic development. Benin has recognised that renewable energy, including solar PV, offers the opportunity to address both problems simultaneously, which has led to policies aimed at increasing electrification based on renewable energy sources. However, technical capacities need to be strengthened, especially at the local government level, where there is an urgent need for action. Furthermore, knowledge about alternative financing approaches and instruments to create bankable renewable energy projects often remains limited.

IMPACT LOGIC

The project contributes to strengthening regional capacities for the development of public-private partnership (PPP) projects. This includes improving the capacity of local and regional governments to identify, design and implement PPP activities with a focus on solar PV projects. The project partners develop a toolkit to help local and regional governments:

(1) prioritise their solar PV infrastructure project pipeline,
(2) design and improve the PPP framework (the combination of legal, regulatory, institutional and financial factors),
(3) assess whether a particular project should be implemented as a PPP, and
(4) structure a sustainable PPP project. Knowledge about the toolkit and PPP implementation is shared with regional government stakeholders and potential PPP actors through capacity building workshops.

INNOVATIVE PROJECT ELEMENTS

The project serves as a "blueprint" for decision-makers in many countries beyond Benin for their urban climate protection efforts. The project's publications and international knowledge dissemination activities ensure that the knowledge gained is freely and comprehensively available even after the project ends. The project is embedded in the Transformative Actions Program led by ICLEI, a global network of local governments focused on transforming their ideas for low-emission infrastructure projects into fullfledged projects. Hence, there exists great potential for these concepts to be adopted in other regions of the world.

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Biogas Saves Women Time and Fosters Their Independence

SUMMARY

Country	Benin
Implementer	Vert-Monde
Target groups	Women farmers and their families
Duration	04/2022 – 04/2023
Type of energy use	Other

CHALLENGE

One of the biggest problems in the village Kontoubarou in northern Benin is the need for cooking energy, which the inhabitants cover almost exclusively with firewood. A family of eight needs an estimated three tons of wood per year for cooking. However, due to increasing deforestation, this resource is becoming scarce. Women and girls, due to a traditional allocation of roles, spend a lot of time collecting firewood or have to buy it at a high price. Some girls even leave school to be able to collect firewood.

IMPACT LOGIC

By using biogas for cooking, women and girls have more time for other productive activities or to go to school. They can also process food with biogas and thus generate their own income. This considerably strengthens the position of women in the families and in the village. Another useful pro duct of a biogas plant is high-quality biofertiliser. Farmers can use it to increase the productivity of their fields and they will no longer be forced to deforest more land for sufficient yields. Nature around Kontoubarou can regenerate. Therefore, the project implemented by the local non-governmental organisation Vert-Monde seeks to build a biogas plant, a storage room for the biomass and a room for management and food processing activities. The required biomass comes from nomadic cattle herds, which pass Kontoubarou, local livestock and food scraps. A threeperson administrativeteam takes care of collecting the biomass, feeding the digest-er and distributing the biogas and fertiliser fairly. Farmers bringing manure from their fields to the biogas plant receive a small compensation. Vert-Monde identifies 50 women, who, in their household, are responsible for cooking and processing of agricultural produce. Each one receives a gas burner and a bag to transport up to 1.2m³ of biogas home – enough for about four hours of cooking per day. To cover the costs of administration and maintenance, each woman pays a small fee for the biogas.

INNOVATIVE PROJECT ELEMENTS

Innovative is the choice of the direct target group being the 50 women, since they are the ones struggeling every day for fire wood for their households. By providing them the alternative of usage of biogas, they can easily save time and engage in income generating activities. This setting is at once improving the livelihood of the 50 women's households and reducing the pressure on the natural resources around the village. A further effect may be the stimulation of the women's social and financial independence. The success of the project is only possible through the sensitisation and facilitation of Vert-Monde on the ground. Sustainability is achieved through strong, long-term community involvement in the management of the biogas plant.

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Capacity Building for Quality Energy Services in Rural Benin

SUMMARY

Country	Benin
Implementer	Brücken bauen mit der Sonne e.V.
Co-implementer	TierraSol Benin
Target groups	Rural population around Abomey and Bohicon
Duration	04/2022 – 06/2023
Type of energy use	Electrification

CHALLENGE

In Benin only about 50 % of the population has access to electricity. In rural areas this number is even lower and amounts to only around 25 %. The reason for this is a poorly developed national electricity grid which, especially in rural areas, does not reach individual villages. While Benin receives up to 12 hours of sunlight per day, due to its proximity to the equator, the possibilities for the expansion of solar PV installations throughout the country still remain largely untapped. More trained technicians are required countrywide to better utilise this potential. However, so far training and capacity building measures have often not reached rural regions.

IMPACT LOGIC

The project aims to improve the knowledge about solar PV systems in rural Benin. With a specifically designed, hands-on solar PV installation and maintenance training, the implementing partner TierraSol builds capacities among youths and young adults in the Zou region in southern Benin. The training takes place part-time over the course of six months in a classroom that is rented for this purpose. All material and demonstration equipment is bought locally. Participants are recruited through awareness and advertisement campaigns, which are broadcast over the radio. The training is designed to improve their theoretical and practical technical capabilities and to prepare them to take up jobs as technicians for solar home appliances. To strengthen the practical application, the approach also foresees an internship for each participant and a networking event for the regional solar energy sector. Thereby, the approach not only improves the employment opportunities of each participant, but in the long term also increases the quality of service for solar installations and repairs in the Zou region. Ultimately, the project accelerates the sustainable development of a decentralised renewable electricity supply in Benin.

INNOVATIVE PROJECT ELEMENTS

The project is characterised by a locally tied approach. Local experts are hired to impart their knowledge in a low-entry, practical way. The measures target local students with the intent of providing training that builds on their school education and offering them a promising job perspective. Accessing material from local sources not only keeps costs down, but also helps to connect the project to the region. Not many projects in Benin have so far put capacity building for solar energy technologies in rural areas in the focus of their activities, which characterises the added value of this project.

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Electrification of the Lake Village Ganvié from Floating Photovoltaic Sources

SUMMARY

Country	Benin
Implementer	Polytechnic School of Abomey-Calavi (Ecole Polytechnique d'Abomey-Calavi, EPAC)
Target groups	Private users and the health center in Ganvié 2
Duration	01/2020 – 03/2021
Type of energy use	Electrification

CHALLENGE

The village of Ganvié is a pile-dwelling village in Lake Noukoué north of Cotonou. It is not yet connected to the national power grid. The people of Ganvié have difficulties with energy supply and mainly use oil as their primary source of energy. This enormously limits their incomegenerating activities, as well as risking fires and causing further health issues. The maternity ward in the village is not lit. Most households still use lanterns, candles and lampions for their illumination. This has negative impacts, e.g. on the performance of students and the health of the population. With access to electricity, the overall living situation of the population of Ganvié would change for the better.

IMPACT LOGIC

The target groups are the citizens of Ganvié and the local health center. The aim is to
(1) develop income-generating activities based on the use of electrical energy,
(2) improve learning conditions,
(3) improve the quality of (public) services,
(4) create jobs, and
(5) provide lighting.

The photovoltaic (PV) panels are mounted on a raft made of recycled canisters and logs. This raft building technique is already used by the local population. The floating PV raft has the potential to create a protection zone for fish and to reduce the formation of algae. The effects of the project are as follows: First, a photovoltaic field is installed on the lake Nokoué, also a technical maintenance committee as well as a financial management committee is set up to accompany and monitor the project activities. Second, a mini hydro plant provides electricity for lighting and income generating activities. Third, there are 100 rechargeable lamps distributed to 200 households in the village. The recharging of mobile phones and small lamps is offered by a central contact point (Social or Commercial Centre) for electricity in the village.

INNOVATIVE PROJECT ELEMENTS

The innovative technological approach of floating PV plants is increasingly implemented worldwide, but in Benin such a project can be considered to be among the first of its kind. Because of its pilot character, the researchers from EPAC will monitor the installation closely and assist the local authority in managing it.

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Securing Health Care with Solar Power

SUMMARY

Country	Benin
Implementer	Culture, Education, Recherche pour le Développment au Bénin (CERD)
Co-implementer	Gemeinde Bürgerkomitee für Entwicklungszusammenarbeit Steinhagen (GBK, Community Citizens' Committee for Development Cooperation Steinhagen)
Target groups	Health centres and users of the health centres
Duration	08/2021 – 11/2021
Type of energy use	Electrification

CHALLENGE

In Boukombé, with its more than 90 villages and a good 80,000 inhabitants, there is only one doctor, who lives in the central community. The health centre in the village has no electricity. Therefore the health centre has limited possibilities to care for patients. This means that patients in the surrounding area of the centre are poorly provided with vaccinations, antenatal and maternity care or acute care. Sensitive medicines are worthless after a short time in the warm climate of northern Benin due to the lack of refrigeration facilities. The consequence of the difficult living conditions is a high mortality rate. Women in particular suffer from the poor health care.

IMPACT LOGIC

To address the lack of medical care, the non-governmental organisation CERD built its own hospital at the entrance to Boukombé. The aim of this project is to equip this hospital with a photovoltaic system and at the same time connect it to the national electricity grid. The intention is to avoid high electricity bills for the hospital. Patients are to receive comprehensive and at the same time cost-effective medical treatment. With this equipment, the hospital offers its medical staff an attractive workplace and improves the quality of health care in Boukombé in the long term. To electrify the hospital, CERD expands its team with two technical experts coordinating the installation of the system. A selected solar company installs the system consisting of photovoltaic solar panels, storage batteries and the grid connection. The solar energy is used to power lamps, a water pump, a steriliser, an ultrasound machine, oxygen concentrators, aspirators, refrigerators and computers. To ensure sustainable use of the system, the entire hospital staff is trained in its use towards the end of the project.

INNOVATIVE PROJECT ELEMENTS

The described approach makes the health centre largely independent of the volatile power grid and at the same time uses the grid as a backup for the night or less sunny days. The large solar component of the systems relieves the non-profit organisation CERD of high electricity prices. In turn, they are able to pass on these lower costs to their patients and offer medical care also to those who otherwise would not be able to afford it. This can serve as an example project for other social infrastructure.

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Solar Power Lights Up a Village and Enables Productive Use

SUMMARY

Country	Benin
Implementer	Light, Information, Health, Education (LU.I.S.E)
Target groups	Rural population
Duration	01/2021 – 05/2023
Type of energy use	Electrification

CHALLENGE

The approximately 3,400 inhabitants of Amouloko – the village is located about 50 kilometers northeast of Cotonou – live almost exclusively from agriculture and cultivate corn, cassava and palm oil, among other crops. Most villagers have no access to electricity. They light their houses with candles and lanterns and use firewood for cooking. There is no light in the school, nor have the villagers access to refrigerated goods. In addition, most villagers cannot afford a connection to the nearest power line. Furthermore, the power lines pass by the village but do not run through it and most villagers cannot afford the connection costs.

IMPACT LOGIC

The local non-governmental organization (NGO) called Light, Information, Health, Education (LU.I.S.E) follows a participatory approach to engage the community of Amouloko in the project. In phase one, the measures are discussed with the population, the local women's group and authorities. In phase two, a plot of land in the village is made available for the project, on which a building is constructed for the productive use activities. This building is equipped with solar PV panels and a battery system and houses equipment for the villagers to use: A grain mill, a refrigerator to store beverages and several outlets to charge their cell phones. In addition, the local school buildings receive small solar panels and LU.I.S.E trains selected residents in the maintenance of the various systems and supports residents in taking up income-generating activities. In phase three, the village community, supported by the NGO, sets up a collective management structure. Whoever wants to use the productive use equipment pays a small fee. This fee is then used by the management committee to pay for maintenance and repair services and to invest in additional productive use equipment. Eventually, the different systems will be handed over to the village community.

INNOVATIVE PROJECT ELEMENTS

Innovative about this approach is the participatory preparation and management of the project, which aims to guarantee the commitment of the target group. The village community is included in the decision making and, over time, is enabled to manage and maintain the provided systems autonomously. As the productive use site was well received in Amouloko, LU.I.S.E. will replicate the approach in two other villages in the northern part of Benin.

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Solar Water Heaters for the Healthcare Sector

SUMMARY

Country	Benin
Implementer	Laboratoire d'Energétique et de Mécanique Appliquées de l'Ecole Polytechnique d'Abomey-Calavi / Université d'Abomey-Calavi (LEMA / EPAC / UAC)
Target groups	Maternity wards
Duration	08/2020 – 07/2021
Type of energy use	Other

CHALLENGE

The various health centres in Benin rely on the use of hot water e.g. in the maternity wards. Often this is not available. Mostly water is heated by the use of firewood and its byproducts. Generally, clean hot water is not sufficiently available. This situation affects access to dependable and quality health care. In addition, these energy sources used contribute negatively to climate change.

IMPACT LOGIC

The maternity wards of two health centers need to be equipped with solar water heaters to improve hygiene on site and at the same time save costs and protect resources (forest). To this end, two locally easy-to-replicate, low-cost boiler models are developed by the project. Subsequently, four craftsmen are trained in design and manufacture of the solar water boilers. The project measures are divided into three phases:

(1) Provision of hot water to two selected nonprofit, non-governmental hospitals;
(2) Capacity building: Train craftsmen in the construction of the solar boilers;
(3) Enable the hospital staff to use and maintain the systems autonomously.

The beneficiaries of the project make a small financial contribution in return, from which the maintenance of the systems is financed. The project activities lead to the effect that the skills to construct hot water boilers are taken over by the trained craftsmen. Similarly, the training enables the hospital staff to operate and maintain the heaters in such a way that their working life will be extended accordingly.

INNOVATIVE PROJECT ELEMENTS

The introduction of the climate-friendly technology of solar energy for hot water production for the social infrastructure of the maternity wards is innovative. The main feature of the intervention is the fact that the boilers are easy-to-build and locally-sourced. Thus, the project provides hot and clean water efficiently and directly for the use on site to ensure the necessary health care at the health centres and their maternity wards.

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Traineeships for Young Women Engineers in Benin's Public Energy Sector

SUMMARY

Country	Benin
Implementer	Unit for Gender and Development, Ministry of Energy (MoE)
Co-implementer	Internal structures of the MoE
Target groups	Young women engineers and students
Duration	12/2020 – 05/2021
Type of energy use	Electrification

CHALLENGE

In Benin, only 41 % of the population have access to electricity and in rural areas it is just 18 % of households. Although women are disproportionately affected by this lack of electricity, they are generally underrepresented in the decision-making bodies in Benin. The rate of female elected officials in the country is extremely low with 78 out of 1,815. The situation in the energy industry and state institutions is similar. Nevertheless, general conditions for women in Benin have improved during the last years, e. g. Benin has jumped from position 90 to 75 out of 190 countries, in the rating of the legal and regulatory framework for women's employability. In technical university courses, although still underrepresented, women nowadays constitute up to 35 % of students.

IMPACT LOGIC

The aim of this project is to contribute to a change in perception and behaviour with regards to women in the field of renewable energy. It is composed of three different pillars: To increase the participation of young female engineers in the public energy sector, the project offers 14 months of traineeships within the Ministry of Energy (MoE) and its related public agencies to eight young female engineers in order to qualify them for a follow-up employment. At the same time, the MoE's Gender and Development Unit intends to mainstream the topic of gender and to build capacities within the key institutions in charge of energy development in Benin. Finally, to increase the overall visibility of women in technical job positions, the trainees facilitate lively sensibilisation sessions, during which they inform female students at six high schools about the career opportunities for women in technical professions.

INNOVATIVE PROJECT ELEMENTS

The innovative dimension lies in the promotion of female engineers in the energy sector by show of example. Starting with these eight women, the project aspires to create a longterm multiplier effect to increase the number of women being actively involved across Benin's public and private energy sector.

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Foundational Work to Improve the Energy Supply at Bugendana Socio-Pastoral Centre

SUMMARY

Country	Burundi
Implementer	Archdiocese of Gitega
Target groups	Bugendana Socio-Pastoral Centre User of electricity provided by the PV system
Duration	03/2020 – 10/2020
Type of energy use	Electrification

CHALLENGE

The Bugendana Socio-Pastoral Centre in Burundi (Archdiocese of Gitega), is located about 30 kilometers from the capital of Gitega Province. The Centre has a clinic, a rectory, a convent and a church, as well as a primary school. As the centre is not connected to the electricity grid, it has been acquiring autonomous photovoltaic systems since 2017. These systems have not provided sufficient power, a situation aggravated by plans to expand the centre with a secondary boarding school and a dormitory for teaching staff. To best utilise the existing assets and ensure a good understanding of what is required for an expansion of the energy supply, a study is conducted.

IMPACT LOGIC

The purpose of the study is to assess the current and future demand for electricity in contrast to the current installed assets. Based on this assessment, various scenarios are proposed to upgrade the existing system with a least-cost approach, taking into consideration the use of energy as well as energy efficiency opportunities. This results in a list of possible system upgrades to allow for various intervention approaches.

Based on the scenario overview, the system can be upgraded via other funds. This helps to lay the foundation for a lasting upgrade of the energy supply at the centre.

INNOVATIVE PROJECT ELEMENTS

The innovation of the project is shown by its orientation to the real needs of the local church institution as well as the development of viable scenarios of power usage, related to the current and future energy supply. The sustainable use of the existing photovoltaic systems will guarantee the supply of the infrastructural services at the centre.

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Solar Energy for Eye Care

SUMMARY

Country	Cameroon
Implementer	Africa Eye Foundation
Target groups	Patients
Duration	07/2020 – 03/2021
Type of energy use	Electrification

CHALLENGE

The Magrabi ICO Cameroon Eye Institute (MICEI) in Cameroon is sub-Saharan Africa's first non-profit ophthalmology institute. Launched in 2017, the institute is located 20 kilometres north of Cameroon's capital, Yaoundé. According to MICEI, the institute has provided over 100,000 consultations and over 5,000 (subsidised) eye surgeries, since its launch. For these treatments, the institute needs a secure energy supply as well as an overall reduction in energy costs, as both will lead to more resources available to the institute to reach a greater amount of people. Presently, MICEI's power supply principally relies on the national electricity network, provided by a hydroelectric dam, situated some 350 km from the site. The energy supply has proved to be unreliable since MICEI is situated in a rural community with power rationing as part of load sharing. As the national electricity grid is prone to power cuts and breakdowns, the institute also operates an emergency generator. The electricity costs are high and exceeded € 72,000 between August 2016 and September 2018.

IMPACT LOGIC

The MICEI Solar Energy for Eye Care project is implemented in several steps. The first step is an environmental impact assessment, followed by the design of the required photovoltaic system and the establishment of a project team. The staff responsible for operation and maintenance is trained accordingly. The photovoltaic system provides electricity for interior lighting, street lighting and power for the Institute's operations, as stipulated by the project plan. As a back-up – for example in times of monsoon – the MICEI can fall back on the national power grid. Through an improved and climate friendly clean energy supply MICEI can save costs, operate more effectively, and extend the provision of health services.

INNOVATIVE PROJECT ELEMENTS

In Cameroon the demand for electric energy far outstrips the available supply. Furthermore, transportation from the source of production to the final consumer has been very challenging (due to power loss and variations). So far, there is very little engagement in seeking solar energy supply. MICEI seems to be the first health institution to have the facility equipment powered by solar energy in Cameroon, and the first non-profit eye hospital in Africa. The solar system is based on three autonomous modules, corresponding to three components: internal lightning, street lights and machines. The modular design approach of these components has two key advantages. The first advantage is flexibility in implementation, the second is efficiency in maintenance. The modular design facilitates maintenance since a fault in one subsystem does not affect the other subsystems. At the same time the system has the possibility to switch back to the national power grid. This allows the existing power supply to be used as backup to the solar system and it provides continuity of service in the event of a fault in the solar system.

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Understanding the CO_2 Footprint of PV Installations

SUMMARY

Country	Cameroon
Implementer	Antenna Foundation
Target groups	Interested stakeholders such as organisations, investors and companies
Duration	03/2022 – 06/2023
Type of energy use	Other

CHALLENGE

Renewable energies are of great importance for the future energy supply and a carbon trajectory that remains with the boundaries of the 1.5° target set in the Paris Accord. While off-grid PV systems can electrify rural areas, and thus create the basis for social and economic development, we know little of their carbon footprint. What is missing are calculation models that help us understand the CO_2 footprint of various system components as well as the potential to save CO_2 compared to alternatives.

IMPACT LOGIC

The Swiss Antenna Foundation (AF) project aims to create a basis for CO_2 analysis of off-grid systems with a view to also be able to participate in the Voluntary Carbon Market. For this purpose, data of a mini-grid is collected and a model for the evaluation of the lifetime and the (saved) CO_2 emissions developed. With the help of a case study, this model is subsequently tested and compared with existing models. In order to be able to generate emission certificates with PV applications, both the buyers of the certificates and the investors need to know how much CO_2 savings the installed systems can generate compared to conventional power supply, for example compared to diesel generators or hydropower plants. Therefore, AF pursues several goals with its project, which logically build on each other. In the first step, the project records the emissions of the different power sources. Based on these calculations, it is possible to calculate the carbon footprint of PV projects. The project develops a practicable model for local partners in the second step and proves its functionality in practice in the third step. Therefore a case study is realised and at least ten technicians are trained. This will encourage local partners to carry out this CO_2 analysis automatically for each PV system. In the next step, AF determines for its own energy projects to what extent it can use the method to generate official and voluntary emission certificates and sell them on the market. AF will make all the results of the project accessible after the project has ended, so that the methods and effects can be shared.

INNOVATIVE PROJECT ELEMENTS

So far, the ecological footprint of the replacing system has rarely played a role in the CO_2 certification of solar technology, neither has the assessment of the advantages and disadvantages of various components. There are thus two levels of innovation present. The first is a holistic calculation model to make the CO_2 savings visible compared to a baseline. And the second being that project developers can assess the carbon footprint of individual components within a system to select the best items based on a CO_2 assessment.

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Increased Access to Solar Energy for the Medical Centres in Rural Areas of South Kivu

SUMMARY

Country	DR Congo
Implementer	Groupe d'Intervention Pour l'Encadrement et la Réhabilitation Intégrale (GIERI)
Target groups	Population of the South Kivu province
Duration	05/2022 – 12/2022
Type of energy use	Electrification

CHALLENGE

More than 90% of the population of the South Kivu province in DR Congo does not have access to electricity due to the poorly developed national electricity grid. Within this region, the Shabunda, Walungu and Kabare territories are some of the most isolated. Electricity does not reach these territories at all. Due to the lack of electricity, medical centres cannot provide adequate health services to the population. They are unable to store medicine or vaccines, they cannot perform surgery during the night, and pregnant women do not get the appropriate health treatment during delivery.

IMPACT LOGIC

Three general health centres as well as one specialised institution focusing on women who have been victim of sexual violence are equipped with solar PV installations. By having access to electricity, these centres are enabled to power their medical equipment as well as fridges and computers. Materials for the installations are sourced locally, and GIERI ensures that the materials can easily be repaired or replaced in case of damage. In addition to these installations, GIERI also organises capacity building measures. In specialised courses, 20 local youths are trained in the installation and maintenance of the solar PV units. Besides supporting the health facilities, these newly trained technicians are also enabled to start their own businesses in the region. Thus, the health care in the region is strengthened at four specific sites and the overall capacities to expand electricity supply are improved.

INNOVATIVE PROJECT ELEMENTS

The main innovative element of this project is its geographic focus on three territories in the South Kivu province. These territories have not only been restricted from access to electricity, but no notable projects focusing on providing electricity to major public services like health care facilities have been carried out until now. Furthermore, the project selects and trains members of the local population so that the installations can be sustained even beyond the end of the project. In addition, this creates the possibility to even expand the supply of solar PV systems in the region.

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Domestic Biogas to Improve Rural Livelihood in Ethiopia

SUMMARY

Country	Ethiopia
Implementer	Hawassa University
Target groups	Farmers
Duration	10/2019 – 10/2021
Type of energy use	Other

CHALLENGE

In the two Ethiopian districts of Damot Woyde and Dugna Fango, more than 75 % of the population live from agriculture. About 95 % of the people depend on biomass for energy. They use this mainly in the form of firewood which they use primarily for cooking, but wood is becoming increasingly scarce. The situation threatens people's livelihoods because wood is becoming more expensive due to the scarcity. The fertility of the soil also decreases because people burn dung and plant residues as an alternative.

IMPACT LOGIC

The project is led by Hawassa University, which is located in the capital of the Southern Nations, Nationalities, and Peoples' Region (SNNPR) – Hawassa. Among other things, Hawassa University is committed to knowledge and technology transfer and cooperates with numerous national and international partners. Currently, the university is implementing 51 projects. The two project districts belong to the SNNPR. In order to spread the use of biogas plants as much as possible, the project informs the people in the district comprehensively about the advantages and prerequisites of biogas plants. This is important because under this project, interested people have to pay 10 % – 20 % of the costs of the plant themselves, depending on their financial circumstances. In the second step, the project trains Innovative Project Element So far biogas has been underutilized in Ethiopia. The project not only expands domestic biogas usage to two new districts, but also includes elements on capacity building. The project enables local farmers to become more resilient to energy shortages and set up their own energy production. This way local farmers are able to expand the national biogas system and further sustainable energy approaches like bio gas on their own. For the project two different sizes of biogas plants (8 m^3 and 6 m^3) are used, depending on household specific livestock holding and dung supply. designers who learn how biogas can be produced and used, and how to construct and complete a biogas plant. The know-how acquired is to be used to improve the employment opportunities of the participants or to enable them to become self-employed. The project aims to build up to 100 domestic biogas plants and train about 50 local micro-entrepreneurs to build and distribute these plants. Thus, apart from clean energy, the project also promotes employment possibilities.

INNOVATIVE PROJECT ELEMENTS

So far biogas has been underutilized in Ethiopia. The project not only expands domestic biogas usage to two new districts, but also includes elements on capacity building. The project enables local farmers to become more resilient to energy shortages and set up their own energy production. This way local farmers are able to expand the national biogas system and further sustainable energy approaches like bio gas on their own. For the project two different sizes of biogas plants (8 m^3 and 6 m^3) are used, depending on household specific livestock holding and dung supply.

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Strengthening Solar PV Education & Solar PV Popularization in Rural Villages of Ethiopia

SUMMARY

Country	Ethiopia
Implementer	Hawassa children's organization (HCO)
Target groups	Young adults
Duration	08/2020 – 01/2023
Type of energy use	Electrification

CHALLENGE

Ethiopia's population is growing, as is its economy. But large parts of the country, especially the Southern Nations, Nationalities and Peoples Region (SNNPR), are without a power grid and rely primarily on wood as an energy source. Off-grid solutions are the only alternative for many population groups. However, there is a lack of technicians who can install and maintain systems.

IMPACT LOGIC

In order to establish itself as a leading training centre in solar energy, Hawassa Vocational Training College (HVTC) expands its technology laboratory and acquires additional equipment for practical exercises, such as measuring instruments, PV components or batteries. This also includes a 5kWp PV system, which ensures the power supply on the one hand and serves as a demonstration and training object on the other. HVTC also further develops its curricula and offers three different training programmes.

Finally, additional trainers, technicians and management experts are hired. The project provides 60 unemployed young adults with technical and business skills and supports them to create their own business opportunities including product sales, installations, and servicing. Accordingly, the training programmes also improve the living conditions and awareness of the local population through the use of the technologies by equipping 46 social institutions with solar applications and creating a demonstration field with a solar water pump. These illustrate the productive use of solar technology for the trainees, resident smallholders and the general public. Finally, HCO informs more than 3,000 people about solar energy through campaigns.

INNOVATIVE PROJECT ELEMENTS

By training new technicians and entrepreneurs in the field of solar technology, the solar sector in Ethiopia becomes strengthened sustainably. 60 young adults are equipped with the necessary skills and knowledge to grow their small businesses with the support from HCO and the awareness campaigns. Additionally, this project, that trains new technicians, complements existing capacity-building efforts focused on solar PV education. HVTC signed a memorandum of understanding with Hawassa University Wondo Genet College of Forestry and Natural Resources to conduct short term trainings on installation and maintenance of solar energy technologies for 150 technicians from governmental energy offices and private enterprises.

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Using Water Hyacinth Blend for Biogas and Fertilizer Production

SUMMARY

Country	Ethiopia
Implementer	Arsi University
Target groups	Population of Arsi zone, Oromia Regional State
Duration	06/2022 – 12/2022
Type of energy use	Other

CHALLENGE

In Ethiopia's Oromia region the invasive water hyacinth plant has infested several lakes. The plant threatens native habitats, but also depletes water bodies of oxygen, increases water loss and provides a breeding ground for mosquitoes. In addition to drinking water these lakes provide large parts of the local population with a source of living and income through fishing, agriculture or animal herding. Thus, water hyacinth actively endangers large parts of the population living in the vicinity of the infested lakes. Furthermore, many of the fishers and farmers in this region face growing economic hardships as the impact of global climate change worsens their working and living conditions.

IMPACT LOGIC

A technical viability study is conducted to determine in what capacity water hyacinths pose a threat to the local population and to present possible solutions for the identified problems. This study also assesses to what extent water hyacinth can be harvested and used in the localized production of biogas and fertilizer. The study features an initial pilot survey, in which 5 % of the total sampled households are interviewed to get feedback on the developed research question. Through this pilot the survey design is tested to determine whether the questions are clear and relevant to the participants. In the final data collection a representative sample of biogas value chain actors is interviewed using a standard survey questionnaire. Additionally, focus group discussions are held with biogas value chain enablers and supporters to identify the key opportunities and bottlenecks along the biogas value chain. The final results of this study are then presented to key stakeholders to discuss next steps.

INNOVATIVE PROJECT ELEMENTS

The idea of using water hyacinth plants to produce biogas and fertilizer (which is a by-product) presents the unique opportunity to develop an integrated solution to a local problem. While the water hyacinth plant threatens the natural habitat around the lakes in the Arsi zone and thus also endangers the local population, there also exists the potential to transform this problem into a new avenue for income generation. This solution not only aims to solve the problem at hand, but also larger socio-economic issues. The produced fertilizer helps livestock and vegetable production and reduces the impact of climate change on local farmers.

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Access to Solar-Powered Water Pumps in Laikipia

SUMMARY

Country	Kenya
Implementer	SNV Netherlands Development Organisation
Target groups	Population of Laikipia
Duration	06/2021 – 05/2023
Type of energy use	Irrigation

CHALLENGE

In Laikipia County, northwest of Mount Kenya, six out of ten households live predominantly from agriculture. Although the potential for this is very good in the region, only 10 % of small-holder farmers can actively irrigate their fields. One reason for this is that many of them live far from the national electricity grid and the use of diesel pumps is often too expensive. Solar-powered water pumps could provide significantly higher yields through the cultivation of vegetables as well as in livestock farming. However, the high initial investment, limited availability of know-how, technologies and after-sales services are high hurdles that hinder the spread of solar irrigation systems.

IMPACT LOGIC

Access to and awareness of clean and affordable energy solutions is an important pillar for the economic development of the region. An important focus of the project is therefore to work with so-called lead farmers at the local level to facilitate on-farm practical trainings. In parallel, the project also strengthens the supply side by supporting national and international manufacturers and traders to expand their distribution channels to rural areas.

To enable more people to purchase solar water pumps, the project promotes access to appropriate, affordable and flexible payment models through local credit providers or rural savings and credit groups. In the end, the economic viability of the solar pumps also depends on the buyers generating higher yields with the solar water pumps. Focussing on the highest return on investment, the project promotes solar water pumps for irrigation in horticulture farming (vegetables and pulses) and animal farming (water and fodder for animals) through training and education of small-holder farmers on best farming practices and application of solar water pumps.

INNOVATIVE PROJECT ELEMENTS

The project addresses barriers that hinder business and market growth for the private sector looking to promote clean energy access products. Of particular importance to the project is the cooperation with lead farmers, who provide their farms and water sources as the training and demonstration sites to stimulate demand for solar water pumps. The project further makes a targeted effort in a defined geographic space to expand local technical capacity, knowledge and understanding of one tested and proven solar-powered water pump technology and best practice in applying this technology to maximise benefits for smallholder farmers. Finally, through the integration of the local credit providers, the project also supports access to finance.

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Establishment of a Training Course for Small-scale Solar Cooling

SUMMARY

Country	Kenya
Implementer	SERC – Strathmore Energy Research Centre
Co-implementer	University of Hohenheim (UHoh)
Target groups	(Young) technicians, project developers, solar companies, small holder farmers
Duration	09/2019 – 02/2022
Type of energy use	Cooling

CHALLENGE

According to the FAO, up to 40 % of the cereals, vegetables,fruits and dairy products produced in developingcountries spoil before they can be put to good use. Theselosses hit smallholder farmers particularly hard and threatentheir livelihoods. One reason for the losses is a lack of coldchains. Cooling methods that rely on decentralised renewableenergies can provide a cost-effective remedy. However, there is a lack of well-trained technicians in rural Kenyawho can install, operate and maintain solar cooling systems.

IMPACT LOGIC

SERC and UHoh begin by developing a five-day trainingcourse that includes selected training materials on topicssuch as basics on refrigeration, calculation of coolingdemand and design of different solar powered coolingsystems. In a second step, trainers are taught to work with the developed material. Parallel to the training of trainers, a 15 m^3 solar powered cold storage room is installed at SERC, which provides the participants with hands-on experienceduring their training. After a first pilot training, SERCdevelops marketing and communication material to attractmembers of the target groups and to ensure the continuationof the training programme. The developed trainingmaterial can also enable other institutions to run courses atlow cost. Through the training of technicians, solar-poweredcooling is offered for different purposes. Thereby e.g. food losses are reduced.

INNOVATIVE PROJECT ELEMENTS

The project includes the creation of completely newtraining materials for a 5-days course including lectures,design tools, and practical work with hands-on prototypes. Maintenance of the technical training equipment is sustainably financed by a fixed share of 30 % of course fees from training participants.

Trained members of Women in Sustainable Enterprise (WISE), a community based organisation that supportswomen and girls from marginalized areas, become female members of the SERC trainer pool. A trained companycommercializes a solar milk cooling system and is planningthe installation of several cold rooms.

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Maa Green Energy Project

SUMMARY

Country	Kenya
Implementer	LRC Foudnation
Target groups	Farmers in Kajiado County
Duration	04/2022 – 06/2023
Type of energy use	Other

CHALLENGE

Kajiado County is a rural and semi-arid county in the south of Kenia. The inhabitants mostly rely on agriculture and livestock herding to provide for their livings. Limited access to water poses one of the major problems for the region. Petrol and diesel-powered pumps are normally used to access water from basins and wells, however the pumps are prone to regular breakdowns. In addition, they cause high operation and maintenance costs while also polluting the environment. Another problem for the region is the poorly developed electricity grid within the sparsely populated parts of the country. As a result, many necessary tasks, like powering agricultural equipment or charging phones, cannot be carried out. Instead, people often need to travel to far away urban centres to access electricity.

IMPACT LOGIC

The project combines a large range of different measures with the overall goal to promote the usage of solar PV systems to up to ten community groups in the Isinya and Ilbisil areas in Kajiado County. One solar-powered water pump is installed for community use as part of the project. The water directly supports a local school and pharmacy, and provides water access to the community and their livestock. Apart from this, 21 solar-powered demonstration units, which raise awareness of the new technologies, are provided. Of these units seven each are irrigation units, solar-powered charging stations for different devices, and poultry incubators. These stations are owned and maintained by groups of local women which have already worked together with the LRC Foundation on previous projects. Finally, LRC sets up and equips a training centre for these technologies at Latia Agripreneurship Institute in Kajiado. This includes the development of tailor-made training content on irrigation, use of solar-powered incubators and agribusiness. The training centre initially trains 20 people from the two areas. This ensures the sustainability of the project as the trained technicians are able to provide long-term support and maintenance for the installations. Furthermore, they can also continue to generate attention through grass-root awareness campaigns using the solar-powered installations as training and demonstration sites. All these measures strengthen the understanding and use of solar PV installations and therefore increase the water supply and electrification rate in the county.

INNOVATIVE PROJECT ELEMENTS

The project aims at creating market stimulus so that members of the targeted communities expand the use of solar PV technologies on their own. The project measures create demand for solar-powered products and solar PV systems. The project generates further interest for the adaption of the systems by providing 55 vouchers covering 20 % of the costs to low-income households which act as early adopters of the new technologies.

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SOLARED Coffee Project

SUMMARY

Country	Kenya
Implementer	Africa Fairtrade Network Limited
Target groups	Coffee producers
Duration	03/2020 – 07/2022
Type of energy use	Drying

CHALLENGE

Coffee is one of Kenya's most important agricultural products. Around 700,000 families live from coffee, usually growing it on small fields. One of the most important tasks is drying the coffee beans in the sun. This usually takes place between October and December, during the rainy season. The drying process goes through several phases, takes between 12 and 14 days and is very labour-intensive. Moreover, the duration and uncertain weather conditions jeopardise the quality of the dried beans, which is an important indicator for the market price.

IMPACT LOGIC

In order for solar drying systems to become established in the coffee cooperatives involved, Fairtrade Africa informs them about the new technology and installs nine solar coffee dryers in nine producer organizations and an additional eight solar dryers financed by producer organizations. Three cooperatives working with Fairtrade Africa are already experienced with solar drying systems due to their involvement in pilot projects. Part of the project is to adapt the design of the systems to local conditions and thereby improve them.

In addition, Fairtrade produces manuals for the design, installation and maintenance of the dryers as well as training manuals that contain best practice examples from the three pilot projects as well as from other countries. Together with the Coffee Research Institute, Fairtrade conducts training of trainers and courses for its cooperatives. The improved drying of the coffee as a result of the measures presented increases its quality and thereby the income and economic situation of the producing farmers.

INNOVATIVE PROJECT ELEMENTS

The idea of using solar-powered PV systems for coffee drying is underutilized itself so far in Kenya. Accordingly, the project establishes a new technology application in Kenya that fits well into an existing value chain system. In addition to that, the project considers the whole value chain when setting up its cooperation system. Fairtrade also works together with coffee marketing organisations which provide financial support for financing solar dryers in terms of loan advances. The effects of the new coffee drying technique are immediately observable: Time used to dry coffee beans is reduced from an average of 14 days to an average of five days. As a direct result of this, no backlog of clearing dry beans at the factory adds up. Furthermore, the beans dry uniformly due to regulated temperature which improves the overall coffee quality which in turn directly translates to increased prices at the markets and returns to the farmer.

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Renewable Energy for Agriculture

SUMMARY

Country	Malawi
Implementer	Modern Farming Technologies (MFT)
Target groups	Women farmers
Duration	11/2021 – 04/2023
Type of energy use	Irrigation

CHALLENGE

Measured by gross domestic product, Malawi is one of the poorest countries in the world. 80 % of the population make their living through farming. People mainly cultivate their fields by rain-fed agriculture, which is becoming increasingly unprofitable due to climate change and soil degradation. For alternative forms of cultivation, large parts of the population lack access to electricity and means of production, especially irrigation pumps, cold storage, an d mobility. Accordingly, post-harvest losses amount to between 30 % and 40 %. Additionally, women in Malawi face further economic uncertainties, as only one percent of the women officially own land.

IMPACT LOGIC

The members of the women's farming cooperative are the main beneficiaries of the project. By using solar-irrigated greenhouses as well as adequate cooling systems and through a resilient marketing strategy, the women are enabled to grow produce all-year-round and increase their income. The higher yields subsequently give them better access to the regional and national food trade. In the first step, a solar drip irrigation system and 15 greenhouses are installed. With these facilities, 45 women of the cooperative grow high-quality vegetables, herbs, and fruits in close coordination with potential future buyers. The women are trained in the use of a cultivation plan and deliver their produce to MFT, the implementing partner organisation, which stores the food in a solar-powered cold store and markets it to restaurants, lodges and exporters. The women in the cooperative jointly use the facilities and share the rent evenly among the members. When the facilities are paid off, they become the property of the cooperative. During the first two years of the project, 45 women gain meaningful and sustainable jobs. This will scale up to 267 jobs by year five, impacting 1,333 people through improvements to women's income and food security. Each woman gains a yearly net income of about €627 rising to over €900, when they have completed the rent-to-own payments for their greenhouse.

INNOVATIVE PROJECT ELEMENTS

A modern form of agricultural production with an integrated renewable energy system, which is directly linked to marketing facilities, presents a new business model for Malawi. Furthermore, the gender-focused approach and the holistic setting of the project are innovative as they integrate renewable energy into a modern agricultural production system. In addition, the rent-to-own-approach is an innovative financing mechanism for the solar-powered irrigation and greenhouses, which allows full ownership after four years. The rent-to-own-approach is made possible by MFT facilitating access to solar-powered cold rooms and to markets of high-quality vegetables by negotiating with large retailers and through contracts on behalf of the women cooperatives.

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Solar PV System and Training at "Casa do Gaiato" Orphanage

SUMMARY

Country	Mozambique
Implementer	Azimut360
Co-implementer	Casa do Gaiato de Maputo
Target groups	Orphaned children and local youth
Duration	03/2022 – 06/2023
Type of energy use	Electrification

CHALLENGE

Mozambique is one of the poorest countries in the world with 72 % of its population living in poverty. In addition, it is one of the countries with the highest HIV rate worldwide amounting to 13 %. More than half of its population is under 18 years old, making it also one of the youngest countries overall. Since many children have lost their parents to HIV, approximately 13 % are orphans. Even though education is one of the main pillars for sustainable development, Mozambican children only attend 3.5 years of school on average, and only 16 % attend high school. These problems are amplified in rural areas, where only 5 % of the population have access to electricity. In those cases where electricity is available, the national grid often proves unreliable and is prone to power cuts. This makes it impossible to run machinery reliably and further limits the quality of health care and education facilities.

IMPACT LOGIC

The project's main goal is to provide the orphanage and education centre Casa do Gaiato de Maputo with sustainable and stable access to electricity. To this end and with technical and administrative support from the Spanish non-profit engineering cooperative Azimut360, a 40 kWp solar PV system is installed at the premises of Casa do Gaiato. The system has enough capacity to power both the electrical appliances in the residential area, including freezers, lighting, kitchen, washroom appliances and computer systems, and those in the professional area, including machinery for carpentry and air compressors for cleaning. To foster local knowledge about solar energy, Azimut360 also helps to train 15 youths during the installation of the solar PV system – seven are residents of the orphanage, the remaining eight come from the surrounding region. Together with these youths, the technical team at Casa do Gaiato will ensure the long-term maintenance of the system.

INNOVATIVE PROJECT ELEMENTS

The project measures not only ensure the sustainable supply with electricity for Casa do Gaiato de Maputo, but also include important training for local youths, which provides them with prospective employment in an important sector. Furthermore, while considering economic needs, the project also considers aspects such as gender and rural development by encouraging girls and women to participate in the training. After the trainees leave the orphanage, they can apply their knowledge, and thus help to promote the use of solar power in the region.

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SolarCent

SUMMARY

Country	Namibia
Implementer	CommonWaters Namseb
Target groups	Smallholder farmers
Duration	03/2022 – 06/2023
Type of energy use	Irrigation

CHALLENGE

The Hardap region located in the Namib Desert in southern Namibia is home to approximately 10,000 indigenous Nama people. After eight years of persistent drought, during which many Nama farmers lost significant shares of their herds, 2021 finally brought the long-awaited rainfalls. These partially replenished the groundwater level and revived the region with grass and other plants. However, access to water remains a challenge in many places due to insufficient maintenance of equipment and other technical reasons. More than 300 of the 450 available boreholes in the region are estimated to work insufficiently or to be completely defective. But because many farmers already have to spend large parts of their income to feed their cattle, repairing these pumps confronts them with unbearable costs.

IMPACT LOGIC

The project aims to improve the water supply in the Hardap region. Its main activity is the rehabilitation of 15 existing boreholes. In an upfront field visit, the sites with the highest yield potential are identified and analysed. Depending on the findings, CommonWaters installs new solar-powered groundwater pumps, replaces the water collection tanks and renews the distribution systems. At each site, the organisation supports the surrounding farmers in the set-up of a small water management committee. Each committee is managed self-responsibly. It assures the basic maintenance of its system and collects a small amount of money from each user – the so-called SolarCent – to finance future repairs. Beyond the project, CommonWaters is working with the GIZ programme Farming for Resilience (F4R) to introduce solar-irrigation gardening in the communities that surround the boreholes to increase agricultural yields and food security in the region.

INNOVATIVE PROJECT ELEMENTS

The project is characterised by several innovative elements. First, using a tailor-made approach, it prioritises repairing existing water provision systems over completely dismantling them in favour of new structures. Second, the project ensures local ownership through the established water committees. Finally, the collection of the SolarCent serves as a showcase for financing maintenance operations, even in very sparsely populated areas.

FURTHER INFORMATION

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AWARENESS, COMMUNICATION AND SENSITISATION

CAPACITY DEVELOPMENT

Solar Boost 4 a Sustainable Future

SUMMARY

Country	Namibia
Implementer	Young Africa International
Co-implementer	Young Africa Namibia
Target groups	Marginalized communities in Namibia
Duration	04/2022 – 06/2023
Type of energy use	Other

CHALLENGE

Namibia is currently in a long economic recession, which is aggravated by the negative effects of COVID-19 on the region. The most recent data on levels of poverty show that one fifth of the population in Namibia live under the poverty line. Namibia also is one of the countries with the highest social inequality and a growing level of un(der)- employment, with youth unemployment reaching 38 % before the start of the COVID-19 pandemic. Meanwhile, solar energy and the renewable energy sector are seen by the Namibian Government as well as national and international donors as a sector with enormous potential for growth. With half of the 2.5 Mio inhabitants not connected to the national grid and even lower connection rates in rural areas (17 %), distributed renewable, and especially solar energy, can bridge the gap towards universal electricity access.

IMPACT LOGIC

To create awareness for the potential use of solar energy, Young Africa's SB4SF project operates through three components. First, it trains 225 youths from rural areas in the installation, repair and maintenance of solar energy equipment. Second, it provides a basic training to 60 small and medium sized local companies on how solar power systems can be utilised within businesses. Both measures aim to promote the use of solar technology in remote settings, to create employment opportunities for those participating in the trainings and enable them to increase their revenues. At the core of the project lies a specially converted and equipped four-wheel drive truck which allows the Young Africa team to reach even the most underserved areas. Third, the final component of the project comprises an awareness campaign targeting the general population in the different regions. The campaign showcases different household solutions that can be powered by solar energy and sensitizes the community with regards to quality characteristics of solar products. In parallel, the campaign also invites regional stakeholders and sector representatives for exchange events.

INNOVATIVE PROJECT ELEMENTS

Many African economies have identified the need for more and better qualified and skilled professionals, but their efforts towards developing and supporting especially vocational education are still insufficient. The SB4SF project bridges the gap between the enormous potential for solar energy in Namibia and the lack of awareness and trained professionals. Through a mobile training and outreach campaign, it brings this knowledge to rural regions where it is needed most.

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Renewable Energy for Marginalised Communities

SUMMARY

Country	Namibia
Implementer	Desert Research Foundation of Namibia (DRFN)
Target groups	Rural communities in the Omaheke region
Duration	07/2022 – 06/2023
Type of energy use	Electrification

CHALLENGE

Access to electricity is one of the biggest hurdles for the vast majority of people living in rural areas in Namibia. These communities often live too remotely to be reached by the national electricity grid. Instead, they rely on candles, kerosene lamps and firewood for lighting. Not only are these energy sources expensive, they have also been found to cause indoor pollution which can potentially lead to long-term respiratory problems and house fires. While Namibia has made good progress in the electrification of many regions, rural electrification is still very limited. The high unemployment rate, especially in rural marginalised communities, has also made it difficult for these parts of the population to have equal access to affordable and safe electricity.

IMPACT LOGIC

The project provides a comprehensive electrification scheme to the communities of the sub-villages Donkerbos and Sonneblom in the Omaheke region. This includes the distribution and installation of solar-powered home systems for 72 households, electrification of the local crèche and community centre, as well as the installation of 25 solar streetlights in five sub-villages.

In addition to these installations, citizens also receive comprehensive trainings. During installation of the solar home systems, ten San women are trained in basic solar installation and maintenance techniques. The second part of the project aims to establish two community-run gardens in proximity to the existing boreholes in Donkerbos and Pietsepos village. Up to 40 members of the community receive training on solar-power ed irrigation and gardening techniques to ensure year round harvests. In combination, these measures minimize the negative environmental impacts of burning firewood, improve safety at night, strengthen the role of women in their communities and provide much needed electricity for all households.

INNOVATIVE PROJECT ELEMENTS

The Omaheke region has so far received comparatively little attention in terms of measures and projects aimed at promoting sustainable energy solutions. This project specifically targets this neglected region. DRFN has worked on other projects in the region since 2007 and has designed the project with and according to the needs of the local community. Furthermore, the project has a gender-sensitive approach, putting female empowerment into focus by providing training specifically for women. The project also ensures that renewable energy technology is included and integrated into day-to-day activities, securing the sustainability of the project.

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Integrated Project for the Development of Local Skills

SUMMARY

Country	Senegal
Implementer	Une lumière dans la rue (NGO)
Co-implementer	Aide aux Femmes Africaines par la formation à l'Agro-écologie (AFAFA)
Target groups	Young people seeking employment
Duration	01/2022 – 12/2023
Type of energy use	Other

CHALLENGE

Senegal's population is very young, with more than 40 % of the population under 16 years. Consequently, there is a high demand for education and vocational training. Nonetheless, many students leave school without having completed vocational training – or only with training in a field for which there is no demand. Both developments exacerbate the high unemployment rate, especially among young women (15 – 24 years). The proportion of young women who are neither in education or training nor in employment was at 46 % in 2019. Nevertheless, there are opportunities for young people, especially in fishing, handicraft, agriculture and sustainable development, including the solar industry.

IMPACT LOGIC

The project improves the employment prospects of Senegalese youth, by
(1) providing vocational training in solar energy technologies;
(2) facilitating the professional integration of the trained technicians in activities related to solar PV energy and finally,
(3) supporting the beneficiary women in the development of income-generating activities related to agro-ecology.

The project's activities to achieve these results are hands-on trainings for future solar technicians with a focus on solar pumping, coaching to integrate newly trained youths into employment and creating links between solar water pumping and farming groups using agro-ecology. Specifically the solar technicians are selected from neighbouring communities and trained with a curriculum of 24 modules in which they learn the basics of solar installations. They then receive information about starting a solar business and are supported through developing a business plan and follow-up training by accredited trainers. Last but not least, some newly trained technicians can apply their knowledge by installing solar water pumps at agro-ecology groups that are supported by AFAFA.

INNOVATIVE PROJECT ELEMENTS

The project achieves its objectives through a holistic approach combining vocational training, assistance in finding employment and opportunities for applying their acquired knowledge in the field. By including business development, the project ensures that the technicians can start a career not only as employees but also self-employed. In addition, the project has a strong focus on gender equality. Women gain additional knowledge through training in agro-ecology, and are direct beneficiaries via the use of solar energy in the field.

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Reliable Electrification Through Solar Mini-Grid and Business Promotion

SUMMARY

Country	Senegal
Implementer	Mercy Corps
Target groups	Rural communities
Duration	06/2020 – 12/2020
Type of energy use	Electrification

CHALLENGE

In Senegal, the share of households with access to electricity nationwide was 70 % in 2020. Meanwhile, about half of the population in rural areas is still without electricity. Currently, four villages in the Tambacounda region with a total of 263 households (or about 4,000 people) receive energy through a solar-powered mini-grid. This system has limited capacity and can no longer sufficiently supply all customers. Due to the limited availability of electricity, both household use and economic development in the region is hampered. Businesses are often unable to operate all necessary equipment and either need to reduce their economic output or are forced to close altogether.

IMPACT LOGIC

Mercy Corps is promoting the use of renewable solar energy for business activities in these four villages as part of the project. For this purpose, first, a market study of 24 small and medium-sized enterprises (SMEs) is conducted to identify their energy needs. Second, an increase of 100 % in the output of the local solar power plant is realised by upgrading existing technology and improving the connection to individual households. Thereafter, the SMEs receive economic mentoring through support in the elaboration of business plans, provision of management and selection of equipment. In addition, the SMEs are connected to technology suppliers and financiers. The aim of the project is to create new jobs, an increase in the turnover of at least 15 % for the 24 SMEs and the implementation of an awareness campaign on electricity consumption reaching out to at least 200 people.

INNOVATIVE PROJECT ELEMENTS

The innovative character of this project shows in the holistic planning, which combines knowledge gained in the market study with the expansion of the solar plant capacity and professional mentoring of the SMEs. In addition, the project also makes an effort to support women empowerment measures. One precondition for the selection of supported SMEs is, that at least 50 % are led by women. Furthermore, the project also has an impact on local households which profit from an improved energy access and economic development. Thus, this approach aims at social, economic and ecologic dimensions for sustainable impact.

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Solar Pumping System for Women Farmers

SUMMARY

Country	Senegal
Implementer	Le Partenariat
Target groups	500 women members of the economic group NAFOORE
Duration	08/2022 – 07/2023
Type of energy use	Irrigation

CHALLENGE

Only 47 % of Senegal's rural population has access to electricity and about 84 % of the available electricity is generated from oil, using expensive diesel generators. In the community of Mboumba in the northeastern part of the SaintLouis region, irrigated agriculture is well developed with water from the Senegal River. Nonetheless, as the costs of the diesel generators needed to run the irrigation system are high, these expenses reduce the profit margin of the rural population. Especially the women in Mboumba, who mainly work in agriculture and manufacture produce for the markets, are affected by the high electricity costs. Access to renewable energy as an alternative to fossil fuels is limited in this area.

IMPACT LOGIC

The project promotes the productive use of renewable energies within the NAFOORE economic association of women farmers. Therefore, a solar system with a water pump is installed in Mboumba. It replaces the previous diesel generator and enables the women's group to irrigate around ten hectares of land. To ensure technical sustainability, a local technician monitors the performance data of the pump closely and sends regular reports to the implementing organisation. During multiple training sessions, the women are sensitized with regards to climate change, renewable energies and the optimal use of the solar pumping system. A sustainable financial operating system is established, wherein the women pay a monthly contribution to the maintenance and upkeep of the installations.

Overall, the project approach aims to
(1) reduce irrigation costs for the NAFOORE women farmers group,
(2) increase their agricultural harvests thanks to an alternative pumping system, and, finally,
(3) change the primary energy source used, thereby promoting the environmental and climatic resilience.

INNOVATIVE PROJECT ELEMENTS

The project approach focuses specifically on women farmers as vulnerable members of Senegalese society. It provides them with access to clean technologies and strengthens their ownership through a selfmanagement approach. This has a consolidating effect on the sustainability of the project.

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Women and Youths Take Off

SUMMARY

Country	Senegal
Implementer	Social Ecological Management Fund (SEM Fund)
Target groups	Women and youths in the Matam region
Duration	05/2022 – 09/2023
Type of energy use	Other

CHALLENGE

In Senegal, the official national unemployment rate is only 4 %. However, for women this rate stands at 22 %, and for youths it amounts to 16 %. Unemployment is particularly high in the Matam region in north-eastern Senegal. The best employment opportunities in Matam are in agriculture and forestry. In order to get women and youth into employment, a mixture of training and technical know-how as well as access to electricity and income-generating assets is needed. With the existing national power grid located far away, standalone solar PV solutions are the optimal choice in this region, which receives plenty of solar irradiation.

IMPACT LOGIC

The non-governmental organisation SEM Fund enables young people and women to start their own businesses with the help of renewable energies. The project targets 17 women's groups and 19 youth associations that are active in the town of Nguidjilone and its surroundings, which belong to the Matam region. 1,800 people benefit directly from the project, with their families benefitting indirectly. The SEM Fund's strategy is to

(1) facilitate access to 26 productive solar PV systems as well as 668 solar home systems for domestic use,
(2) support 26 small businesses including on employment creation and training, and finally
(3) raise awareness among the general population about the importance of gender equality and women's economic independence.

To achieve these goals, SEM Fund enables the selected groups to purchase solar-powered equipment for entrepreneurial activities as well as solar home systems for private use via a layered financing structure. As soon as the party interested in purchasing an asset has paid an upfront sum of 10 % of the total investment costs, they receive a 90 % loan to be repaid over 18 – 24 months. The 90 % are split in a 50 % loan covered by SEM Fund and a supplier credit of 40 % that both are handled by a local microfinance institution. This model ensures that the supplier is willing to sell the asset to the remote region of Matam, as they receive 60 % upon installation, and only have an outstanding receivable of 40 %, which is further guaranteed via an agreement with the ECOWAS Centre for Renewable Energy and Energy Efficiency. After successful repayment, the loan allows other beneficiaries to access additional solar assets.

INNOVATIVE PROJECT ELEMENTS

Access to finance and skills remain as two of the key barriers to economic development. This project addresses both elements via an innovative approach that is centred on women and youth groups. Through the layered financing structure described above, the risk for technology suppliers to sell in the remote region is reduced, while SEM Fund ensures, via a handholding approach, that the recipients are enabled to use the newly acquired assets successfully. In case of successful repayments, the approach can then be replicated further, and allows additional groups and individuals to access solar equipment.

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Enhancing the Role of Solar Irrigation for Poverty Reduction Near Mt. Kilimanjaro

SUMMARY

Country	Tanzania
Implementer	Climate Action Network Tanzania (CAN TZ)
Target groups	Smallholder farmers
Duration	02/2021 – 08/2022
Type of energy use	Irrigation

CHALLENGE

Agriculture continues to be the main part of Tanzania's economy. The sector is responsible for over a quarter of the country's GDP and contributes to over 65 % of jobs nationally. The sector is dominated by smallholder farmers cultivating small pieces of land between 0.6 and 3.0 acres each. For these smallholder farmers traditional irrigation, which utilizes water from river diversions or natural springs, has historically been a major means of ensuring food security and income. However, the situation has changed significantly in recent years as farmers in the project areas are no longer able to rely on traditional irrigation schemes except during rain seasons. This is largely because rain falls have become shorter and more unreliable, thereby making it impossible for rivers and streams to flow continuously throughout the year supporting the traditional raindependent farming activities.

IMPACT LOGIC

The project leverages a combination of two approaches. The first approach focusses on the installation of new solar-powered water pumps at boreholes. Geological surveys are carried out to identify the best location for the installations and afterwards solar-powered irrigation systems are set up at three villages. The second approach puts the focus on traditional water irrigation schemes. Information on the existing canals and waterways is collected in order to decide how to best revive and integrate them into the overall irrigation schemes for each location. Additionally, throughout the project farmers are actively involved and trained in the maintenance of the solar PV installations to promote sustainability of the project. Farmers also receive training for agribusiness development to adapt their work to changing climate conditions.

INNOVATIVE PROJECT ELEMENTS

The project adopts a gender sensitive, bottomup, participatory and inclusive approach. The project was initiated by members of the local community, thus local ownership is very high. Furthermore, a joint Project Steering Committee (PSC) is formed to provide local administration to the project by reviewing and approving project work plans on a quarterly basis. The PSC is comprised of members from the local Hai District Council, Pangani Water Basin Board (PWBB), Climate Action Network Tanzania (CAN TZ), and representatives of farmers/water user groups from the project villages.

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Solar Power for Hai Vocational Training Centre

SUMMARY

Country	Tanzania
Implementer	Hai Vocational Training Centre
Target groups	Students in rural Tanzania
Duration	05/2018 – 07/2018
Type of energy use	Other

CHALLENGE

The Maasai Steppe on the southern foothills of Mt. Kilimanjaro in northern Tanzania is traditionally home to many smallholders, most of whom are nomadic cattle breeders. Due to climate change, temperatures have been rising for years and rainfall, which normally happens in two seasons in spring and autumn, has been drastically shortened or in some years failed to occur at all. Apart from that, access to electricity remains limited in Tanzania. Especially in rural areas only about 25 % of households have access to electricity, compared to 75 % in urban areas.

IMPACT LOGIC

The project focusses on supporting the Hai Vocational Training Centre in Hai district on the slopes of Mt. Kilimanjaro through solar PV installations. The centre focuses on providing high quality training to the local population in various fields. Local farmers are trained in sustainable agriculture, with a focus on combining different crops that are best adapted to the changing climate in order to maximise crop yields. In addition, the training centre offers special courses on topics like the duration of the rainy seasons, beekeeping or optimal use of small fields and difficult terrain such as the hills of Mt. Kilimanjaro. Besides agriculture, the training centre also offers courses in other areas: For example, Hai Vocational Training Centre trains local youth to become electricians, carpenters, bricklayers and more. Considering the potential for tourism in the region and the need for qualified personnel in this sector, the centre also offers classes on tourism management. To support this growing range of different training programmes, the centre is equipped with a new solar-powered water pump that can be used to reach the deep water reserves on the volcanic mountain slopes.

INNOVATIVE PROJECT ELEMENTS

The project shows its innovative character by supporting a training institution located in a remote region of Tanzania. As solar energy has not been used to its full potential in the communities near Mt. Kilimanjaro, the project provides an introduction to the different opportunities that solar PV installations can offer to many people in the region. If students have the opportunity to interact with and learn about these technologies during their training, it helps to spread awareness about solar-powered installations.

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Solar Training & Entrepreneurship

SUMMARY

Country	Togo
Implementer	Energy Generation
Target groups	Young from Togo, Benin, Ivory Coast and Senegal
Duration	12/2021 – 06/2023
Type of energy use	Electrification

CHALLENGE

The West African Region has one of the lowest electrification rates worldwide, with 220 million people living without access. At the same time, it has a vast renewable energy potential. The Economic Community of West African States' (ECOWAS) Renewable Energy Policy aims to achieve univer sal access to electricity by 2030, with 25 % of the population served by solar PV minigrids or standalone solutions. However, rollout of such systems has been slow. One reason for this is a lack of welltrained technicians. Due to improper installation and maintenance, systems are susceptible to failure, which can lead to reduced trust in the technology and results in fewer new projects overall.

IMPACT LOGIC

Energy Generation trains 49 young people, among them 20 women, from Togo, Benin, Ivory Coast and Senegal, on how to plan, install and maintain solar PV systems, opening up a new business field for them. Young people who successfully complete this training can apply for a oneyear startup grant to help them realise their project idea. The threemonths training at Energy Generation's campus in Lomé qualifies participants to install and maintain solar PV and irrigation systems. Theoretical knowledge on renewable energy and business management also enables them to develop their own business idea in the field of solar energy. Those who do not start their own business are prepared for the job market through targeted workshops. Throughout their training, the young technicians have access to the resources of the Energy Generation Campus. All participants receive a scholarship and those who do not live in Lomé are also provided with housing. At the end of the training, participants return to their home countries to apply their knowledge. Those who excel with their business idea receive a onetime financial award and are mentored by Energy Generation during the startup phase. During this time, the newly trained technicians go through a multistage learning course, focusing on business strategy, product development, marketing and communication.

INNOVATIVE PROJECT ELEMENTS

This approach offers an intraregional training of new solar technicians in West Africa. It fosters the proliferation of quality solar PV installations in the region and young entrepreneurs in entering the sector.

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Enhancing Immunizations and Vaccinations Coverage in Moyo District

SUMMARY

Country	Uganda
Implementer	Moyo District Local Government
Target groups	Local population in Moyo District
Duration	05/2021 – 06/2022
Type of energy use	Cooling

Electricity is crucial for ensuring quality health care and enables the uninterrupted delivery of the three main health services that are provided by health centre level IIs (a higher level stands for a larger and better equipped health centre as well as more funds from the government), namely treatment of outpatients, vaccination and emergency deliveries during night-time. The solar PV system is used for refrigeration of medicine, lighting and supplying power to other medical appliances at the health centres. This directly leads to improved working conditions for the health workers and better service delivery for the beneficiaries.

CHALLENGE

In the Moyo region in northern Uganda on the border with Sudan, only every second inhabitant can be vaccinated. This means that the region falls short of the national immunisation and vaccination targets by 40 %. The mortality rate among newborns and infants is correspondingly high, because meningitis, yellow fever, hepatitis, tetanus and measles are rampant in Moyo. Yellow fever and COVID-19 are spreading particularly rapidly and require remedial action. The reason for the poor vaccination rate is a lack of refrigeration facilities for vaccines, as only one of the 18 smaller health centres is connected to the national power grid and gas is only irregularly available as a source of energy.

IMPACT LOGIC

The Moyo district government first identifies the three most suitable health centres for electrification in a transparent selection process. Each health centre serves about 15,000 people. Once the appropriate technical equipment has been installed, some of the health centre staff are trained in its use and maintenance.

INNOVATIVE PROJECT ELEMENTS

The project provides health centre IIs in rural Moyo with cost-effective and sustainable solar PV systems, which provide power for vaccinerefrigerators, lighting, phone charging for staff and other medical appliances. This directly leads to improved working conditions for the health workers and better service delivery for the beneficiaries. Furthermore, the continuous electric power supply also has benefits for patients, who in addition to better possibilities for vaccinations also profit from being able to charge their own phones and other devices. Additionally, the Moyo District Local Government takes direct ownership of the solar PV system without involving other organisations. By training its own staff in maintenance it can set an example for other governmental organisations to become involved in installing and maintaining solar PV systems.

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german cooperation
DEUTSCHE ZUSAMMENARBEIT

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Extension of PV Solar Park at Radio Pacis with 204 kWp

SUMMARY

Country	Uganda
Implementer	Radio Pacis
Target groups	Local population of Arua
Duration	07/2020 – 03/2022
Type of energy use	Electrification

CHALLENGE

Only 10 % of the four million people in the West Nile sub-region in the far north-west of Uganda are connected to the electricity grid. Because the grid regularly breaks down, many companies and businesses rely on diesel generators to provide power. Yet the subregion has considerable potential for renewable energy sources. The radio station Radio Pacis, based in the district capital Arua, spent about € 87,000 on el ectricity costs in 2008 alone. This was one reason why the ra dio station installed its own solar park in 2008. Six years later, it was connected to the power grid of the West Nile Rural Electrification Company (WENRECo) and has been feeding electricity into the grid ever since. However, the capacities of the current PV system are limited and do not cover the demand.

IMPACT LOGIC

Radio Pacis installs new PV systems to upgrade its existing electricity generation. First, the steel rebar system is upgraded to support the new PV system, afterwards the system itself is installed and connected to the overall electricity grid. Additionally, battery systems are installed to ensure that the radio equipment has access to power. This allows Radio Pacis to continue its operations even if there is a power outage. By ensuring that Radio Pacis retains operability listeners can stay informed about current (emergency) news regardless of the national energy supply. Additionally, because of the already installed system, the extended solar park reaches 504 kWp and can also sustain the day-to-day needs of the regional referral hospital, other health units, small enterprises and shops in Arua (in total more than 250,000 people). This leads to better economic development in the area and even greater opportunities to expand the solar PV systems in the region.

INNOVATIVE PROJECT ELEMENTS

In the past Radio Pacis became one of the first companies in Uganda to have a PV solar system connected to the grid with a bidirectional meter. This project aims to capitalize on the possibilities of solar power and to expand on the already installed system. In addition, Radio Pacis is in the unique position to not only directly benefit from Solar Power, but also to inform its listeners about the benefits of the installed PV systems. This in turn can lead to an overall increase in renewable energy systems through a large scale information campaign that other businesses do not have. Through its leading role in this field of solar energy usage, Radio Pacis can also successfully become a role model for renewable energy in the region. The topic already gathers interest from other institutions like Muni University and Radio Pacis increasingly attracts students for internships and further trainings on renewable energy and environment conservation.

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Harnessing CO_2 Emission Reduction Monitoring to Accelerate EV Adoption

SUMMARY

Country	Uganda
Implementer	Perspectives Climate Research gGmbH
Co-implementer	Bodawerk International
Target groups	Electric vehicle distributors
Duration	12/2021 – 06/2023
Type of energy use	Other

CHALLENGE

Uganda's transport sector is dominated by motorcycles, accounting for 70 % of all vehicles. These motorcycles are used for the transport of goods and people alike. While a motorcycle produces less CO_2 per person compared to a car, the sheer number of them driving on Ugandan roads make this difference negligible. Besides, Ugandan motorcyclists spend up to 75 % of their income on operating costs for their vehicles, usually consisting of fuel, rent, oil, maintenance and repairs. Furthermore, potential projects offering products for the voluntary carbon market suffer from limited understanding of market access options.

IMPACT LOGIC

The project's objective is to create a robust, data-driven study, outlining a method for producing CO_2 certificates. The necessary data for this is generated through a physical pilot study. Five electric motorcycles (e-bikes) are distributed to and operated by selected beneficiaries, producing the necessary real-world data for determining the potential for CO_2 savings. The CO_2 emission reduction monitoring system uses data that is continuously produced and remotely collected by the smart batteries that power the e-bikes. Capacity building measures build up knowledge of the processes required for the generation of CO_2 certificates. This is done in accordance with international certification standards by pioneering the application of existing approved monitoring methodologies to the results from Uganda.

INNOVATIVE PROJECT ELEMENTS

The combination of this pilot with the preparation of a written guideline for the methodology for using and calculating CO_2 emission reduction in e-mobility and smart battery application represents an ambitious innovative approach. This guideline includes a baseline assessment of the setting for a potential replication by other CO_2 certification programmes for e-mobility in Uganda and potentially in other countries in East Africa. Furthermore, the guideline also includes information on the reparation of documents in line with Gold Standard's and Voluntary Carbon Standard's requirements that can be used for seeking registration under these standards. Finally, the revenues from the CO_2 certificates' sale can be used to reduce obstacles hindering a widespread use and expansion of innovative e-mobility solutions, such as the e-bikes' high acquisition costs.

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Increasing Access to Clean Energy and Micro-finance Products for Small-Producer Organisations

SUMMARY

Country	Uganda
Implementer	Fairtrade Foundation
Co-implementer	Practical Action, Fairtrade Africa
Target groups	Fairtrade certified coffee cooperatives and their members
Duration	09/2020 – 07/2022
Type of energy use	Electrification

CHALLENGE

4.2 million adults in Uganda are excluded from the formal financial sector, of which 85 % reside in rural areas. The high cost of providing financial services in rural areas has meant that often formal institutions both lack the incentive to penetrate these areas as well as the capability to mitigate the perceived operational risks of doing so. Considering that almost half (48 %) of the Ugandan population relies on farming activities to cover their expenses, there is a great need to increase access to finance for rural farmers. Additionally, with only 8 % of Uganda's rural population having access to the national grid, the rural population is both isolated from national grid infrastructure and the least likely to be connected in the near future, due to the expense of setting up last mile connections.

IMPACT LOGIC

To enable more members of farming cooperatives to access financial products and use them to purchase solar energy systems, the project facilitates the development of microfinance products tailored to the target groups. Members of the cooperatives can purchase renewable energy systems and thus fuel a market for them. With the help of information campaigns, the project informs the members of the cooperatives about technologies and financial products and networks all actors with each other. All these measures combined contribute to more members using solar systems and in turn to an overall more robust energy supply in Uganda especially in rural areas.

INNOVATIVE PROJECT ELEMENTS

The approach of this project differs from other similar activities through its core focus on placing farmer based small producer organizations (SPOs) at the centre of implementation, validating and leveraging the extraordinary potential of SPOs to connect and align huge numbers of rural, poor and isolated Ugandan farming households. The approach of working within existing farmer structures increases the likelihood of creating solid market links that last beyond the project's lifetime. In addition, the project has an important trust building component. As companies are more willing to trust bigger groups instead of individuals and individual frames are more willing to trust cooperatives instead of companies, the cooperative can leverage trust from both sides to build a better platform for communication and business.

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Promoting Renewable Energy Use in Uganda (ProREU)

SUMMARY

Country	Uganda
Implementer	URBIS Foundation
Target groups	Young adults
Duration	10/2020 – 08/2022
Type of energy use	Electrification

CHALLENGE

Energy supply in rural Uganda is still based on charcoal, firewood and paraffin. Only 7 % of rural areas are electrified. A good alternative are solar energy solutions. On a national scale, households and institutions have installed solar systems to meet their energy needs, but most of the solar users have no access to after-sales services (repair and maintenance) in the rural communities, leading to frequent system malfunction. As a result of this unreliability, many inhabitants do not trust renewable energy solutions and are reluctant to invest.

IMPACT LOGIC

ProREU cooperates with the Ugandan Technical College (UTC) in Lira for the training and uses an existing curriculum of the Nakawa Vocational Training Institute (NVTI) for the courses. The focus of the five-weeks training course is on the topics of installation, maintenance and repair of solar systems. It also includes an internship in several solar companies. 50 young people between 18 and 30 years of age are selected for the courses. The training is acknowledged by the Directorate of Industrial Training in Uganda and is part of UTCs regular curriculum going forward.

The trained Solar Extension Agents (SEA) form a network responsible for installing, maintaining and mapping solar systems in the region as well as giving advice to clients and providing information on suppliers and the solar products that fit to the client's needs. Furthermore, an open-source map of functional and non-functional solar energy systems in public institutions and private households in the Lango Sub Region is created to provide information and statistical data for investments and market potential. The trained SEAs deepen their knowledge by supporting the mapping activities as mapping assistants and can simultaneously create a revenue by offering their services. The map will consequently function as a visualisation of the maintenance and repair service demand which creates a justification for policy alterations in local governments and private companies.

INNOVATIVE PROJECT ELEMENTS

The project is a pioneering activity in Uganda which is carried out for the first time to create new knowledge about the solar system coverage in Northern Uganda. In addition, the practical courses composed of five weeks of training and four weeks of internship provide an innovative angle of sustainable knowledge transfer and education. The trained technicians provide sustainable technical skills because they live within the rural communities. Furthermore, they also provide strong links between private solar companies and the rural consumers. By training local technicians to install and maintain solar systems, the project is ensuring the sustainable use of existing and future solar systems in the region.

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Solar for Health Project (S4H)

SUMMARY

Country	Uganda
Implementer	Action for Rural Women Empowerment (ARUWE)
Target groups	Pregnant women and new-born children
Duration	09/2021 – 09/2022
Type of energy use	Electrification

CHALLENGE

The frequently interrupted electricity supply in the rural regions of Uganda makes medical care difficult and poses a deadly danger to patients. In the Sembabule District with more than 200,000 inhabitants, the insufficient power supply affects a total of six health centres of different sizes. On average, up to 100 people are treated in each of these centres per day. Every week, about 45 expectant mothers seek help there. But the mortality rate for mothers and newborns during childbirth is high. After dark, the centres rely on paraffin lights, which makes it especially difficult to attend to night-time emergencies. Coal is still the most common basic material for boiling water and sterilising instruments. Medicines are missing or spoil due to lack of continuous refrigeration. Operations often have to be cancelled or postponed, which has already claimed many lives.

IMPACT LOGIC

In cooperation with the District Health Officers, ARUWE identified three suitable health centres, one in Busheka, one in Kasaalu and one in Kyaabi. The project brings together all key stakeholders, including national and local government officials, health managers, PV technicians and medical professionals.

After the technical installation of the systems for solar energy generation, storage and cooling, the project focuses on training the technical staff in the health centres. In several training measures, the employees are trained in the operation and maintenance of the PV systems in order to ensure their functionality beyond the project period.

INNOVATIVE PROJECT ELEMENTS

The S4H project provides more reliable and efficient sources of energy which are independent from the National grid. The national grid proves often not reliable and cannot be accessed by two of the targeted health centres at all. With an off-grid renewable energy supply, rural facilities gain the reliable and unlimited power supply that they need. The solar system attracts more patients to the health centres because the system offers additional benefits of charging phones and lamps to the patients and their caretakers. Thereby, the work of the village health teams is made easier as less effort is required to convince communities to come for health services. The highest influx of people seeking health services at Kasaalu was registered during the national campaigns for mass immunisation against Covid-19. Kasaalu was the only immunisation centre in the entire Mabindo sub county because the project provided the means to run a refrigerator and solar system which guaranteed full time preservation of the vaccines. It is for this reason that the district is reconsidering Kasaalu for elevation to health centre level III (a higher level stands for a larger and better equipped health centre as well as more funds from the government).

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Solar Project for CoRSU Hospital

SUMMARY

Country	Uganda
Implementer	Comprehensive Rehabilitation Services in Uganda (CoRSU)
Target groups	Patients at CoRSU Hospital
Duration	11/2021 – 06/2023
Type of energy use	Electrification

CHALLENGE

Energy is a vital element of Uganda's Vision 2040 agenda. Electricity connection enhances access to quality essential health care services while making health systems more resilient. Despite this importance, power is unavailable or unreliable in most of the health facilities in Uganda. A majority of these health facilities is located in remote offgrid areas, and those with grid connections are faced with intermittent or unreliable power supply with regular power cuts. In addition, many hospitals in Uganda are facing rising electricity prices and high costs of operating a diesel generator.

IMPACT LOGIC

The project improves access to renewable energy by using solar power as a green energy source at the Comprehensive Rehabilitation Services in Uganda (CoRSU) Hospital. To achieve this, a hybrid solar system with 80 kWp solar panels plus 50 kWh effective storage is installed at the hospital. This solar system provides daytime autonomy for the entire hospital plus four hours of night time backup. These installations are supplemented by capacity building measures in the form of specialised training.

Three CoRSU Hospital technicians are trained in managing, operating and maintaining the installed hybrid solar PV system at Nakawa Vocational Training Institute in Kampala. In addition, 17 CoRSU Hospital employees from key departments participate in capacity building and sensitisation workshops focused on energy efficiency and how to reduce energy consumption. Finally, the hospital itself is used as a training and demonstration institution for similar energy projects in the future.

INNOVATIVE PROJECT ELEMENTS

At CoRSU Hospital a hybrid solar PV system is installed. The robust smart solar system is integrated with a captive power PV solution which allows direct consumption. In addition, a supercapacitor battery storage solution is installed to allow storage of backup power to be used for lifesaving equipment. These batteries are costeffective, durable and reliable. By applying load prioritization, the smart system will automatically power high priority and lifesaving infrastructure. Should CoRSU Hospital's energy demand increase in future, the hospital is able to scale up the system to allow more energy generation (from PV) and meet future demand. Through this project CoRSU Hospital not only reduces its CO_2 emissions, but also saves up to € 27,000 annually in power bills. These savings are reinvested to finance specialised surgeries for children from low income communities in Uganda.

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Solar Solutions for Refugees and Host Communities

SUMMARY

Country	Uganda
Implementer	ZOA International Uganda
Co-implementer	ZOA International GmbH
Target groups	Refugees and hosting communities
Duration	05/2022 – 07/2023
Type of energy use	Electrification

CHALLENGE

Uganda is host to 1.5 million refugees from the neighbouring countries of Burundi, D.R. Congo, Eritrea, Rwanda, Somalia, and South Sudan among others. These refugees often have no access to clean energy and need to rely on fuel material and devices that can be harmful to their health or the environment, such as candles, paraffin, and disposable batteries, which are also very expensive. Several humanitarian actors are trying to solve this problem by distributing different solar-powered products free of charge. However, this is not a sustainable long-term solution as there are not nearly enough goods for everyone and it is not financially feasible as the associated acquisition and logistical costs are very high.

IMPACT LOGIC

The project combines supply- and demand-oriented measures. To stimulate demand, access to potential customers of solar-powered products in the refugee shelters is organised through the 330 established saving groups. Those take on the role of a trustee for the individual savers and potential customers. Meanwhile, ZOA informs the potential customers about the advantages of owning their own solar systems and payment options such as "pay as you go" or other credit-based financing available on the market. Further, farmers can benefit by receiving partial funding within the framework of grants. A second focus of the project is the development of a market for solar PV systems. To do this, the project employs shopkeepers and retailers to act as intermediaries between solar PV companies and the saving groups. Through trainings, they gain an understanding of the technology involved and thus are able to stimulate community interest in solar-powered products and solar PV systems. Finally, the project trains young adults with prior technical experience, so that they can provide repair services for the advertised solar systems.

INNOVATIVE PROJECT ELEMENTS

Besides the involvement of the saving groups and the project focus on refugees and their hosting communities, the most innovative element are individual village agents. They act as an intermediary group between the solar companies and the target group, through the direct cooperation with the saving groups instead of with individuals. This aims at reducing the failure rate of the "pay as you go" systems. In addition, village agents receive specialised training related to solar products including minor operation, maintenance and brand awareness. These measures ensure the sustainability of the project as the village agents are valuable to solar companies in creating a market among saving group members and bridging the supply gap.

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Strengthen Sendea: An innovative cooperative of local solar SME for energy access

SUMMARY

Country	Uganda
Implementer	Stiftung Solarenergie
Co-implementer	Association of Sendea UG Ltd.
Target groups	SMEs in the solar energy sector
Duration	10/2020 – 06/2022
Type of energy use	Electrification

CHALLENGE

Many Ugandans only have limited access to electricity, and where they do, they can rarely rely on it. To compensate for power outages, many households, micro-entrepreneurs and businesses rely on self-produced solar power. However, the Ugandan market for solar technology solutions is often in the hands of international companies because local small and medium-sized enterprises (SMEs) lack access to quality products, credit, advice and marketing and face stiff competition. To overcome these challenges, five Ugandan solar companies have founded the "Solar Entrepreneurs Network for Decentralised Energy Access Uganda" (Sendea UG).

IMPACT LOGIC

In order to better position the Ugandan solar industry on the domestic market in competition with international companies, Sendea UG is pursuing four priorities: Promoting the exchange of experience between the management of the member solar companies, establishing a Sendea Academy that offers training courses in the areas of technology, sales, financing and management, arranging loans to its members and acquiring orders from international aid organisations that need support for their solar projects.

These activities ensure that Seneda can grow and attract new members and train more technicians. This in turn leads to an overall increase in the availability and usage of solar power-systems throughout Uganda, which strengthens the Ugandan national energy grid.

INNOVATIVE PROJECT ELEMENTS

What makes Sendea unique is the fact that local companies take the initiative and join forces to work together in the energy access sector. Therefore Sendea Uganda is a grassroots cooperative and initiative. The fundamental idea: Growth through cooperation. The target is to ensure a better business by cooperation, for instance: Offering services to all members (e. g. training); sharing resources (tools, staff); and acting as a purchasing syndicate. As an economic cooperative Sendea is complementary to associations like the National Solar Association or the Renewable Energy Association. Members of these organisations are not limited to local companies. Therefore bigger (international) companies take a more prominent role and usually are in command. Additionally, these associations, which are more politically oriented, influence policies. These associations are not allow ed to do business (e. g. become a purchasing syndicate). In contrast to this, Sendea is an economic cooperative which promotes growth through offers for its members. The activities of Sendea are therefore complementary to those of national associations and support their work.

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Tukole Solar Project

SUMMARY

Country	Uganda
Implementer	The Innovation Village (TIV)
Co-implementer	Centre for Research in Energy and Energy Conservation (CREEC)
Target groups	Young graduates in the solar sector
Duration	12/2021 – 03/2023
Type of energy use	Electrification

CHALLENGE

The solar sector in Uganda has been heavily affected by the COVID-19 pandemic. Normally, Uganda's national solar standard requires providers of solar products to offer after-sales-services for at least two years, but due to the pandemic, many solar companies were unable to retain their technicians and staff. In addition, many Ugandan communities lack the knowledge of how to get their solar systems repaired. Instead customers purchase new solar systems, ending up owning systems from multiple companies, since their providers do not repair any defects after the warranty period has expired. Furthermore, it is difficult to find competent solar technicians within the last mile, as employers in the industry are concentrated in central Uganda. This leads skilled technicians to move away from smaller towns and rural areas in search of more attractive employers.

IMPACT LOGIC

The project has two main objectives: Firstly, to match young graduates seeking employment with the growing demand of solar energy companies for skilled workers, and secondly, to meet the demand for services and qualified service providers, especially in rural areas. To meet these objectives, TIV has developed the Tukole web platform and app, which enables communities to access technically competent and trained solar technicians nationwide in a sustainable and convenient way. To raise awareness of the app and recruit interested staff, TIV runs campaigns in different parts of Uganda. In a second step, CREEC offers specialised trainings for graduates and young workers who are interested and want to gain more technical skills, and who are subsequently accepted by TIV as technicians in the Tukole app. 40 technicians are trained from each of the four districts of Kampala, Jinja, Gulu and Mbarara, bringing the total number of technicians trained to 160. Customised training materials are developed that focus on trouble-shooting, repairs, and maintenance to ensure that the technicians meet the exact demands of the market.

INNOVATIVE PROJECT ELEMENTS

To achieve its objectives, the project expands the usage of the innovative Tukole app to include solar installation technicians. End-users can contact technicians in their area directly and thus receive technical support through repairs and maintenance. Furthermore, users can review and rate the quality of services through the app, which ensures that a high overall level of quality is achieved. After the conclusion of the initial project, the app ensures sustainability as trained technicians can continue to use the app and new technicians can join the network.

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e-Education: Energy for Schools

SUMMARY

Country	Zambia
Implementer	PAMODZI NDI ANA
Target groups	Students and teachers in Chipangali District
Duration	12/2021 – 05/2023
Type of energy use	Electrification

CHALLENGE

The electrification rate in Zambia averages at only 31 % overall with only 4% of the rural population having access to electricity. Especially for schools in remote locations, this poses a serious barrier to quality education. Besides the importance of electricity for basic needs including lighting there are two main challenges. First, students living in rural areas cannot complete their IT study programmes as energy supply and IT equipment including computers are not available. Second, it is difficult to motivate teachers, who are currently living and working in urbanised and electrified areas, to move to more rural and remote locations. In the long term this might lead to severe shortages of qualified teachers in rural areas. Accordingly, these challenges must be overcome in order to ensure a high level of quality education even in rural Zambia.

IMPACT LOGIC

The primary aim of the project is to electrify five schools in rural villages with off-grid systems as the national grid infrastructure is unavailable. In order to ensure the success of the project, local stakeholders are contacted and connected with the relevant actors at each school to anchor the project locally. Each school is supplied with a solar PV system, a preassembled electrical cabinet and an appropriate supporting structure. Furthermore, the schools each receive a fully equipped computer science room consisting of five computers, one printer and one projector. In addition, to encourage teachers to remain at the schools or to move there, solar PV systems are installed at three teacher's houses at each school to allow energy access for domestic use. Not only are important local stakeholders included in the planning process, but the project also ensures that the schools are supported beyond the installation period. By providing electricity to teacher houses, which encourages teachers to come and work at the schools, the project provides support on another level than just the installation of solar PV systems at the schools.

INNOVATIVE PROJECT ELEMENTS

The project presents a holistic approach with a sustainable long-term plan. Complementing the installations, each school receives support in establishing a sustainable business model for solar system monitoring, maintenance and management. In order to do so, technical staff is selected and trained in maintenance to support the schools.

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Improvement of Milk Storage Using Solar Powered Coolers

SUMMARY

Country	Zambia
Implementer	Ministry of Agriculture of Zambia
Target groups	Smallholder cattle farmers
Duration	02/2021 – 05/2023
Type of energy use	Cooling

CHALLENGE

The livestock sector provides essential food products and sustains employment and income of the rural population in Zambia. The dairy subsector plays a major role in the livestock sector. Production of milk for the markets is dominated by smallholders largely due to many farmers joining dairy cooperatives. Smallholder dairy farmers contribute about 50 % of the marketed milk in Zambia. However, it is estimated that 60 % of raw milk, mostly produced by traditional cattle keepers, does not reach the formal market. This is attributed to the fact that many traditional cattle farmers live outside of the existing network of milk collection centres, which are often closer to bigger cities or the railway lines. Therefore, the milk of these farmers cannot be processed and marketed. This often leads to a waste of milk that cannot be used locally, reduces the earning potential of the cattle farmers and increases the dependency on foreign milk imports to the country.

IMPACT LOGIC

The project provides cooling solutions for rural farmers, who are located off-grid, and in addition, also provides these farmers with an opportunity to participate in the formal sector of the diary product value chain. This is achieved through a two-step process. First, all relevant local stakeholders are identified and mapped to ensure that the project is locally anchored. Second, a suitable location for a new milk cooling unit is identified. At this location a milk cooling unit, which is operated completely by solar power, is constructed. As no connection to the national power grid is possible due to the remote location, the solar PV system ensures that the unit can operate continuously and the cooling chain is not interrupted. At the same time, sensitisation measures teach farmers about the importance and process of cooling chains to ensure the sustainability of the project. Combined, these measures increase the quantity of milk collected by the dairy processors, provide an income for farmers selling milk to the collection centres, and offer employment opportunities at the new milk collection centres.

INNOVATIVE PROJECT ELEMENTS

This project provides a reliable alternative to traditional electricity supply for the milk's cooling value chain. The constructed milk cooling unit has no connection to the national electricity grid and instead is run entirely on solar power. Furthermore, milk can be stored for up to two days, which enables individual farmers to sell more milk overall. This innovative cooling system provides an additional advantage during dry seasons. Traditionally, farmers would not feed their cattle more than necessary to keep costs down, but by collecting and storing their milk at the cooling unit, they are incentivised to feed their cattle throughout the year, enabling them to establish a stable income from milk production.

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Solar for Improved Rural Health Systems

SUMMARY

Country	Zambia
Implementer	On Call Africa
Target groups	Rural communities in southern Zambia
Duration	03/2022 – 06/2023
Type of energy use	Electrification

CHALLENGE

Rural health facilities in Zambia often only have limited access to electricity. Over 2,000 rural health facilities have insufficient power supply to meet their basic needs. The government lacks resources to invest in the necessary infrastructure and cannot provide financing for the associated operational and maintenance costs. This significantly impacts the quality of health services that are delivered to rural communities, due to the limitation of power for medical equipment, storage, and the use and availability of information technology. This problem is most evident in the availability of lighting. When delivering a baby during the night, nurses often need to ask non-staff to assist them by providing light with their phones. Furthermore, lack of electricity also has had negative effects on facilities' water, sanitation, hygiene, and waste management, making it challenging for them to install water systems including hand washing facilities and flushable toilets.

IMPACT LOGIC

The project targets three rural health facilities in Zambia. After an initial assessment of the individual centres, a plan is drafted on how to best use solar PV equipment to provide the centres with sustainable electricity. These installations enable the facilities to provide better quality of care through simple improvements such as: lighting for improved care in the evening; improved supply and storage of medicines and vaccines; and improved communication and reporting through IT equipment. In addition, the Kazungula District Health Office receives a solar-powered chlorine production system which can produce up to 2,400 litres of chlorine per month. 45 % of the chlorine produced is distributed to all 27 health facilities in Kazungula District, while 20 % are distributed among five communities particularly affected by diarrhoea for free. The chlorine production also serves as a form of income generation as the remaining 35 % of chlorine is sold to line ministries and lodges. This supports operations and maintenance costs of the solar installations as well as the work of Neighborhood Health Committees and the district health campaigns. Improving access to electricity helps the facilities to meet nationally identified standards and allows for WASH and health interventions that further enhance the functioning of the health system.

INNOVATIVE PROJECT ELEMENTS

The project is the first of its kind focusing on chlorine production in rural regions in southern Zambia. The pilot project creates an evidence base for wider adoption of solar PV technology for rural healthcare facilities and chlorine production in Zambia. The newly created means of generating income through producing chlorine is an important innovative element. This improves the technical and financial sustainability of the installed solar PV systems significantly. Furthermore, it potentially allows the funds for more solar PV systems to be installed on rural health facilities.

FURTHER INFORMATION

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Solar Saver: Second Generation Lights

SUMMARY

Country	Zambia
Implementer	SolarAid
Target groups	Low-income users of small solar-powered products
Duration	12/2021 – 06/2023
Type of energy use	Electrification

CHALLENGE

Solar-powered lighting is an integral part of many strategies to supply rural areas of Zambia with renewable energy access. A quarter million of these solar lights and systems have been sold in Zambia. While the acquisition costs of these systems are relatively low and there are almost no upkeep costs as the solar installations do not require fuel, the systems wear out over time due to heavy usage. Instead of buying a new system, the preferred remedial action for many Zambians is to repair the lights. In many instances, however, repairs are virtually impossible as spare parts for solar-powered lights are sparse, and the required know-how to repair these systems is not widespread. Furthermore, growing electronic waste is fueled by higher consumption rates of electric equipment, short life cycles, and few repair options.

IMPACT LOGIC

This project extends the life of small solar-powered products by providing better maintenance and repair options for low-income Zambians. Off-grid electricity system sustainability is increased through the development of a repair network. SolarAid identifies five repair technicians, ensuring that they follow clear codes of conduct, and trains them further focusing on the different kinds of solar-powered products available. Following, repair days for rural communities are organized. During these events, people can bring in their defect products for inspection and if possible to repair them. SolarAid provides the necessary spare parts and tools for these repairs, as the original manufacturers oftentimes do not provide these resources. Electronic waste is reduced by repairing defect solar-powered lights and other equipment instead of throwing it away and buying new products. Moreover, the overall consumption of fossil fuels is reduced as less generators need to run to produce electricity.

INNOVATIVE PROJECT ELEMENTS

SolarAid has developed a repair app which provides repair guidance for different solar products. The app enables technicians to receive specific product repair information, and gives customers an opportunity to learn more about solar repair and expand on their own repair skills to extend the life of their solar products. This app is open-source and can be shared with anyone who is interested, which makes the project easily scalable and replicable in other countries.

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Fairtrade Inclusive Energy Fund

SUMMARY

Country	Rwanda, Tanzania, Uganda
Implementer	Fairtrade Foundation
Co-implementer	Fairtrade Africa
Target groups	Fairtrade producers and workers
Duration	08/2021 – 09/2023
Type of energy use	Electrification

CHALLENGE

A majority of farmer small producer organisations (SPO) and hired labour organisations (HLO) in the Fairtrade network remain cut-off from reliable, affordable and clean energy and are, by consequence, vulnerable to a range of related negative health, environmental, educational and livelihood impacts. Initial outputs from work in Uganda have confirmed the need for high quality off-grid solar equipment in the region. This demand is however crowded out by cheap, untrustworthy goods, and the kind of financing available to rural communities is prohibitively expensive, poorly tailored to the agricultural context, and often difficult to access. Aside from household products, Fairtrade cooperative partners are also seeking ways to convert their operations to renewable energy. This too is hindered by a lack of technical knowledge and resources to support the conversion to suitable systems.

IMPACT LOGIC

Based on results and experiences from a pilot phase in Uganda, the Fairtrade Inclusive Energy Fund (IEF) is established to adaptively scale access to energy solutions into new SPO and HLO settings while prioritising project co-creation and bottom-up solutions. The IEF is thus a vehicle to allow for project ideas that advance access on cooperative and individual farmer level. For this purpose the IEF offers different support streams such as training of agents to create a link to trusted sources of solar energy systems, after-care service agents to provide support to the sold and installed systems or financial officers and accountants focused on setting up the loan systems for the purchase of solar energy systems. These streams are accompanied by farmer field days (member-focused awareness events) and road shows (community awareness events) where vetted solar products are improved and awareness of quality vs. generic products is increased. The overall objective of the IEF is to establish both

(1) new tailored inclusive financial products and
(2) inclusive off-grid energy products for use by cooperatives and their members.

INNOVATIVE PROJECT ELEMENTS

There are two key innovations within the IEF approach. The first is that trust must originate from producer and worker organisations. These are the entities who initiate project ideation and development thus ensuring that solutions have buy-in, ownership and sustainability. This is in line with the second innovative element, i. e. the IEF building on and catering to the wide Fairtrade network, which itself is a system of trust, checks and balances.

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