

2020 MARKET REPORT

Productivity and Circularity in the
Clean Energy Sector



EEP
Africa



**NORDIC
DEVELOPMENT
FUND**

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EXECUTIVE SUMMARY

This report explores recent developments in the clean energy market in Southern and East Africa based on insights from EEP Africa's support for early-stage, private sector-led projects.

During 2020, EEP Africa primarily focused its attention on three rapidly developing areas of the clean energy market:

- the evolution of **productive use** of energy (PUE)
- the role of clean energy in a **circular economy**
- the impact of **COVID-19** on early-stage companies

This report looks at each of these issues using data collected from our call for proposals, annual survey and active portfolio. Project highlights are provided throughout the report to demonstrate these developments in action.

OVERVIEW OF 2020 CALL

The EEP Africa 2020 call for proposals, Clean Energy Powering Green Growth, attracted over 350 applications.¹ The proposals included a diverse range of agricultural processing and waste-to-energy projects, solar irrigation and cold chain solutions, e-mobility technologies, and mini-grids with integrated PUE solutions. A majority of proposed projects were in the pilot or demonstration stage, indicating the need for grant funding to test new products and business models in these areas.

Grant funding is needed to test and demonstrate new clean energy products and business models.

Most companies plan to use a proven technology, such as solar PV, but apply it in a new way or introduce a product to a new market. Innovation could also be seen in the growth of hybrid solutions, the diversity of implementing partnerships, and the development of complex business models to reach last-mile communities. A high proportion of applicants were local and women-led companies, both of which are a funding priority for EEP Africa.

PRODUCTIVE USE OF ENERGY

There is rising market interest in productive use as an effective way to strengthen the financial viability and impact of clean energy companies.

Over half of the PUE applications were related to agricultural value chains, demonstrating the critical role clean energy plays in developing sustainable and climate resilient methods of food production. Proposed PUE appliances ranged from small egg incubators to industrial-scale mills, with a high number of solar irrigation and cold storage products.

While the quality and range of appliances is growing, market entry is still challenging. Successful projects often require targeted awareness-raising activities and payment schemes that defer the full cost of the appliance, such as pay-as-you-go (PAYG). Expanding financial inclusion and access to financing for PUE assets is one of the strongest drivers for increasing uptake in the region.

¹ EEP Africa covers Botswana, Burundi, Eswatini, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, Seychelles, South Africa, Tanzania, Uganda, Zambia and Zimbabwe.

Solar Sister is unlocking productive power in last-mile communities in Tanzania by distributing Tier 3-4 PUE appliances through a network of local women entrepreneurs.



Expanding access to financing is a strong driver for increasing uptake of productive use assets.

In addition to local agriculture, companies are also developing reliable and affordable clean energy for municipal institutions, such as schools, health clinics and transportation. Technical improvements in energy storage solutions enable community solar hubs to serve as recharging stations. Such hubs can support e-mobility and bring energy access to last-mile communities through a battery-as-a-service model.

CIRCULAR ECONOMY

Circular economy is a global priority and offers new economic opportunities while also addressing climate change. The circular market in Africa is still nascent, but the quality of projects in this area is growing.

Most applications focused on waste-to-energy, proposing to convert agricultural and human waste into electricity, heat and biofuels. Projects are tailored to locally-available feedstock, ensuring consistent supply and low transport costs. Some projects also produce organic fertiliser, thus utilising waste in multiple phases of the agriculture, energy and food cycle.

Clean energy is being produced from a wide variety of agricultural and municipal waste.

The main innovations in this sector can be seen within the business models. Companies are adapting PAYG and distribution networks set up for solar home systems (SHS) to expand the use of biomass, biogas and other biofuels. Energy producers are moving beyond households to target institutional clients and are establishing effective partnerships with municipal authorities.

One challenge for off-grid energy, however, is e-waste management. Efforts to recapture and recycle e-waste in Africa are limited by a lack of consumer awareness, uneven regulation and low capacity.

COVID-19

The impact of COVID-19 on early-stage clean energy companies has been significant. More than 80% of companies reported a moderate to severe negative impact from the crisis in our annual survey and only 30% reported sufficient liquidity to cover a downturn of five months or longer.

The biggest challenges stem from restrictions on the movement of people and goods, which has blocked supply chains and restricted sales and distribution. While some companies have been able to register as essential services, others had to close temporarily. Many companies saw revenue and funding streams dry up during the protracted lockdowns.

Companies have reported taking various mitigation measures such as offering flexible payment schemes, providing additional products and services, relocating operations and restructuring debt. Most companies made a strong effort to retain staff during the crisis in order to preserve their investments in training and remain ready to relaunch operations.

COVID-19 has demanded ingenuity and resilience from entrepreneurs, companies and investors.

Some of these short-term coping mechanisms may evolve into lasting business solutions that shape the evolution of the market.

FUTURE OUTLOOK

The long-term impact of these developments on business and society is still unclear. Yet innovations in productivity and circularity have the potential to shift the clean energy sector beyond access towards sustainable and inclusive green growth.

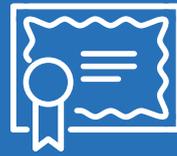
In order to achieve this, more early-stage financing is needed to test new models and demonstrate their economic and environmental value. Local capacity also needs to be strengthened to ensure operational sustainability and resilient infrastructure.

The businesses able to innovate and adapt will have greater potential to lead the clean energy sector onto a path of commercial viability and green growth.

FAST FACTS

**357**

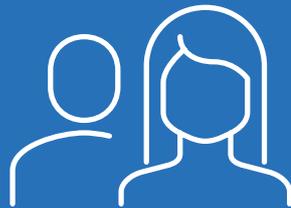
applications were submitted

**79%**

from locally-registered companies

39%

from women-led companies

**50%**

proposed stand-alone solutions

**57%**

projects in pilot or demonstration stage

**40%**

proposed solar PV technology

**23%**

proposed mini-grids

GENERAL OBSERVATIONS FROM THE 2020 CALL

Trends:

- Proven technologies used in new ways and new markets
- Hybrid solutions combining multiple energy sources to increase efficiency and reliability
- More local and women-led companies
- Effective partnerships between local and international companies, as well as for-profit and social entities
- Complex business models being developed to reach last-mile customers

Challenges:

- Low capacity among early-stage companies in budgeting, project preparation and scenario planning
- A deficit of knowledge about market demand and supply chains in some countries
- Lack of diversity among salaried staff and senior management
- Unexpected risks in implementation capacity, supply chains and co-financing due to COVID-19

INTRODUCTION

The theme of the EEP Africa 2020 Call for Proposals was Clean Energy Powering Green Growth. Companies operating in one or more of 15 countries in Africa were invited to propose innovative clean energy projects that advance productive use of energy (PUE) or circular economy solutions.

The focus of the call stemmed partly from *Powering Productivity*, an in-depth study of PUE in the EEP Africa portfolio.² The report demonstrated a clear evolution among energy companies in Africa towards increasing demand by promoting productive use. This strategy is proving to be an effective way for companies to increase their financial viability, while enhancing energy access and economic and social development.

Companies are promoting productive use as a strategy to increase demand, strengthen financial viability and enhance economic development.

The theme also acknowledged the global trend towards more circular economies. The traditional linear production model is transitioning to a model in which more products and raw materials are reduced, reused and recycled. Companies in all sectors are increasingly prioritising environmental sustainability and integrating circular solutions into their core business strategies.

Green Growth is used to describe a path of economic growth that uses natural resources in a sustainable way.

While both the call and the EEP Africa annual survey³ were in progress, countries in Africa and around the world entered varying levels of lockdown due to the COVID-19 pandemic.

This unprecedented health crisis is having a profound economic impact on all sectors, including clean energy, with the full repercussions still far from clear. In the midst of this crisis, EEP Africa has continued to operate fully and provide business support.

The data collected from our applicants and portfolio companies provide a snapshot of the clean energy market in Southern and East Africa in 2020.

² Read the full [Powering Productivity](#) report on our website.

³ The EEP Africa 2020 Annual Survey collected responses from 45 companies with active operations in Africa.

OffGridBox produces and deploys unique solar-powered container units that can provide charged batteries, WiFi and purified water for up to 400 households. Self-contained and quick to install, the boxes are being used in disaster and humanitarian relief settings.



OVERVIEW OF 2020 CALL: POWERING GREEN GROWTH

In the 2020 competitive call for proposals, EEP Africa received 357 applications proposing innovative technologies and business models. The proposals included a diverse range of agricultural processing and waste-to-energy projects, solar irrigation and cooling solutions, e-mobility technologies, and mini-grids with integrated PUE solutions. The average grant request was EUR 345,000, with a median co-financing of 43%.

Projects were proposed in 14 countries.⁴ The number of applications for projects in Malawi and Zimbabwe, countries added to the portfolio in 2018, were more than double the number in the previous call, indicating growing clean energy markets in these countries. There was also a rise in applications for projects in Namibia and Zambia, but a slight decrease for South Africa. The theme was perhaps less relevant for South Africa, which has a large commercial agricultural sector and relatively few smallholder farmers. Overall, there was a 25% increase in applications compared to the previous call.

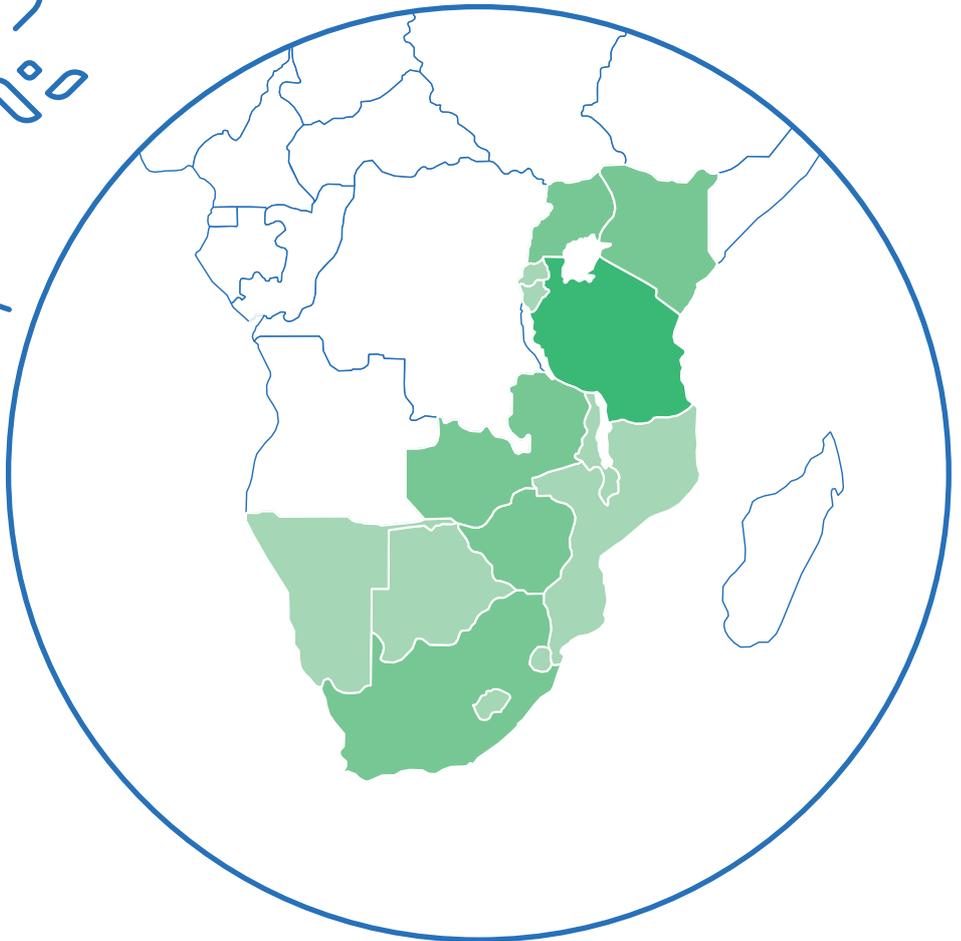
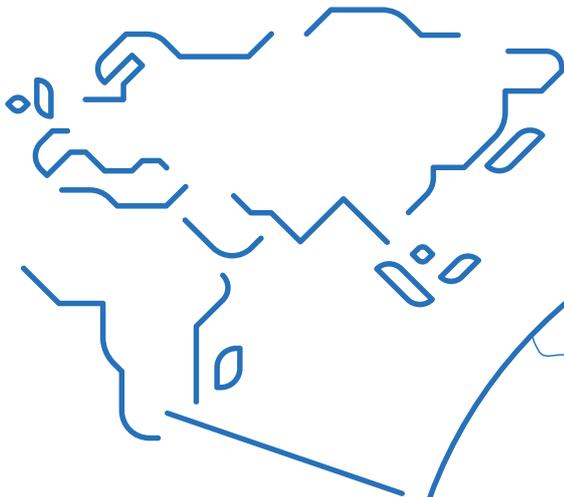


Figure 1: Geographic Spread

Kenya	75
Uganda	43
Zimbabwe	38
Tanzania	37
Zambia	36
South Africa	26
Regional	26
Malawi	23
Rwanda	23
Mozambique	9
Namibia	7
Burundi	5
Botswana	4
Eswatini	3
Lesotho	2

⁴ Applications were received for all countries covered by EEP Africa except Seychelles.

The majority of applications (83%) were submitted by private sector companies, with the rest coming from non-profits or social enterprises. The private sector is playing a growing role in the development of the clean energy sector as the focus in many countries shifts from simple household access to energy as a catalyst for local economic development.

Another trend in the market is an increase in the number of local and women entrepreneurs operating in the sector. EEP Africa encourages projects by local and women-led companies, and a number of strong applications were received from both groups.⁵

Over half of the proposed projects (57%) were in the pilot or demonstration stage, indicating the need for early-stage funding to test new technologies, markets and business models. About 30% sought funding to replicate or scale-up a successful project (figure 2). Half the applications were for stand-alone systems, including cookstoves, and mini-grids accounted for another 23%. The on-grid projects (10%) were primarily in wind and hydropower (figure 3).

Figure 2: Project Stages

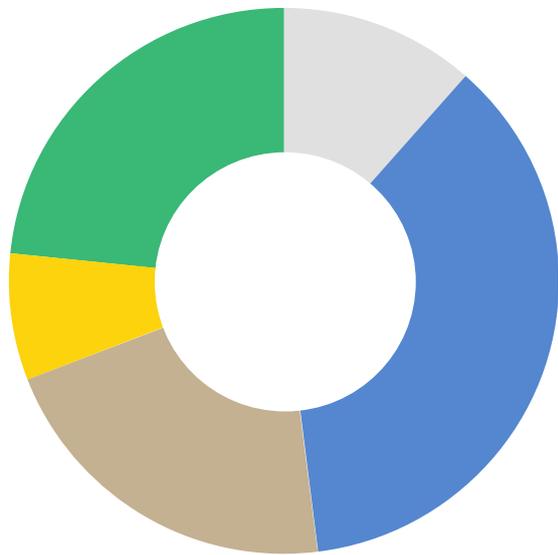
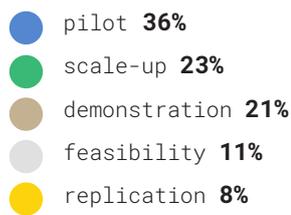
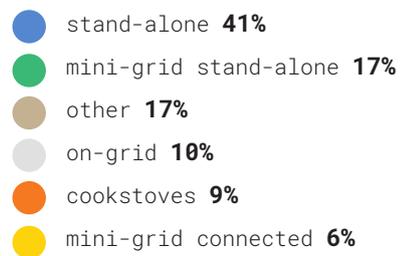


Figure 3: Project Types



⁵ Applications were submitted by companies from 41 different countries. The top 8 countries represented by project developers were in Africa, followed by Germany, Sweden, UK and the Netherlands.



Advancing Women in Leadership

EEP Africa is working to advance women in leadership and create opportunities for women entrepreneurs in the clean energy sector. Our 2019 call focused on this theme⁶ and, according to the annual survey, half of our portfolio companies report making a concerted effort to attract women applicants for open positions.

In the 2020 call, there was a significant jump in the share of women-led companies compared to the last general call, up from 18% in 2018 to 39% this year. In addition, more than one-third of applicants in the call planned to have a majority of leadership positions in the company filled by women.

Women-led companies were particularly well-represented in technologies that power circular economy solutions. The share of women leaders was highest in cookstoves (58%) and waste-to-energy (46%), as well as over one-third each in biogas and solid biomass.

This trend demonstrates greater awareness among clean energy companies about the value of gender-balanced leadership and targeted efforts to recruit and promote women managers.



Powerlive Zimbabwe is a local women-led company that approaches energy access through a gender lens. Powerlive is distributing modular SHS that can be scaled up to Tier 5 service. The systems are sold together with productive use assets, such as pumps and food processing machinery. Powerlive has a strong team of women managers and sales agents, and the company provides mentoring support for women micro-entrepreneurs.

⁶ Read about the projects funded through this call in the [2020 portfolio](#) booklet.

Solar PV continues to lead the sector, representing over 40% of all applications. Given the theme of the call this year, it was not surprising to see the share of waste-to-energy applications increase (up from 8% to 13%). A focus on circular economy could also be seen in energy efficiency projects (4%) and projects to develop solid, gas and liquid biofuels (collectively 12%). A majority of the applications included some element of PUE, with a strong trend toward services and appliances for agricultural value chains.

While most applicants proposed proven technologies, there were some game-changing pilot projects related to energy storage, scalable SHS and smart mini-grids, energy trading through block chain technology, electric vehicles, and demand side management through Internet of Things (IoT) approaches.

GENERAL OBSERVATIONS ABOUT TRENDS AND CHALLENGES BASED ON APPLICATIONS SUBMITTED IN THE 2020 CALL

Trends:

- Companies are increasingly using proven technologies in new ways and introducing them into new markets.
- Companies are utilising hybrid solutions that combine multiple energy sources to increase access in a reliable and efficient way.
- More local and women-led companies are gaining a foothold in the market.
- Companies with potential for system-level impact are largely based in Kenya and South Africa, but there is also rising sophistication among companies in Zambia and Zimbabwe.
- Effective partnerships between local and international companies, as well as for-profit and social entities, are strengthening impact.
- Companies targeting last-mile distribution are developing complex business models that combine technology, distribution, training and financing (e.g. asset-based loans).

Challenges:

- Start-ups and early-stage companies have difficulty projecting realistic outputs and timelines, so there is a need to improve budgeting, project preparation and scenario planning capacity.
- There is a deficit of knowledge about market demand and supply chains in some countries.
- Studies have shown that diverse companies perform better, and yet many companies limit inclusive recruitment efforts to temporary or commission-based jobs.
- The spread of COVID-19 is causing unexpected risks in terms of implementation capacity, supply chains and co-financing.



Partnerships Strengthen Impact

Almost 70% of applications included some form of implementing partnership. Typical partnerships are local companies supported by international technology providers or international companies working with local distributors and capacity building partners. About 20% of the circular economy applications featured a Nordic developer or project partner. Projects that include a strong sales and distribution component are often proposed to be implemented in tandem with community associations or networks of local entrepreneurs.

Many of the PUE projects included business development support for local companies and micro-lending or asset financing for start-ups and entrepreneurs. Some projects strengthened local engagement through a plan to transfer ownership of the power source to the local community after a specified amount of the development costs were recouped. The Build, Own, Operate,

Transfer (BOOT) model can lead to high development impact by providing not just local access to reliable energy but long-term control of the generation source.

There were interesting public-private partnerships proposed for waste-to-energy projects, such as private companies processing municipal waste for public sector off-takers. Projects to build wind and hydropower plants had fewer formal partnerships, however successful implementation is often heavily dependent on relationships with government agencies for regulatory approval and power purchase agreements (PPAs).

The annual survey indicated that over 30% of our portfolio companies have established partnerships with government entities, and 'efficiency of regulatory processes and procedures' was the second most commonly cited barrier to development/expansion.⁷



EnerGrow (EG), which provides asset financing and training in Uganda, is partnering with both a public utility and an international NGO. EG signed a Memorandum of Understanding with Umeme, the largest electricity distributor, to test an innovative digital credit scoring platform with grid-connected customers around Mbale. EG is also partnering with CLASP, an energy efficiency non-profit, to survey potential customers and test appliances in rural settings. These partnerships help the company reduce risks and increase financial inclusion.

⁷ The most common barrier to expansion cited by project developers was 'lack of access to financing.'

EVOLUTION OF PRODUCTIVE USE OF ENERGY

EEP Africa has witnessed growing market interest in productive use. In past years, only a few front-runner companies focused on productive use. Now there is a broader understanding in the sector that promoting PUE is an effective way for energy companies to strengthen their impact and financial viability.

An element of productive use was identified in 79% of the applications.⁸ Although the market is still developing, interesting PUE models were proposed by project developers in all countries covered by EEP Africa. The annual survey also indicated that a majority of projects in our active portfolio are providing some form of PUE service or appliance.

An emerging trend is integrated energy services along the entire agricultural value chain.

Productive use activities in rural areas primarily focus on:

- local agriculture, such as irrigation, processing (drying, grinding, milling) and cold storage
- commercial and retail activities, such as tailors, hairdressers and restaurants
- light manufacturing, such as drilling, welding and carpentry
- medium-scale production, such as small factories or intensive agro-processing

Productive use of energy can be defined as agricultural, commercial and industrial activities that generate income and are powered by clean energy sources. These activities increase productivity, enhance diversity, and create economic value.

Two emerging trends seen this year are clean energy companies providing services for municipal institutions, such as schools and health clinics, and clean energy being utilised for integrated services along agricultural value chains, such as food processing combined with cold storage or e-transport.

⁸ Unless noted otherwise, all references to applications or proposed projects refer to the 2020 call for proposals.

Agsol is developing and distributing a network of solar mills in East Africa. The mills are purpose-built to meet local food processing needs, while also incorporating IoT technology and cloud computing that enables remote monitoring.



Many of the most promising business models build upon distribution and financing schemes, such as PAYG, that originated in the SHS sector and are now being used for a wide range of products and technologies.

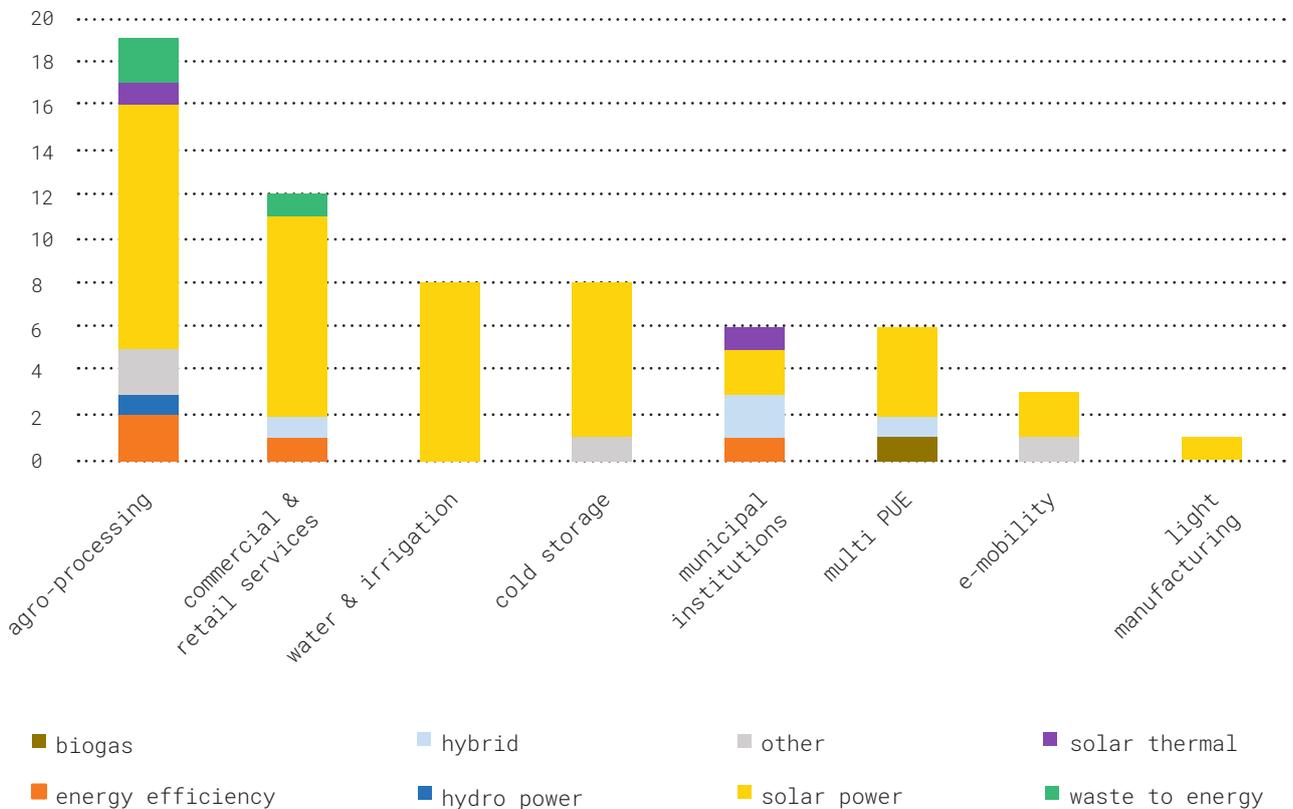
The most popular technology utilised for PUE purposes is solar PV, which was proposed in a majority of projects in every category. The most diverse range of clean energy technologies were proposed for agro-processing and municipal institutions (figure 4).

Over half of the PUE applications related to agricultural value chains, demonstrating the critical role energy plays in developing sustainable and climate resilient methods of food production. Some companies had already identified a specific service or appliance, based on preliminary studies or market testing, while others were in an earlier stage of planning.

Proposed PUE appliances ranged from small egg incubators to industrial-scale mills. Solar irrigation is a rapidly growing technology in the region as climate change makes it increasingly difficult for smallholder farmers to earn a living from rain-fed crops. There is also a growing focus on cold storage as a way to improve food security and increase income by reducing food loss and waste. The diverse cooling solutions proposed in the call included dairy freezer boxes that could be placed on motorcycles for transport to market, refrigeration for livestock vaccines, and large cold rooms able to store produce from dozens of farms.

Although market testing of cooling solutions so far indicates challenges in creating viable businesses, the range of models observed in this call suggests a high level of innovation that could rapidly transform the sector.

Figure 4: PUE Categories and Technologies





Wala is a local, women-owned start-up bringing solar irrigation to smallholder farmers in Malawi. Farmers purchase solar water pumps through a lease-to-own model using soft loans from a member-based finance cooperative. In addition to technical training on technical use and maintenance, Wala and its partners provide agribusiness training on land productivity, crop diversification, water conservation and financial management.

While the quality and range of clean energy appliances is improving, market entry can be challenging. Encouraging the uptake of PUE equipment requires targeted awareness-raising activities and payment schemes that defer the full cost of the appliance. Many diesel-powered machines are not convertible to run on electricity, which increases the upfront costs of switching to clean energy. Low diesel prices also reduce consumer demand for efficient appliances.

One of the strongest drivers for increasing uptake of PUE in the region is the expansion of access to asset financing.

Most companies planned to distribute stand-alone systems and appliances through PAYG, which has moved from the SHS sector to a broad range of clean energy products. The integration of smart technology and remote monitoring of appliances facilitates payment schemes and enables suppliers to collect valuable data on product use and consumer demand. This data helps to de-risk small loans and asset financing programs and increase financial inclusion of women and vulnerable populations. The expansion of access to financing for PUE assets is one of the strongest drivers for increasing PUE in the region.



Pawane is piloting proprietary software to monitor repayments on solar-enabled PAYG products. The system tracks creditworthiness and provides mobile agricultural data services. Positive credit unlocks increasing levels of access to financing for PUE and life-enhancing appliances. When repayment rates on the starter bundle of products are above 90%, financing for school loans is unlocked, creating a pathway to educational achievement for rural families.

A growing number of mini-grid developers are turning their focus to PUE as a way to increase demand and achieve financial sustainability. Many mini-grid projects in this call included sales and financing of PUE appliances as a core part of their business model. This trend was identified in *Powering Productivity* as the Business Acceleration Model.⁹

Other mini-grid projects focus on a primary off-taker, which is usually a local agricultural producer or a commercial and industrial enterprise operated by the developer. Several mini-grid companies proposed establishing local business parks, with training and financing made available for entrepreneurs and small and medium-sized enterprises.



East African Power is developing a hydropower plant combined with a local mini-grid and sustainable aquaculture business in Rwanda. The 4.2 MW run-of-the-river plant will have a hybrid intake structure that enables a women-led business to grow and process fish in the intake head pond. The plant will also power a 150 kW mini-grid providing clean energy to a micro-industrial park and community centre that includes a multipurpose building, a library and an agricultural centre of excellence.

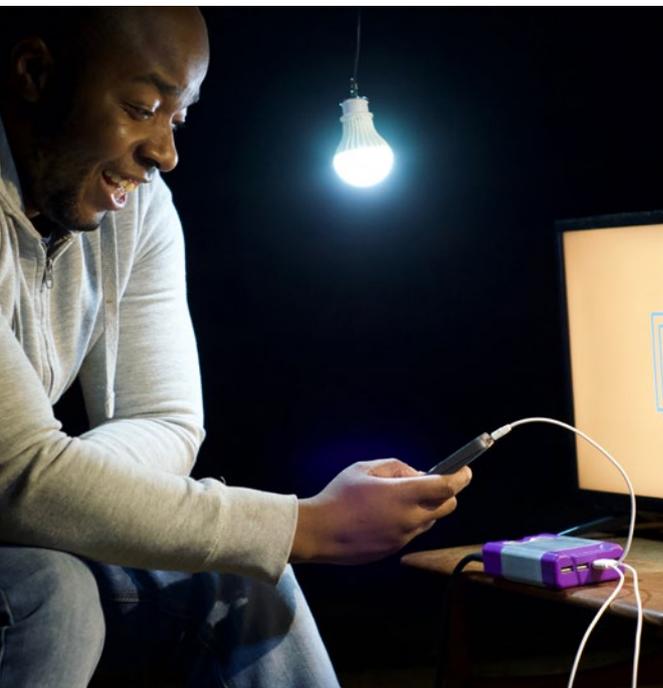
Engie-Equatorial is a new joint venture developing smart mini-grids and IoT-enabled industrial parks in Uganda. The project is deploying mini-grids on islands in Lake Victoria with an industrial park owned by the developers serving as the anchor client. The industrial park will provide products and services for local agricultural value chains, as well as offer asset financing for PUE appliances and a business incubation program for local entrepreneurs.



⁹ [Powering Productivity](#) (EEP Africa, 2019) identified three evolving business models related to PUE in the mini-grid sector: Energy Supply Model, Business Acceleration Model, and Supplier-Offtaker Model. A detailed analysis of each model, with case studies from our portfolio can be found in the report.

Projects to power municipal institutions also generally propose mini-grids or plug-and-play systems. The primary focus of these projects is usually on reducing GHG emissions from diesel generators and promoting educational or health outcomes, such as bringing lighting and internet connectivity to schools or ensuring reliable electricity and purified water for rural health clinics. This is of critical importance at any time, but even more so during a pandemic. In addition to ensuring energy security for an institution, excess generated energy can be used by households and small businesses in the community.

Technical improvements and reduced costs for batteries and energy storage solutions are stimulating a trend towards the battery-as-a-service model. Solar hubs and other clean energy systems can host battery recharging and battery swap stations that serve a wide variety of customers and needs. This model is expanding energy access to last-mile communities and will likely be revolutionary for e-mobility and a wide range of PUE solutions.



VAC Solar is bringing energy access to rural health clinics and bottom-of-the-pyramid households in Uganda through Community Solar Hubs. The hubs are located at health clinics in poor communities and refugee camps to enable e-health diagnostic and treatment devices. Each hub can charge 300 smart batteries per day with sufficient capacity to power basic appliances and low-voltage machinery. Distributed through PAYG using mobile money, the project empowers local women to create micro-businesses with surplus battery capacity.

Jaza Energy is bringing energy access to last-mile communities in Tanzania through its network of solar energy hubs. Each hub serves as a one-stop energy shop for off-grid households. Operated by local women entrepreneurs, the hubs offer customers home electrification kits and rechargeable battery packs.





Growth of e-Mobility in Africa

Many governments and donors in Africa are making sustainable transport a priority for research and advocacy, but there is limited financing available for private sector-led projects.

EEP Africa has seen the demand for grant funding to pilot and demonstrate e-mobility solutions grow rapidly in recent years.

In the latest call, there was a significant increase in the number and diversity of projects related to e-mobility, with projects proposed in Kenya, Malawi, Namibia, Rwanda, Tanzania and Uganda.

E-mobility applications focused on clean energy solutions for a variety of electric vehicles: 2-wheeled motorcycle taxis, 3-wheeled delivery bikes, 4-wheeled cars and minibuses, 4x4 off-road vehicles (for game reserves or refugee camps), and fishing boats on Lake Victoria.

Some projects focused simply on replacing diesel and gas with electric motors, but many went beyond this to propose innovations in battery recycling, solar-powered charging stations, connections to local mini-grids, and integration with cold storage technology and agricultural value chains.

Zembo is replacing taxi motorcycles in Uganda with electric models and a network of PAYG solar-powered charging stations using a battery swap business model. The motorcycles cost less to lease and operate than traditional models and dramatically reduce noise and air pollution. The project is aligned with Kampala's plan more sustainable infrastructure and city authorities have purchased four Zembo bikes and financed one charging station in a government effort to lead by example.¹⁰



¹⁰ Read more about Zembo's innovative business model in the case study [Electric Boda Bodas](#).

CLEAN ENERGY FOR CIRCULAR ECONOMY SOLUTIONS

Circular economy is a global trend that offers new economic opportunities while addressing climate change and the depletion of natural resources.

The Nordic countries have been at the forefront of the shift from a linear production and consumption model to one in which materials are used more sustainably and kept in circulation longer. This concept is also a growing priority in Africa and is promoted through the African Circular Economy Alliance and other government and non-governmental networks.

Circular economy solutions represented a smaller share of applications (30%) than PUE but the quality of proposed projects was higher than in previous years. The strongest proposals were for projects in Kenya, South Africa, Tanzania, and Uganda. These countries all have vibrant clean energy markets and companies operating there seem more ready to integrate circularity into their core business models.

While biomass sources of energy are not new, there is innovation in the business models.

Most of the circular economy projects seen in this call were waste-to-energy projects, including biomass and biogas projects, which produce energy from agricultural or human waste. The other projects focused on energy efficiency, recycling of non-biomaterials, battery refurbishment and e-waste.

A wide variety of waste materials can be utilised to generate clean energy. Solid biomass pellets and briquettes are being created out of corn cobs, cashew shells, rice coffee husks and other forms of crop residue and agricultural waste. The resulting non-carbonized biomass fuel replaces charcoal and

A **Circular Economy** redesigns production and consumption models around reducing, reusing and recycling. It aims to reduce or eliminate waste and keep more products, equipment and infrastructure in use for longer.

firewood for clean cooking, heating and electricity. Each project is tailored to locally-available forms of waste, ensuring consistent supply of feedstock and limited transport costs. These solutions also reduce the amount of waste being burned or dumped into waterways.

While biomass sources of energy are not new, there is innovation in the business models. Some of the key developments are the adaptation of SHS strategies and distribution networks to lower costs and the introduction of financing schemes like PAYG. More biomass producers in Africa are moving beyond the household level to target institutional clients, such as schools and restaurants. This strategy often results in more stable demand and revenue projections, while also reducing fuel costs for enterprises that are important to the social and economic life of a community.

Village Industrial Power (VIP) uses steam-powered plants to recycle water and produce heat and energy from crop residue. The units produce three-phase power that enables agricultural processing (e.g. fruit and vegetable drying), water pumping, battery charging and micro-grids. Each VIP unit can serve up to 30 small businesses or 300 households.



Agricultural, industrial and municipal waste is also being used to create biogas for household energy, agricultural processing and commercial industry. Biogas projects in the call ranged from household biodigesters designed to provide energy for a single smallholder farm to large biogas plants that would provide clean electricity to the national grid. There were also projects that aimed to produce portable biogas-in-a-bag in order to serve a wider network of clients, such as restaurants or market vendors.

Some biogas projects, especially those that use livestock manure or sewage, also produce organic fertiliser or other by-products that can improve the agricultural productivity of the main off-taker or be sold as a source of revenue. These offer the highest degree of circularity by utilizing waste in multiple phases of the agriculture, energy and food cycle.

Waste-to-energy businesses can face complications when they scale-up, including sourcing of feedstock, commercial viability, technical challenges, market demand and supply chain issues. Integrating solutions into an agricultural processing value chain can address some of these challenges, but innovative business models are needed to better link supply and demand.

One trend apparent in the circular economy proposals was private-public partnerships, in which private companies work with local authorities to collect and process municipal waste and provide power for local industries. The majority of these partnerships were in South Africa and Kenya. Some innovative partnerships could also be seen in projects focused on recycling single-use plastics or scrap metal, e-waste processing, and battery refurbishment. However, this sector is still nascent in much of the region and, unfortunately, these proposals were not very strong.



Sistema.bio offers modular biodigesters that enable smallholder farmers in Kenya to turn animal waste into biogas for cookstoves, water heaters and small agro-processing machinery. Each unit can serve a farm with up to 200 cows, and just one bucket of waste per day can generate 3 hours of biogas cooking and enough biofertilizer for 40-80 m² of crops.

The Challenge of e-Waste

E-waste from off-grid solar and other products is a rapidly growing challenge. Based on expected product lifespan, the Efficiency for Access coalition estimates that 10,000 metric tonnes of e-waste will be produced in 2020.

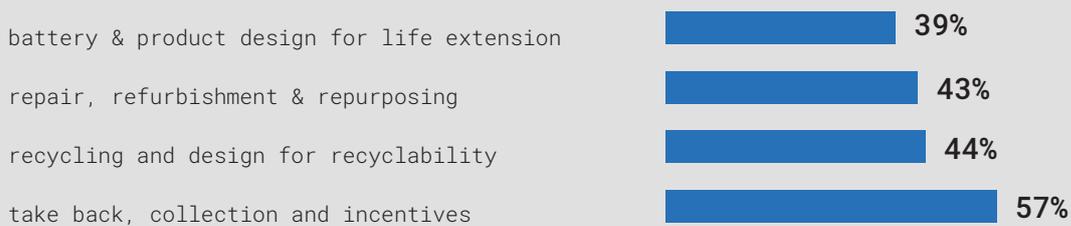
Efforts to recapture and recycle e-waste in Africa are gaining ground but are limited by a lack of consumer awareness, uneven regulation and low capacity. More incentives are needed to encourage consumers to turn in end-of-life products and recycling infrastructure needs to reach sufficient volumes to become profitable. This is a critical priority as a functioning market for secondary materials is generally seen as a prerequisite for a circular economy.

EEP Africa partners with CLASP, which manages the Global LEAP Awards, to share information about e-waste management. A total of 275 people from 44 countries registered for an e-waste learning event in May 2020. Many confirmed that their company implements some type of e-waste protocol or programme (figure 5).



Zonful Energy is a local SHS provider in Zimbabwe that has seen the challenge of e-waste from depleted batteries first-hand. Because returning batteries to a supplier is costly and time consuming, many companies in the sector store or dispose of them in a hazardous manner. To address this need in the market, Zonful is setting up battery collection bins in their distribution centres and educating customers on responsible e-waste disposal.

Figure 5: Types of e-Waste Management



IMPACT OF COVID-19

During 2020, the global economy has been faced with an unprecedented set of challenges due to the COVID-19 pandemic. Like many other sectors, early-stage clean energy companies have been heavily affected by the crisis and the government restrictions put in place to manage it.

Start-up companies with a limited client base and low liquidity have been hardest hit by the lockdowns.

Travel restrictions have hindered sales, distribution and product maintenance, resulting in lost income for companies and commission-based employees. Prohibitions on gatherings have limited grassroots marketing efforts. Many energy companies and business customers were forced to close temporarily, and private customers have struggled to pay energy bills. New projects have stalled due to slower licencing and permitting processes as governments focus on the acute health and economic crises.

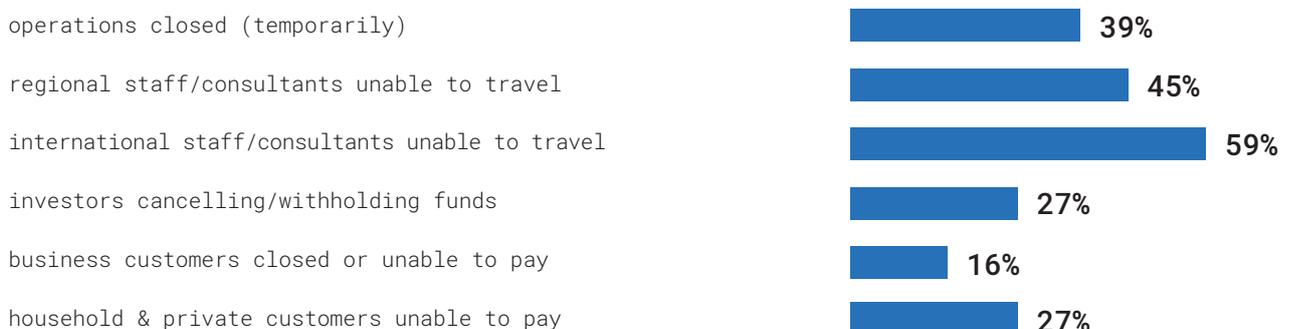
Over 80% of companies that participated in the annual survey¹¹ reported a moderate to severe negative impact from the crisis. The biggest impact stemmed from restrictions on the movement of people and goods. The closing of borders between countries

prevented international consultants from travelling to the country of operations and, in many cases, local staff based in cities were restricted from visiting rural project sites. Many technical components and products are sourced from China or other global manufacturing hubs, and the restrictions caused severe delays in the supply chain (figure 6).

Business revenue streams were also affected by COVID-19. Some clean energy companies were able to register as essential services and continue operating, but many were forced to temporarily close. Some faced reduced sales as household and business customers were unable to pay for products and services, although this was less evident than expected in the early months of the crisis. Start-up companies with a limited client base have been hardest hit as lockdowns have prevented aggressive marketing efforts. A number of companies also reported that investors had withheld disbursements, delayed funding decisions or even cancelled promised financing.

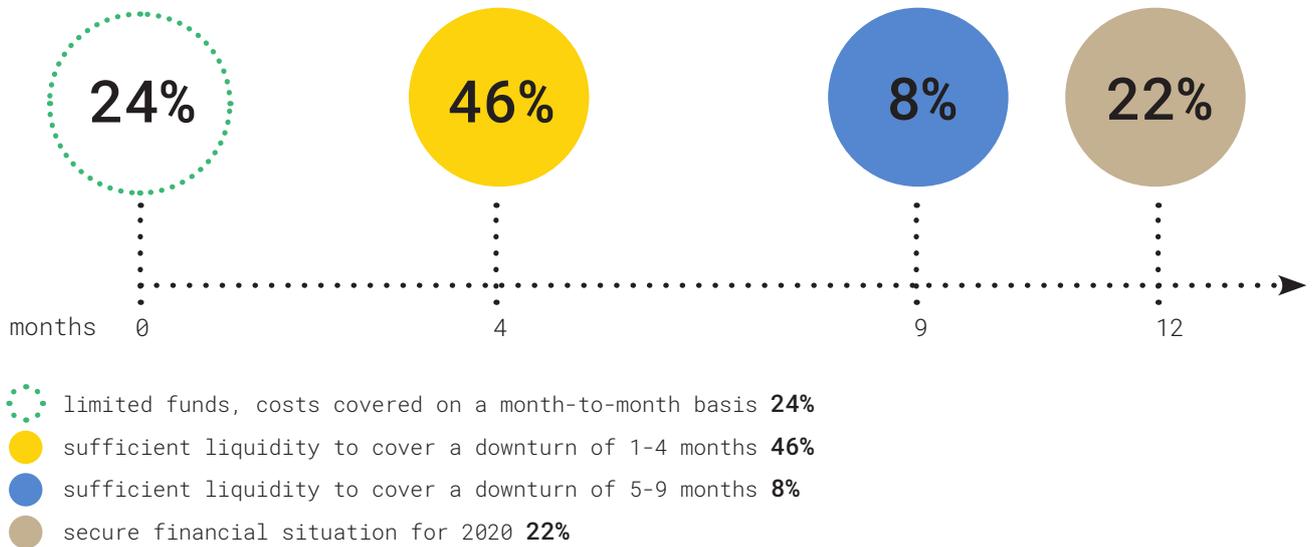
The loss of revenue and investment has led to a precarious financial position for many companies. Only 30% of the surveyed companies reported sufficient liquidity to cover a downturn of five months or longer. Close to half (46%) could cover expenses for up to 4 months, but 24% were covering costs on a month-to-month basis (figure 7 on next page).

Figure 6: Impact of COVID-19 on Operations



¹¹ The EEP Africa annual survey was conducted during May-June 2020. A total of 45 companies with active operations in Africa responded.

Figure 7: Financial Liquidity of the Company

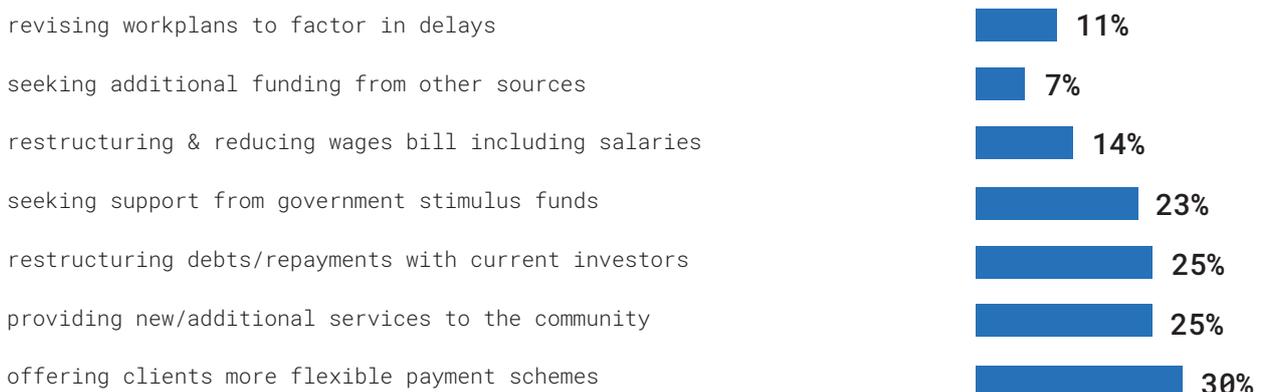


A range of mitigation strategies have been used by clean energy companies to support operations during this difficult time. According to the annual survey, about 30% of companies offered clients more flexible payment schemes to retain and attract customers and 25% began providing additional products and services to their communities in order to generate new revenue streams (figure 8).

Most companies tried to retain staff during the downturn.

Some companies opted to reduce costs through salary cuts or restructuring, including relocating operations outside of capital cities. However, other companies chose to take on additional short-term costs in order to retain staff, such as temporarily moving commission-based agents onto their payroll. This reflects the limited availability of qualified staff, leading companies to make efforts to preserve their previous investments in staff training and remain ready to relaunch operations when restrictions ease. The choice of options depends partly on financial liquidity and partly on where the company is registered.

Figure 8: Mitigation Strategies in Response to COVID-19





Sistema.bio's agents are motivated to work during the pandemic because they see the dramatic impact that biodigesters have on the safety and self-reliance of their customers.

Many EU governments offered relief payments to cover salaries and some African countries, such as Kenya and South Africa, offered employee tax relief.

The crisis may speed up market consolidation, and short-term mitigation measures may lead to long-term business solutions.

During this unprecedented situation, EEP Africa has applied a more flexible approach to disbursing grant funds by allowing more advance payments to help businesses manage tight cash flows. Portfolio companies have also been offered risk analysis and training sessions on financial management and scenario planning to support continuity of operations, especially for start-ups and local companies. EEP Africa has also collaborated with other clean energy investors to assess needs, share resources, and develop plans for technical assistance and financing.

The pandemic has highlighted some operational areas that need to be carefully considered in future risk assessments by donors and investors prior to financing:

- Role of staff and consultants based in other regions or countries
- Complexity of supply and value chains
- Diversity of available materials, products and markets in case of disruptions
- Company liquidity, with a lower threshold required for start-ups
- Amount of co-financing not yet secured

While 2020 has been extremely challenging, EEP Africa portfolio companies have demonstrated remarkable ingenuity and resilience.

There will be corporate casualties and the crisis may speed up market consolidation in the sector. However, the companies that survive may be better able to cope with the evolving market environment and short-term crisis mitigation measures may lead to long-term business solutions.

How to COVID-proof Early-stage Clean Energy Companies

(Adapted from an article by the EEP Africa team in May 2020)¹²

Challenge 1: How to keep your staff on board?

Most companies are trying to keep their staff on board during this period of upheaval. Several have implemented measures to reduce staff costs through progressive salary cuts across the board or by asking management to defer pay. Other companies have increased short-term costs by taking commission-based sales agents onto their regular payroll. Companies are also utilising this time of reduced operations to upskill their staff through online training programmes.

Challenge 2: How to service debt?

Many companies have entered into negotiations to restructure debts and repayments. As early stage companies often receive funding from a variety of financiers, this provides an opportunity for investors and donors to collaborate on developing creative solutions and effective technical assistance.

Challenge 3: How to keep the lights on?

Some companies are providing short-term payment relief to vital services, such as healthcare clinics and small businesses. However, it is important for the financial viability of the sector that this does not undermine long term progress toward bankability for both energy providers and consumers. Some governments have introduced cash transfers to support households through the crisis and this may be necessary in order to maintain progress toward the goal of energy access for all (SDG 7).

Challenge 4: How to minimize procurement delays?

Initial delays due to production disruptions in China were followed by the imposition of barriers to the shipment and clearance of goods into Africa, as well as border closures that prevented transport from entry ports to landlocked countries. To mitigate this, more companies are looking into importing raw materials or semi-finished products and completing assembly in-country.

Procurement problems have also been caused by a rush on Forex in many countries. As governments prioritised importing medical equipment, energy companies were not able to settle payments to foreign suppliers. Advance payments into Forex accounts by international investors can help ensure orders are paid on time.

Challenge 5: How to future proof your business?

Many companies are using this period to reassess their business model. Some are carrying out a detailed analysis of customer profiles based on existing information or developing surveys to collect new data. Others are fast-tracking R&D on new products so that these are ready to be launched when restrictions ease. Companies are also restructuring their business to attain substantial savings, for instance, by relocating their headquarters from the capital city to a regional factory.

¹² The full article was published on eeпаfrica.org and in Sun-Connect Off-Grid News on 9 May 2020.

OUTLOOK FOR THE FUTURE

This has been a year of upheaval for people and companies around the world. It is still unclear whether business and society will return to normal when the immediate crisis has passed or whether some kind of 'new normal' will emerge. It is the hope of many that this will mark a turning point in the way we work, produce and consume, and that the recovery will follow a path towards green and sustainable growth.

Economic recovery should follow a path towards green growth.

Promoting productive use of clean energy is one step in the right direction. However, energy efficient appliances face obstacles to market entry and mini-grids are still looking for financially sustainable business models. Circular economy solutions are also key for the future but are currently underdeveloped and driven more by donors than market demand.

More early-stage and risk-tolerant financing is needed to test and demonstrate innovations.

In order to shift the sector towards sustainable productivity, more early-stage, risk-tolerant financing is needed to test and demonstrate innovations. EEP Africa plays a critical role, but grant funding is just the first step. Other financiers and investors are needed to take these innovations further and integrate them at every stage of the value chain.

The pandemic has highlighted that local capacity needs to be strengthened so that off-grid energy companies are not so dependent on international technology and expertise. Local maintenance and

repair are vital to operational sustainability, especially in times of crisis. Resilient infrastructure depends on more products and systems being produced, assembled and restored in Africa.

A greater share of businesses should be managed by local entrepreneurs to ensure that energy solutions address the specific needs and challenges of rapidly evolving local markets. Clean energy know-how also needs to be more inclusive. Women and youth can play a larger role as leaders and agents of change in all areas of the sector, but this requires targeted outreach and partnerships.

Local and women entrepreneurs, as well as youth, can play a larger role as leaders and change agents.

At the same time, tariffs and regulations need to be streamlined to enable more efficient deployment of clean energy. It is estimated that a mini-grid project takes an average of 50 weeks to secure all legal and regulatory approvals.¹³ Waste-to-energy projects are hindered by restrictive regulations governing waste disposal, which are unrealistically applied to agricultural waste in many countries.

One positive impact of the pandemic is that clean energy companies, investors and government stakeholders have enhanced their coordination and collaboration. Not all businesses will survive this challenging year, but the ones that successfully innovate and adapt have the potential to demonstrate a path to commercial viability for the sector.

The resulting shift towards sustainable, inclusive and green growth in Africa will contribute tremendously towards achievement of the Paris Climate Agreement and Sustainable Development Goals.

¹³ *Benchmarking Africa's Minigrids (AMDA, 2020)*

The Energy and Environment Partnership Trust Fund (EEP Africa) provides early-stage financing for innovative clean energy technologies, products and business models in Southern and East Africa.

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