



Finance mechanisms for private sector-led energy access in urban informal settlements

Sierra Leone case study

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This Sierra Leone paper is authored by [Energy 4 Impact](#), [Mercy Corps](#)' energy access platform, as part of the [Enabling African Cities for Transformative Energy Access \(ENACT\)](#) project implemented in Freetown, Sierra Leone and Kampala, Uganda, by [ICLEI Africa](#) and Energy 4 Impact. ENACT is funded with UK aid from the UK government via the [Transforming Energy Access platform](#). This report aims to provide an overview of finance mechanisms that the private sector can leverage to advance energy access in urban informal settlements. Whilst the focus is on clean cooking solutions, these mechanisms are also applicable to other energy interventions and applications. This paper is part of a series of public and private financing reports prepared under ENACT with the aim of galvanising financial inclusion for energy access in urban settings.

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Cover image: A cookery seller in the informal settlement of Susan's Bay prepares meals using an LPG stove at her food kiosk.

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Abbreviations

AECF	Africa Enterprise Challenge Fund
AfDB	African Development Bank
ARD	Association for Rural Development
CCA	Clean Cooking Alliance
CDM	UN's Clean Development Mechanism
CIB	Clean Impact Bond
DFI	Development Finance Institution
EDSA	The Electricity Distribution and Supply Authority
ENACT	The Enabling African Cities for Transformative Energy Access project
ESP	Energy Service Provider
FCC	The Freetown City Council
FCDO	The UK's Foreign, Commonwealth and Development Office
GDP	Gross Domestic Product
ICSEA	Improved Cook Stoves for East Africa
IEA	The International Energy Agency
ILO	The International Labor Organisation
LPG	Liquefied Petroleum Gas
MECS	Modern Energy Cooking Services
MFI	Microfinance Institution
MSD	Market Systems Development
NBAP	National Bioenergy Action Plan
NGO	Non-governmental organisation
PPP	Public-Private Partnership
PUE	Productive Uses of Energy
RBF	Results-Based Financing
SDGs	Sustainable Development Goals

SEFA	Sustainable Energy Fund for Africa
SLIHS	The Sierra Leone Integrated Household Survey
SME	Small and Medium Enterprise
SSA	Sub-Saharan Africa
TA	Technical Assistance
UNCDF	UN Capital Development Fund
UNDP	United Nations Development Programme

EXECUTIVE SUMMARY

The push for universal energy access in Africa requires significant energy project financing, estimated at approximately \$25 billion annually by 2030 to achieve modern energy access for all. Sierra Leone is no exception, with only 26% electrification, mainly in urban areas and peri-urban areas¹. The private sector is pivotal if the country is to achieve 85% renewable energy capacity by 2030, with the urban population growth averaging 3.36% annually between 2010 and 2023 and increasing the population by over 1.3 million.

As consumers grapple with the cost of living, energy service providers (ESPs) face the unique challenge of ensuring product affordability while securing a return on their investment to maintain business sustainability. Innovative business models based on credit terms, such as rent-to-own or pay-as-you-go, have proven effective in promoting the uptake of clean energy technologies by reducing their upfront costs. However, this is insufficient, as ESPs still need funding to enable them to carry out other interlinked activities around market activation, awareness creation, business model development and enhancement, capacity building, research and

development, innovation and adaptation, community engagement, infrastructure development, operations and maintenance, and compliance with regulatory requirements, to mention a few.

This paper explores various finance mechanisms that would enable ESPs to deliver sustainable energy solutions to urban informal settlements in Sierra Leone. While focused on clean cooking solutions, most insights presented in this paper also apply to other energy solutions, such as decentralised renewable energy and productive use appliances in the context of urban informal settlements. Financing mechanisms such as equity, debt, output-/outcome-based grants, crowdfunding, and carbon credits are reviewed through a clean cooking ESP lens. Equity and grants appear to hold the highest share of financing into the clean cooking space, although there is considerable potential in other financing mechanisms, such as carbon credits and output-based grants, which could substantially de-risk capital costs for ESPs.

Finance providers face challenges due to data and information gaps on energy consumption patterns

1. (UNOPS, 2021)

and market design conditions, which hinder project valuation and assessment. The fluid nature of foreign exchange rates against major currencies, such as the US dollar, poses risks to projected returns on investment, discouraging potential financiers. Additionally, there is still progress to be made in effectively implementing results-based financing to ensure simplicity in project tracking, validation, and disbursement. However, the ever-growing demand for clean energy is creating promising opportunities, and Sierra Leone, like many countries, is facilitating the transition by incorporating targets into national plans. An increasing number of finance providers are optimistic about investing in the energy sector due to growing global support to de-risk clean energy projects through incentives, subsidies and conducive regulatory frameworks.

In conclusion, there is a great need to invest into private sector-led clean cooking solutions in the African region. Enterprises face significant financial challenges that hinder market expansion and the development of consumer-responsive market systems, both of which are critical to driving the adoption of clean cooking technologies. This situation calls for close collaboration between governments and finance providers to invest in the private sector. Through projects such as ENACT, entities have an opportunity to support investment in clean cooking ESPs to grow the adoption of technologies which remain low in Sierra Leone.

This paper is part of a series of reports on financing clean cooking solutions for clean cooking adoption in urban informal settlements, which can be found on the ENACT website².

2. For more information on ENACT, please see <https://africa.iclei.org/project/enact/>

INTRODUCTION

More than 4 billion people – 56% of the world’s population – currently live in cities and towns. This is expected to rise to 70% by 2050 and most of this growth is projected to take place in Africa and Asia. In Africa, for example, the urban population is expected to triple to 1.5 billion between 2015 and 2050, accounting for two-thirds of Africa’s population and 22% of the world’s population³. Africa, particularly sub-Saharan Africa (SSA), is however urbanising at lower gross domestic product (GDP) per capita levels compared to other world regions. This has led to a rise in the urban underserved population, among other factors. Today, close to 60% of people living in urban areas in Africa live in informal settlements, compared to 21% in Asia, and 28% in Latin America and the Caribbean⁴.



3. (World Bank, n.d.)

4. (Habitat for Humanity International, 2018)

While cities offer opportunities for wealth creation, employment, improved quality of life and increased social diversity, these opportunities are not equally distributed among people living in urban areas. Informal settlements are often left out of urban plans and strategies, leading to insufficient provision of services such as energy.

Limited access to sustainable energy for the urban underserved has detrimental impacts, including missed livelihood opportunities in both supplying energy solutions and using power to deliver added-value goods and services. There is also a significant quality of life impact on end users: traditional energy sources (torch batteries or kerosene for lighting; charcoal or wood for cooking) are unhealthy, ineffective, expensive, and unsafe. In many instances, clean and reliable energy is available in the urban market but is perceived as inaccessible to the urban underserved due to limited awareness and/or limited market activation opportunities that energy service providers can leverage. More broadly, these traditional energy sources often contribute to other climate and environment-related hazards such as air pollution, fires leading to loss of assets and livelihoods, deforestation, land degradation, soil erosion and increasing occurrences of landslides.

The private sector has, over time, proven to be a key facilitator in accelerating energy access through innovative, environmentally and socially impactful sustainable approaches. As such, the private sector has the potential to support local governments in delivering mandates related to energy access, job creation, promoting economic opportunities, and improving the wellbeing of people living in urban areas. However, private companies need support such as access to capital, market scoping/profiling of communities, route-to-market support, and technical assistance to build locally relevant business and delivery models, among others, to effectively deliver energy services.

SSA is embracing renewable sources of energy, but funding to grow the value chain into a market system development (MSD) approach remains a problem. The International Energy Agency (IEA) estimates that achieving universal energy access in SSA will require an investment of \$25 billion annually until 2030⁵, which is at least double the current levels of financing. To accelerate the transition to clean cooking, an annual investment commitment of about \$131 million⁶ is progressive, but remains trivial compared to the estimated \$8 billion needed annually by 2030⁷.

About ENACT

The Enabling African Cities for Transformative Energy Access (ENACT)⁸ project works with local governments, the private sector, and local communities to create an enabling environment to help improve energy security for low-income urban communities in Freetown, Sierra Leone, and Kampala, Uganda. The project aims to introduce market-led energy solutions to provide adequate, safe, reliable, clean, and affordable forms of energy to urban underserved communities, addressing three key barriers to energy access in urban areas in SSA:

1. Limited capacity of local governments to plan and implement market-led energy access interventions in partnership with the private sector.
2. Low support for the private sector in commercially scaling locally relevant, reliable, affordable, and sustainable energy solutions to urban informal settlements.

3. Limited knowledge and data on energy access gaps in urban informal settlements, and opportunities to improve access.

ENACT is funded by UK aid from the UK government via the Transforming Energy Access platform. It is managed by The Carbon Trust, and delivered by ICLEI Africa with support from Energy 4 Impact. The project has been actively working with the public and private sector since August 2020, aiming to increase access to clean energy (particularly clean cooking) in informal settlements through private sector penetration in Kampala and Freetown, with the goal of curating and piloting these approaches in other African cities.

5. (IEA, 2022)

6. (SEforALL, 2021)

7. (IEA, 2023)

8. More information here: <https://africa.iclei.org/project/enact/>

About this paper

ENACT focuses in part on designing and testing private sector-led energy access implementation models in the target locations of Kampala and Freetown. It provides grant support to de-risk private sector operations in informal settlements, and tests technologies and delivery models in these communities. Ongoing financing is crucial for sustaining, scaling, and replicating these efforts.

To support this, the ENACT project conducted research to map the energy access market in each country (providers and financiers) and identified financing options for ESPs to penetrate urban informal settlements and address challenges to financial access. This paper highlights gaps in financing and makes recommendations on improving the design of financing mechanisms to better suit ESPs.

This paper, which focuses on energy access financing in Sierra Leone, is one of a series of reports that provide a landscape of energy access providers and financiers in Sierra Leone and Uganda and details financing mechanisms that private companies can leverage to implement relevant business models in urban informal settlements in these and potentially other countries in SSA. This research complements additional research under the ENACT project on public financing proposals to support investments in energy solutions in cities.

The paper draws on in-depth engagements with energy companies, funders, and investors throughout ENACT's implementation, to understand the landscape, gaps, and opportunities for financing the private sector in 2023. This is complemented by background research on the energy access and financing landscape, and findings from ENACT project activities.

BACKGROUND

National energy access context

Sierra Leone is among the lowest ranked in electricity access across the world, with a national electrification rate of 26%, much of which is in urban areas⁹. The country currently faces challenges with commercial energy supplies, particularly on-grid electricity. In many sub-Saharan African countries, biomass (wood fuel and charcoal) plays a critical role in the energy mix.

9. (Ministry of Energy, 2023)

Image: A resident of Susan's Bay preparing tea with an LPG stove at home.



Due to the limited availability of affordable and sustainable energy options at the household level, biomass accounts for over 80% of energy consumed by both urban and rural populations in Sierra Leone¹⁰. Because of the negative environmental and health impacts associated with the production and use of traditional biomass fuel, there is a need to shift to higher-quality sources of energy such as LPG.

Poverty rates¹¹ have affected affordability, which remains a key obstacle to accessing cleaner and more sustainable energy sources. For example, the poverty rate among households without electricity is 32.9%, compared to 13% for those with electricity. In rural areas, the rates are 72.5% and 59%, respectively¹². This highlights the socio-economic benefits that access to energy can have in unlocking human potential. It powers businesses and creates economic opportunities, paving the way for greater stability and resilience. The following sections of this chapter detail the use of energy in cooking and lighting, the context of urban informal settlements and their unique features, various programmes and policies supporting socioeconomic aspects of populations living in informal settlements, and a justification for financing energy access in urban informal settlements.

Energy for lighting and powering appliances

Sierra Leone's small power sector, compared to other countries in SSA, generates approximately 150 MW of power, serving roughly 150,000 customers¹³ out of a national population of approximately 8.6 million¹⁴. As of 2022, the national electrification rate was 29.4%¹⁵, 95% of which was concentrated in urban areas. Electricity represents only 7% of total energy consumption, with per capita annual consumption averaging at 16kWh¹⁶. On a national scale, the three main sources of residential lighting are batteries, electricity, and solar energy, as shown in Figure 1 below. Electricity use for household lighting is more prevalent in urban areas at 49.3%, compared to just 0.9% in rural areas. As a result, batteries are the most commonly used source of lighting in rural areas, at 89%¹⁷. Stand-alone solar systems are also more common in rural households than in urban ones, at 8.2% and 3.9%, respectively.

Figure 1: Sources of residential lighting in Sierra Leone



10. (Ministry of Energy, 2021)

11. Poverty rate – ratio of population whose income falls below the minimum level of income in a particular county

12. (Ministry of Energy, 2023)

13. (International Trade Administration, 2024)

14. (World Bank, 2022)

15. (World Bank, 2023)

16. (Country economy, n.d.)

17. (Government of Sierra Leone, n.d.)

Limited electricity supply has led to low connection rates, while affordability issues keep electricity consumption levels very low. Monthly electricity tariffs are categorised into three bands: social, normal, and high-end users, with tariffs set at 0.082, 0.15, and 0.16 USD/kWh, respectively¹⁸. These rates fall within the average electricity tariff in SSA of 0.114 USD/kWh¹⁹.

Public electricity services are limited to selected areas, mainly in Freetown, Bo, and Kenema — the major cities — and the surrounding Western Area, covering about 40% of their residents²⁰. The service in these areas also tends to be unreliable, even in urban areas. To address these challenges, the Government of Sierra Leone has set targets to increase electricity access from 26.1% in 2013 to 92% by 2030, and to raise renewable energy generation from 43,464 GWh in 2013 to 111,780 GWh by 2030.

Cooking

The reliance on biomass for cooking is ubiquitous in both urban and rural areas in Sierra Leone. The heavy dependence on biomass (wood and charcoal) for cooking is primarily driven by the limited availability of cleaner and affordable alternatives and low awareness of clean cooking solutions. As of 2022, only 1% of households in Sierra Leone had access to clean cooking solutions (fuels and technologies), which is a slight increase from 0.6% in 2016. The proportion of the population primarily relying on clean cooking fuels and technologies in urban areas is 1.5%²². In comparison, SSA has 19% access to clean fuels and cooking technologies, placing Sierra Leone well below the regional average²³.

In Sierra Leone, fuel collection for the growing population has accelerated the clearing of woody biomass. When fallow periods are shortened for agricultural production, firewood typically collected from fallow land cannot be replenished, forcing collectors into forests. Ecologically, deforestation further decreases terrestrial carbon stock, reduces biodiversity and natural habitats, and weakens ecological resilience, making droughts, landslides, and floods more common²⁴.

The Sierra Leone Integrated Household Survey (SLIHS)²⁵ showed that, nationally, 72% of households used firewood as their main cooking fuel, while 27.7% used charcoal.

Recent estimates indicate that only 1% of households mainly use liquefied petroleum gas (LPG). The percentage of households using firewood decreased from 78.7% in 2011 to 72.0% in 2018, while charcoal use increased from 20.2% in 2011 to 27.7% in 2018. Firewood remained the main source of cooking fuel in rural areas, although its usage declined from 97.2% in 2011 to 95.2% in 2018. In contrast, only 32.8% of urban households used firewood, down from 50.1% in 2011. Charcoal became the most common cooking fuel in urban areas, rising from 48.8% in 2011 to 66.7% in 2018. In both urban and rural areas, affordability and availability have remained key barriers to accessing and using clean cooking fuels and technologies²⁶.

Inefficient firewood cooking methods are most common in rural areas, with the open ‘three-stone fire’ being the most prevalent. These three-stone fires are gradually being phased out and replaced by clay stoves and metal coal pots in urban centres. However, it is important to note that three-stone fires still play a significant role, even in urban centres, for preparing food that requires longer cooking times.

Despite the heavy reliance on traditional biomass in Sierra Leone, both public and private initiatives are working to increase access to clean cooking solutions. For instance, Sierra Leone’s Cleaner Cooking Energy Compact aims to provide all households with access to energy-saving cooking solutions and increase the adoption of LPG to 25% in 2030²⁷, up from 1%.

In an effort to increase the use of clean cooking energy, the Ministry of Energy, through the Sierra Leone Electricity and Water Regulatory Commission for Electricity Distribution and Supply Authority, has introduced incentives related to monthly electricity tariffs. These tariffs are classified into three bands: social, normal, and high-end users, with rates set at 0.082, 0.15, and 0.16 USD/kWh, respectively²⁸, which fall within the range of the average electricity tariff in SSA of 0.114 USD/kWh.

Other policies include: (1) the National Cooking Energy Action Plan, which aims to reduce the use of charcoal and firewood by 60% and 80%, respectively, by 2030; and (2) the National Bioenergy Action Plans (NBAPs) aimed at increasing the scale of LPG use from 1% to 20% by 2030²⁹.

18. (SLEWRC, 2022)

19. (Statista, 2023)

20. (Diecker, Wheeldon, & Scott, 2016)

21. (Trading Economics, 2024)

22. (WHO, 2022)

23. (World Bank, 2023)

24. (Fargione et al, 2010)

25. (Stats SL, 2018)

26. (EnDev)

27. (Ministry of Energy, 2021)

28. (SLEWRC, 2022)

29. (ECOWAS, 2020)

Access to finance

Household level access

Sierra Leone ranks the lowest in terms of financial inclusion in West Africa, with only about 20% of the adult populace having access to formal financial services³⁰. The World Bank's Global Findex data shows that only 25% of men and 15% of women in the adult population own a bank account³¹. These figures fall significantly below the SSA average of 42.6%, indicating that a large portion of the population is financially excluded³². Most financial institutions are concentrated in the capital city, Freetown, and secondary urban areas like Bo and Kenema, leaving a large portion of the population in other parts of the country excluded from the financial system. Contributing factors may include high operational costs for financial institutions entering rural and underserved areas of the country, as well as the lack of an established business case and sustainability plan for operating in remote locations.

In the informal settlement of Susan's Bay, one of ENACT's project locations, most inhabitants are unemployed, whilst only a few are engaged in informal employment opportunities. This has contributed to lower income levels, making it difficult for many to access formal credit from microfinance and other lending institutions. Moreover, the requirement for collateral to secure credit from the existing lending institutions remains a stumbling block for some people living in informal settlements who operate small-scale businesses.

Individuals running small and medium enterprises (SMEs) have, however, benefited from a government-led scheme known as the Munafa Fund, where the Bank of Sierra Leone has provided a 500 billion Sierra Leonean Leone (SLL) credit facility aimed at boosting economic activities across the main value chains in the country³³. For small-scale traders, access to credit is facilitated through membership in savings groups (*osusu*), a form of self-support for individuals engaged in micro and small-scale trading activities. The majority of *osusu* members are women³⁴.

Economic activities

The main economic activities of Susan's Bay inhabitants include hawking, fishing, fish mongering, auto-rickshaw (*keke*) and motorbike (*okada*) riding, as well as skills-based trades such as making artefacts and local stoves. Despite the range of economic activities, the lack of a dedicated marketplace remains a significant challenge. Without a well-constructed space to display their merchandise and produce, many residents – especially those involved in skills trading – are discouraged, leading to higher unemployment. Figure 2 highlights the country's employment distribution by sector, with agriculture contributing the largest share, a typical trend in the sub-Saharan region.

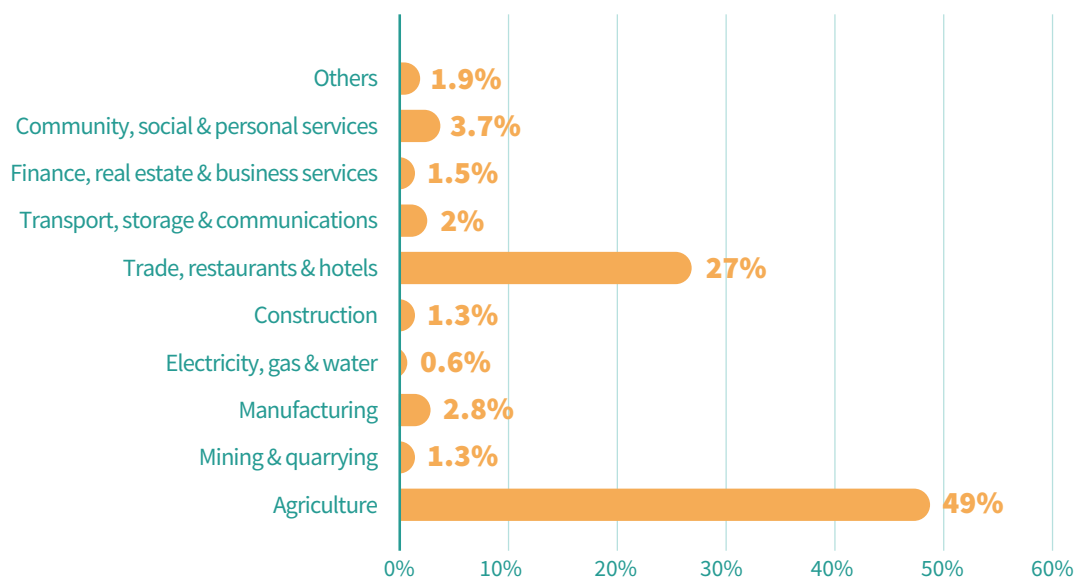
30. More information here: <https://www.mfw4a.org/country/sierra-leone>

31. (Demirguc-Kunt et al, 2021)

32. (World Bank, 2024)

33. (World Bank, 2022)

34. (SLURC, 2018)

Figure 2: Share of total sector employment in Sierra Leone 2020**Source:** International Labour Organization

High levels of unemployment have led to a rise in entrepreneurship (self-employment) in urban areas. A fragile economy, a lack of formal employment opportunities for an increasing number of graduates, and low wages for those employed have contributed to the growth of entrepreneurship in Sierra Leone. The country's labour force participation rate has slightly declined, from 64% in 2000 to 58% in 2020, which is lower than the average for West Africa. Informal employment accounted for almost 86% of the total employment in 2018³⁵.

In recent years, there has been demographic shift which has led to a growing population of young people that is unemployed or under-employed. This reflects the scarcity of formal employment opportunities. In 2020, approximately 88% of Sierra Leone's population was self-employed, with women constituting 94% and men 82%³⁶.

Enterprise case level

Public finance from the national government alone is insufficient to bridge the financing gap for providing low-carbon energy sources and cooking solutions³⁷. This is understandable from two key perspectives related to Sierra Leone's economic situation: the limited pool of financial resources and the need to avoid increasing unsustainable debt-to-GDP ratios. Consequently, commercial capital from private financing is crucial to bridging the access to financing gap in Sierra Leone's clean cooking energy sector. However, the trend of private capital in the country is concerning; data from the Bank of Sierra Leone shows that private sector credit, as a proportion of gross

outstanding credit, has been declining since 2018³⁸.

Despite the low levels of commercial finance³⁹, supply chain financing has played a key role in advancing the energy sector. This type of financing has enabled the channelling of funds into the value chain from impact investors, community banks, development finance institutions (DFIs), commercial banks, and crowdfunders/crowdfunding platforms. For instance, the African Development Bank (AfDB) and the World Bank are active providers of technical and financial assistance to the sector. Double bottom-line investors, such as Gaia

35. (Danish Trade Development Agency, 2020)

36. (World Bank, 2020)

37. (Natural Resources Defense Council, 2016)

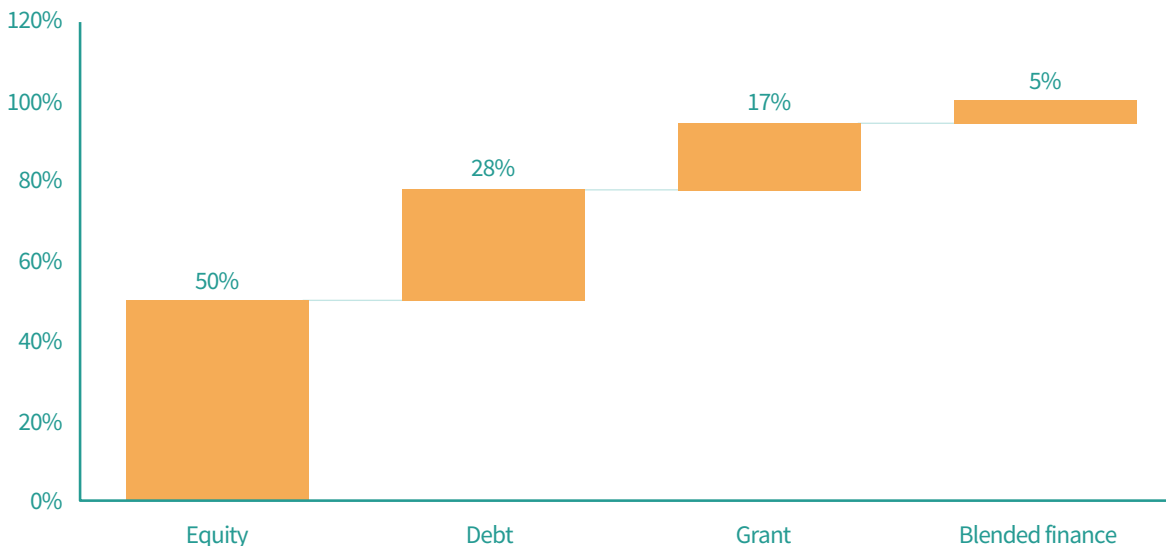
38. More information here <https://bsl.gov.sl/>

39. Author's derivation per assessment of existing literature.

Fund and Acumen, invested approximately \$3.5 million in Easy Solar in 2018, followed by a \$3 million round in 2020 from the Dutch Entrepreneurial Development Bank

and Acumen⁴⁰. The funding landscape in Sierra Leone has been mainly dominated by equity from private fund managers as depicted in Figure 3.

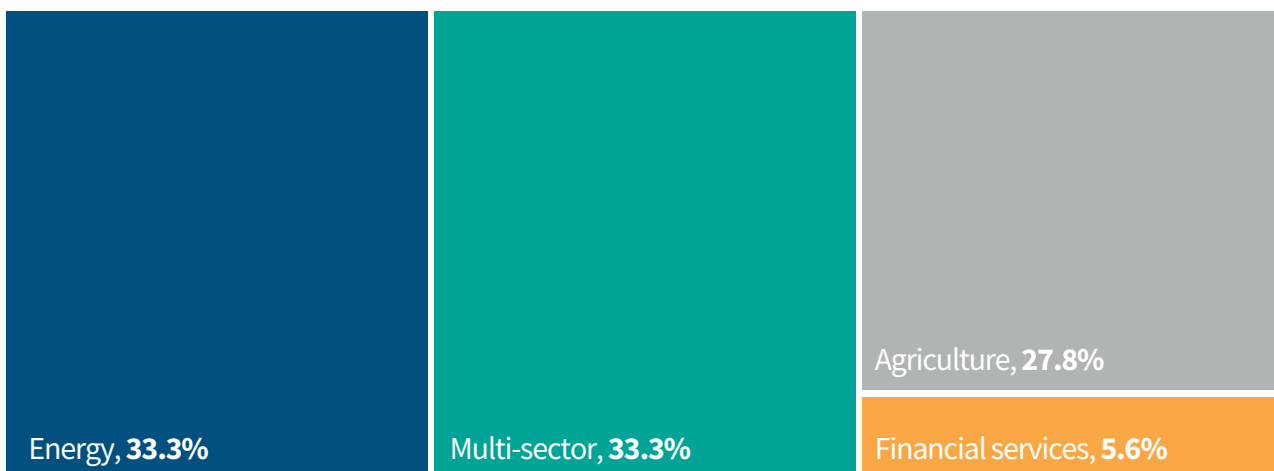
Figure 3: Funding instruments used by private fund managers in Sierra Leone



Most of this funding is directed towards the energy sector (33%), as can be seen in Figure 4.

Figure 4: Private fund sector investments

Source: Intellecap synthesis⁴¹



40. More information here: <https://acumen.org/news/acumen-makes-first-investment-in-sierra-leone/>
 41. (Intellecap, 2021)

Small and medium enterprises in Sierra Leone face acutely low levels of access to finance and scarce credit options. A recent World Bank survey found that only 17% of SMEs in Sierra Leone have an active line of credit or a loan⁴².

The survey also noted that, although 70% of SMEs had a formal bank account, access to loans was persistently low, as depicted in Figure 5.

Figure 5: Use of financial services by SMEs with respect to firm size

Source: World Bank Enterprise Survey



Challenges hindering SMEs from accessing financial services to boost their business operations include high collateral requirements by banks, a lack of business development support in the form of technical assistance

to grow SMEs into creditworthy or investment-eligible enterprises, a lack of business readiness, and limited availability of financing instruments and external capital that meet SMEs' financing needs.

The urbanisation, energy and climate change nexus

UN-Habitat estimates that Africa's rate of urbanisation will likely reach 60% by 2050⁴³. However, despite the higher urbanisation rate, GDP growth in sub-Saharan countries has remained low⁴⁴, hence the rising inequalities and limited economic opportunities in both primary and secondary urban areas. This is further exacerbated by the limited technical, financial, and institutional capacity of cities to manage the expansion of informal settlements. As a result, residents of informal settlements are often excluded from city plans and strategies, leading to

inadequate provision of basic services such as energy, water/sanitation, proper housing, secure tenure, and waste management⁴⁵.

The rapid growth of urban centres in SSA has driven up energy demand, placing a vastly increased burden on urban governance. This has consequently incentivised increased focus from relevant public institutions and development agencies on urban centres. Despite the demand for energy in African cities, energy access remains significantly low,

42. (World Bank, 2018)

43. For more information, see UN-HABITAT's Africa Urban Agenda Programme here <https://unhabitat.org/africa-urban-agenda-programme>

44. (World Bank, 2023)

45. (Cities Alliance, n.d.)

mainly due to inaffordability and the inability of energy product and service providers to service the low-income urban population. Access to affordable, reliable, and sustainable energy is a prerequisite for economic growth, employment, poverty reduction, quality education and healthcare services⁴⁶.

The resulting outcome of low or limited access to sustainable energy includes missed livelihood opportunities. There is also a significant quality of life impact: traditional energy sources, such as torch batteries or kerosene for lighting, and charcoal for cooking, are unhealthy, ineffective, expensive, and unsafe.

Household energy use contributes more than half of black carbon emissions, making it a significant contributor to climate change⁴⁷. While affordability heavily influences the use of unclean fuels in urban informal settlements, cleaner cooking brings about a double dividend ecosystem gain: combating climate change and reducing environmental degradation.

As informal settlements are located along the coastline and hillsides, residents are exposed to constant environmental risks, such as flooding and landslides. These threats have intensified due to continuous hillside deforestation for charcoal and firewood. The August 2017 landslide on the hillside overlooking Freetown destroyed 400 buildings, affected 5,000 people, and claimed an estimated 1,100 lives. This natural disaster highlighted the urgent need for planning to promote urban resilience and risk reduction. Other than disasters, current urbanisation patterns have created 'urban risk traps', such as insufficient sanitation, informal electrical connections, and inadequate physical planning. These issues have led to congestion in urban informal settlements and exposed the urban underserved to the cumulative deterioration of lives and assets caused by everyday risks and small-scale disasters.

Therefore, exploring and transitioning to alternative cleaner and more efficient fuels for cooking (such as ethanol, LPG, biogas, electricity), is essential, including assessing their economic feasibility relative to current options and to the constraints shaping household decisions.

Urbanisation in Sierra Leone

Sierra Leone's urban population stands at 24%, with an annual urbanisation rate of 2.75%. By 2030, the urban population is expected to grow by 2.4 million⁴⁸. This population increase saturates the limited employment opportunities, leading to a higher incidence of unemployment, and unstable informal employment with low-income levels. The resulting economic limitations, combined with a lack of affordable housing, are key drivers behind the formation of informal settlements which only offer sub-standard living conditions⁴⁹. Low incomes and high unemployment have pushed the urban population to seek cheaper housing, contributing to the growth of informal urban settlements, which stands at 36%⁵⁰.

Freetown has 26 informal settlements, most of which are located in the hillside terrain or along the coastline. This report focuses on Susan's Bay, an informal settlement along the shoreline of the Atlantic Ocean. Susan's Bay is one of the largest and most economically disadvantaged informal settlements in Freetown, with an estimated 1,857 households and a population of approximately 7,519⁵¹.

Like other informal urban settlements, the lack of quality basic services, such as energy access, has hindered economic growth in the community and Freetown overall, resulting in missed livelihood opportunities and financial challenges in the community's daily life. Challenges such as consumer affordability and constrained funding for enterprises to introduce, pilot, and scale innovations have often hindered clean energy providers from serving these communities.

Affordability, a major barrier to accessing clean cooking energy sources, has led to continued reliance on firewood and charcoal in informal settlements. A needs assessment by ILEM Africa, Afrigas, and Paygas revealed the following: firewood was the main source of energy for 72% of households, followed by charcoal at 27%, while LPG and biogas were at 0.99% and 0.2%, respectively (Figure 6).

46. Find more details on Sustainable Development Goal 7 at <https://sdgs.un.org/goals/goal7>

47. (Climate and Clean Air Coalition, n.d.)

48. (World Bank, 2021)

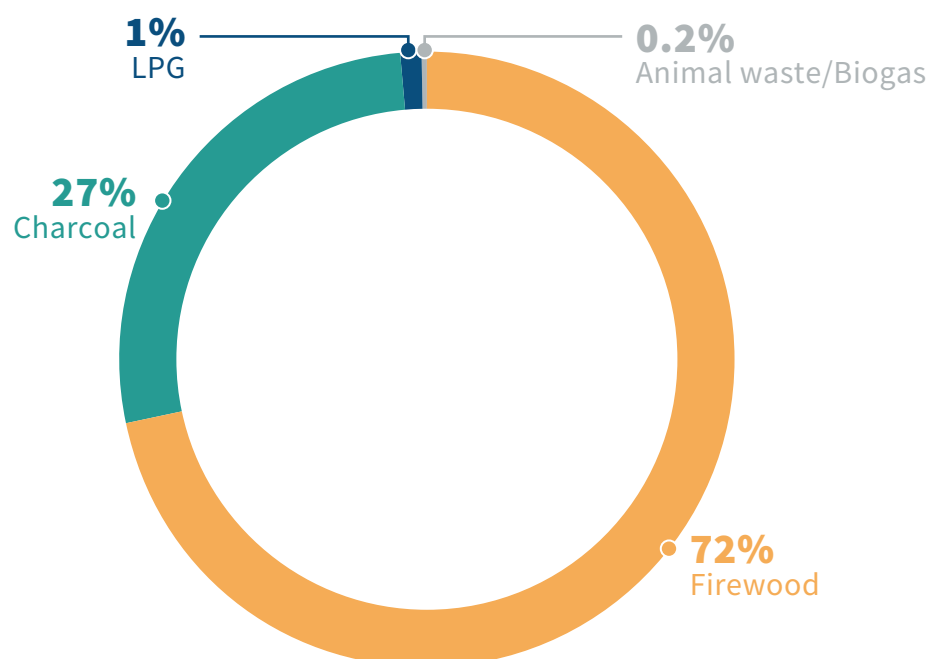
49. (UN-HABITAT, 2024)

50. (BRAC Sierra Leone, 2014)

51. (CODOHSAPA & FEDURP, 2011)

Figure 6: Cooking energy sources in Susan's Bay informal settlement

Source: ENACT Project, 2022. Feasibility Assessment on Access to Clean Cooking Solutions in Susan's Bay, Freetown, Sierra Leone (some percentages rounded up).



Features of urban informal settlements

Informal settlements are home to Freetown's lowest-income residents. It is estimated that about two-fifths of Africa's urban population lives in informal settlements. According to UN-Habitat, an informal settlement is defined as an area that exhibits one or more of the following five characteristics⁵²:

1. **Structurally deficient housing:** The housing lacks a permanent structure that provides protection from extreme climatic conditions. Most housing structures in informal settlements are made from temporary material such as cardboard, tin sheets, or mud. There are some permanent structures made from bricks or cement, though most do not comply with national building standards, and are not designed to protect their inhabitants from climate-related issues such as prolonged cold or hot periods, storms, or heavy rains⁵³.
2. **High occupant density:** There is insufficient living space, with an acceptable standard being no more than three people per habitable room.
3. **Limited access to safe water:** Water is insufficient, unaffordable and is obtained with extreme effort. A household is considered to have adequate access if it can get at least 20 litres of drinking water per person per day for family use at a price not exceeding 10% of its total income.
4. **Limited access to sanitation and other infrastructure:** Access to infrastructure and sanitation is uneven and limited. Informal communities often struggle to access sanitation, electricity, and water. They are often forced to pay more for these services through landlords and intermediaries.
5. **Insecure residential status:** There is no de facto or de jure security of tenure or protection against forced eviction. Residents are considered secure if they have documentation that demonstrates protection against unlawful eviction.

52. (UN-Habitat, 2014)

53. (UN-Habitat, 2018).

These gaps exacerbate the underlying socioeconomic inequalities, further hindering the overall development and wellbeing of informal communities. According to Cities Alliance, informal settlements also lack municipal services, such as water, sanitation, and waste collection services, as well as schools and clinics within easy reach, safe areas for children to play, and spaces for the community to meet and socialise⁵⁴. Notably, none of the

definitions above specifically mention access to quality and affordable energy services or infrastructure, yet this is a common challenge among the urban underserved.

UN-Habitat further outlines factors contributing to the formation of informal settlements, and how governments have traditionally handled informal settlements^{55, 56, 57}. These are highlighted in Box 1 below.

Box 1: The formation and management of urban informal settlements

The following key factors have led to the rapid growth of informal settlements, particularly in developing countries:

1. **Failure of governments and markets to meet the high demand for safe, stable and affordable housing:** Rural migrants move to cities at a high rate, driving up demand for housing. Both governments and the private sector are unable to keep pace with this demand. Quality land and housing are often out of reach for most rural-urban migrants, who tend to experience more economic hardship than other residents of urban areas. They, therefore, resort to low-quality accommodation or squatting. Additionally, affordable, quality land is in short supply, which means many informal settlements are in high-risk areas that expose residents to climate-related hazards such as floods and landslides.
2. **Weak government policies:** Urban planning systems, especially in developing countries, are not designed to manage or prevent the development of further informal settlements. The fact that national and local governments do not acknowledge informal settlements as part of the city further exacerbates the situation. In addition, city planning often does not consider the projected economic and social needs of people living in informal settlements.
3. **Under-investment in infrastructure for underserved communities:** When local authorities do not recognise informal settlements as legitimate, minimal investment is made in developing infrastructure such as proper housing, roads, electricity, water and sanitation, waste management, and social institutions in these areas. Housing standards and building by-laws, for example, seldom favour the urban underserved, and any construction that does not meet these standards is classified as “illegal”, which is often accompanied by tenure insecurity and eviction threats. As a result, the urban underserved use temporary or semi-permanent materials for their housing, fearing loss of investment due to forced eviction. On the other hand, the private sector does not consider informal settlements to be an attractive housing market, due to high perceived risk and low return on investment. Limited avenues for the urban underserved to access financing for proper housing further exacerbates this challenge.

National and local governments have traditionally adopted the following five measures to address the formation and growth of urban informal settlements:

1. Ignoring them, assuming that they are temporary and will disappear as the economy grows.
2. Politicising them as a way for politicians to gain popular support. While this can lead to some improvements, it is usually pegged to the political interests of leaders and the legitimate needs of people living in informal settlements may not be addressed.
3. Displacement through eviction, often to pave the way for large-scale development projects and events, or for failure in complying with increased rent rates.

54. More information here: <https://www.citiesalliance.org/newsroom/news/results/informality-cities-global-review-series>

55. (UN-Habitat, 2003)

56. (UN-Habitat, 2014)

57. (UN-Habitat, 2018)

4. Relocation, where the urban underserved are relocated to other areas and the land in informal settlements is redeveloped. However, relocation initiatives often fail to consider broader needs, such as proximity to work and household expenditure, causing some people to return to their original residences.
5. Public housing, where people living in informal settlements are rehoused in public housing in other parts of the settlement.

Programmes and policies supporting informal settlements

Various programmes and policies have been implemented with the short- and long-term goal of improving the livelihoods of inhabitants in urban informal settlements. Some of these initiatives are led by a blend of governments (national and local), and private organisations such as community-based organisations and non-governmental organisations (NGOs). Below is a brief overview of programmes that have directly impacted urban informal settlements in Freetown.

Credit enhancement instrument (Munafa)

Munafa is a microfinance institution (MFI) with a social mission to improve the financial inclusion of rural informal businesses that are otherwise unserved or underserved. Established in 2018 and operationalised in 2021 with funding from a French non-government association (Entrepreneurs du Monde), Munafa focuses on supporting entrepreneurs in communities most affected by climate events and economic hardship⁵⁸.

The lack of formal credit access for informal enterprises and underserved groups highlights the urgent need for affordable credit solutions. This creates an opportunity for MFIs to serve as primary providers of brick-and-mortar-based financial services. To bridge this gap, Munafa provides small and microloans to marginalised and underserved communities and groups. The institution adapted and adopted the ASA International⁵⁹ group lending model.

Munafa identifies locations with a relatively low social development index, high poverty, and economic distress. It then supports the community to form groups of 20-30

individuals. Group members act as “social collateral” for members, ensuring personal liability for loan repayment.

Smiling Through Light

Smiling Through Light⁶⁰ is a social enterprise that aims to increase clean electricity access in Sierra Leone. The enterprise has set up distribution networks and supports women-led enterprises. It focuses on last-mile distribution, enabling communities to access to safe and clean lighting technologies, while concurrently improving their income levels.

As a progressive consequence, Smiling Through Light promotes economic growth, strengthens environmental awareness, and addresses household air pollution through its dual approach of creating business opportunities and expanding clean energy access. In addition, profits are reinvested to acquire new stand-alone solar products and provide training and ongoing support to local women.

GOAL Sierra Leone

The rapid rate of urbanisation in Freetown has constrained the management of liquid and solid waste, leading to inadequate sanitation. With financial support from the Foreign, Commonwealth and Development Office (FCDO) and in partnership with the Freetown City Council (FCC), GOAL Sierra Leone has established a waste treatment plant that uses Geobag de-watering technology, which sieves the liquid from the solid waste. This has helped reduce the amount of liquid waste that would have contaminated the environment, thereby reducing health risks for the communities. The waste treatment facility has also employed young people. The by-products of the

58. (Entrepreneurs du Monde, 2023)

59. For more information on ASA International, see <https://www.asa-international.com/>

60. More information here: <https://www.smilingthroughlight.com/>

Geobag technology provide an avenue to explore climate-smart waste-to-energy solutions, offering alternatives to biomass for cooking and addressing unregulated deforestation, as well as producing raw materials for composting on farms⁶¹.

JICA biogas project (UNOPS and FCC partnership)

Since the devastating fire at Susan's Bay, UNOPS has been working with the government of Japan to help the informal settlement build back better. Located along the Atlantic shoreline, Susan's Bay is highly exposed during the rainy season when flash floods occur, due to high population density and inadequate sanitation. As a result, \$2.3 million in funding from JICA incentivised a working cooperation between UNOPS, FCC, and the government of Sierra Leone's National Disaster Management Agency to enhance Susan's Bay's resilience to disasters⁶².

To address the energy deficiency within Susan's Bay, the JICA programme plans to construct a biogas energy system through UNOPS. The system will convert food waste and kitchen refuse into electricity. Additionally, biodigester toilets will be used to turn waste into organic

fertiliser, improving sanitation and promoting a circular economy. UNOPS also plans to rehabilitate stairways and drainage systems and connect existing water reservoirs to community taps, addressing the community's clean water challenges⁶³.

Women for Water and Peace (W4WP)

The project is funded by the United Nations Secretary General's Peacebuilding Fund, with the implementing partners comprising FCC, United Nations Capital Development Fund (UNCDF), and International Labour Organization (ILO). Using a community-led approach, the project aims to support young girls and women in the communities to become agents of change by supporting the construction and management of 25 water kiosks fitted with solar-powered purification systems. The water kiosks will provide accessible, clean water to Freetown's communities most impacted by climate hazards in a conflict-sensitive manner. Young girls and women will be supported to operate the kiosks as businesses and become agents of change and peace⁶⁴.

Why do we need more financing for energy access in urban informal settlements?

The slow shift to clean cooking solutions has been spotlighted extensively in literature covering wide variations in momentum and outcomes of the transition across geographies. The literature points out the inhibiting factors limiting the wider uptake of clean cooking solutions such as undeveloped and underdeveloped supply chains. While urbanisation steadily increases, informal urban settlements are experiencing rapid population growth, further worsening particulate matter emissions from reliance on unclean cooking solutions.

In the final decade for achieving the 2030 Agenda for Sustainable Development and in the face of global economic turbulence, it has never been more important to steer private finance towards the Sustainable Development Goals (SDGs) to improve people's wellbeing, enhance prosperity and protect the planet. Clean cooking, encompassing Modern Energy Cooking Solutions (MECS), is a key target under SDG 7, with implications for several other SDGs, such as good health, gender equality and

climate. The energy mix in Sierra Leone's informal settlements shows that, traditionally, biomass is used for cooking, while electricity is used in lighting.

Preliminary findings from existing literature indicate market failure in the clean cooking value chain, as the currently most used solution, traditional biomass, results in few or no improvements to people's lives. Rectifying this failure, which emanates from multiple market and behavioural obstacles, would result in significant health, time, and emissions benefits. However, achieving this requires identifying and promoting market system development-oriented financial approaches and policies aimed at transforming cooking energy use.

Considering the net social and economic benefits, time is nigh for facilitating more direct and targeted financing that is urgently needed in expanding the use of clean cooking solutions.

63. (UNOPS, 2022)

64. (United Nations, 2016)

61. (United Nations, 2022)

62. (United Nations, 2022)

ENERGY PRODUCT AND SERVICE PROVIDERS

Mapping energy service providers

Energy service providers (ESPs) are essential to promoting clean cooking technologies in the informal settlement of Freetown. Table 1 shows some of the clean cooking ESPs in Sierra Leone providing clean cooking products and services.



Image: Cookery seller in Susan's Bay uses an LPG stove to prepare meals to sell.

Table 1: Energy product and service providers in Sierra Leone

ESP	Activities
Easy Solar Limited	Deals in energy access projects, offering products such as solar lanterns, home lighting systems, appliances, and cookstoves on affordable financing plans.
Afrigas	Imports, stores and distributes portable LPG (6kg and 12kg cylinders) for clean cooking purposes.
Westwind Energy	Designs, manufactures and distributes efficient cookstoves in West Africa under the Wonder Stoves brand. Since 2012, over 50,000 cookstoves have been distributed in Sierra Leone, Guinea and Liberia, reducing biomass consumption by up to 50%. Approximately 15,000 tons of CO ₂ e emissions have been reduced annually, while creating more than 200 jobs and trainings.
Women in Energy Sierra Leone Limited	Fosters the acquisition of knowledge and enhances access to clean cooking and clean energy solutions. The main products include smart green stoves and smart green briquette cookstoves, along with solar home systems.
St Conrad Company Limited	Provides clean cooking solutions in the form of briquettes and energy efficient cookstoves to help reduce household air pollution and offer cleaner cooking options for women and girls.

Engagements in informal settlements

ESPs elevate the standards in informal settlements through programmes and products that promote energy access, enhance energy efficiency, and support sustainable development. Informal settlements, characterised by limited infrastructure and economic constraints, require concerted efforts to address these issues through activities that include:

- Provision of affordable solar solutions:** ESPs install solar home systems, solar lanterns and other appliances to provide reliable and affordable lighting and electricity solutions. These are paired with favourable payment models, such as pay-as-you-go, to bridge the gap in affordability for communities with low disposable income.
- Energy efficiency programmes:** Distribution of energy-efficient appliances and advocacy for practices that optimise energy consumption, including the use of LED bulbs and efficient cookstoves by ESPs, are essential in promoting energy efficiency within the informal settlements.
- Community awareness and education:** Workshops and outreach programmes conducted by ESPs in informal settlements help to inform residents about the benefits of clean energy and energy efficiency projects. The safety of the populace is enhanced with the dissemination of information on safety practices relating to energy use as well as equipment operation procedures.
- Partnerships with local businesses:** Within the informal settlements, there are opportunities for ESPs to collaborate with local entrepreneurs and retailers to expand the distribution and maintenance of energy access products. Local businesses that benefit from the products can also operate more efficiently and extend the operation hours.
- Waste-to-energy initiatives:** Waste from informal settlements can be converted into energy for community use, such as biogas from organic waste. Freetown Waste Transformers and Freetown City Council piloted a waste-to-energy biodigester project to address waste management and sanitation issues, while simultaneously providing electricity and compost fertiliser. The combination of waste management, energy provision, and job creation demonstrates the project's positive impact on the community.
- Skills enhancement and peer-to-peer knowledge sharing:** Local technicians in informal settlements benefit from training offered by ESPs on the installation, maintenance, and repair of energy access systems.

- Facilitation of financing and payment plans:** Consumer affordability is one of the barriers to adopting clean energy projects within the informal settlements, as the end-users have low disposable incomes. ESPs are essential in developing business models that are favourable to that context by enacting pay-as-you-go or credit-based models where consumers pay for the product over a given term as they use it.
- Resilience and adaptation support:** ESPs are crucial in building climate-resilient and adaptive communities, particularly for those living in informal settlements, by providing sustainable and reliable energy solutions in adverse weather conditions. They also incorporate productive use of energy (PUE) applications as an economic cushion from environmental shocks.
- Support for social and community services:** ESPs support social and community services in informal settlements by providing energy solutions across schools, clinics, and community centres, among others, to enhance service delivery.

Financing needs

ESPs have taken up a crucial role in energy transition and low-carbon projects, which are finance-intensive. Therefore, more support is required as long as the objectives remain: increasing the share of renewable energy, reducing greenhouse gas emissions, and promoting sustainable development. The financing needs for ESPs have been identified based on lessons learnt throughout the ENACT project implementation phase. Business growth stages, from seed to maturity level, all require capital investments to perform the following functions:

- Market and brand activation:** Endearing the target audience to the products requires interactive events and experiences, which require the facilitation of capital investment.
- Research and development:** Important at initial stages for developing new technologies, improving the existing solutions, and conducting feasibility studies.
- Scaling up:** Growth in demand necessitates additional capital to scale up operations, including expanding production capacity, venturing into new markets and enhancing distribution networks.
- Infrastructure development:** Capital investment is critical for building necessary infrastructure, such as LPG refill plants, energy-efficient cookstoves assembly, briquette manufacturing plants and distribution lines, among others.
- Community and stakeholder engagement:** The success of projects is heavily pegged on engaging local communities and stakeholders, which requires investment in communication, outreach, and may extend to social and behavioural intervention programmes.
- Innovation and adaptation:** The constantly evolving energy sector demands that companies keep up to date with the trends, while adapting to new technologies and market conditions. Financial investment is required for staff retraining, adopting new business models, and integrating new technologies.
- Compliance and regulatory requirements:** ESPs must comply with environmental and safety regulations and obtaining the mandatory permits and licenses in their jurisdiction that may attract financial resources.
- Operations and maintenance:** Recurrent expenses for maintaining equipment and facilities, ensuring operational efficiency, and minimising downtime to support reliable and sustainable operations all require financial resources.

FINANCING INSTRUMENTS FOR CLEAN COOKING

Overview of energy financing mechanisms

Financial support is pivotal in enabling energy access enterprises to succeed, especially in highly competitive urban spaces. Financial support is mainly delivered through instruments or mechanisms that are issued in various forms, as outlined in Box 2 below. It is estimated that \$4 billion is needed annually to provide clean cooking energy to 250 million people in Africa. AfDB plans to invest \$200 million per year towards achieving the target.



Image: An AfriGas community ambassador conducts an awareness-raising event at Susan's Bay community hall.

Box 2: Forms of financial instruments/mechanisms applicable to energy access projects

Grants: Funds given to an entity with no repayment expectation. Mostly provided by philanthropic and public actors.

Equity: Capital provided in exchange for ownership in the enterprise, with expectations of future growth. Equity finance is most often provided by investors and investment funds.

Debt: Capital provided with the expectation of future repayments plus interest. Debt financing usually requires hefty collateral and is most often provided by financial institutions.

Outcome-based financing: A mechanism where governments, state agencies, or donor agencies disburse funds to a recipient once a pre-agreed set of results has been achieved.

Crowdfunding: Fundraising that involves people and organisations contributing money to finance projects and businesses.

Commercial capital: Funds that can be obtained in domestic and international capital markets through, for example, the issuance of bonds (debt obligations or borrowing by enterprises, governments, and multilateral banks) with a target market rate of return.

Blended finance: Use of catalytic capital from public or philanthropic sources to increase private sector investment in sustainable development. Catalytic capital is more patient, risk-tolerant, or concessionary than traditional private sector capital, which seeks to maximise financial returns.

Depending on the growth stage of an enterprise, various financial instruments are tailored to meet its specific needs, ensuring that the funding aligns with the enterprise's level of operation and profitability (Figure 7). A non-exhaustive list of such instruments includes impact-ready matching grants, repayable grants, soft loans, crowdfunding, convertibles, SAFE agreements, social impact incentives,

tech-enabled lending, trade finance, and public equity. Beyond the private sector, governments have played a momentous role in enhancing access to clean energy for both cooking and lighting. In this context, ICLEI Africa has published a report on the various forms of public sector financing aimed at scaling clean energy access⁶⁶.

66. Key resources published by ENACT can be found at <https://africa.iclei.org/project/enact/> and <https://www.energy4impact.org/resources>

Figure 7: Financing S-curve

Source: Energy 4 Impact research on the financing landscape⁶⁷

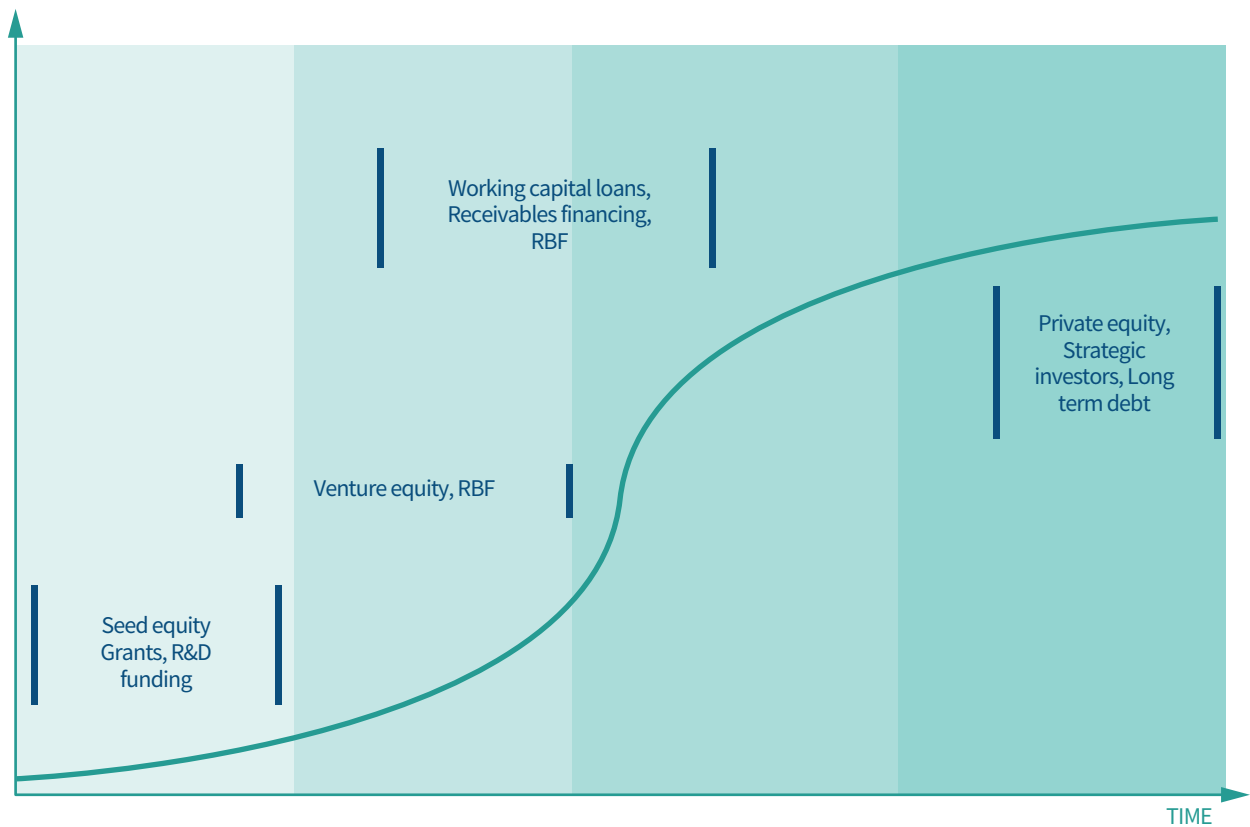
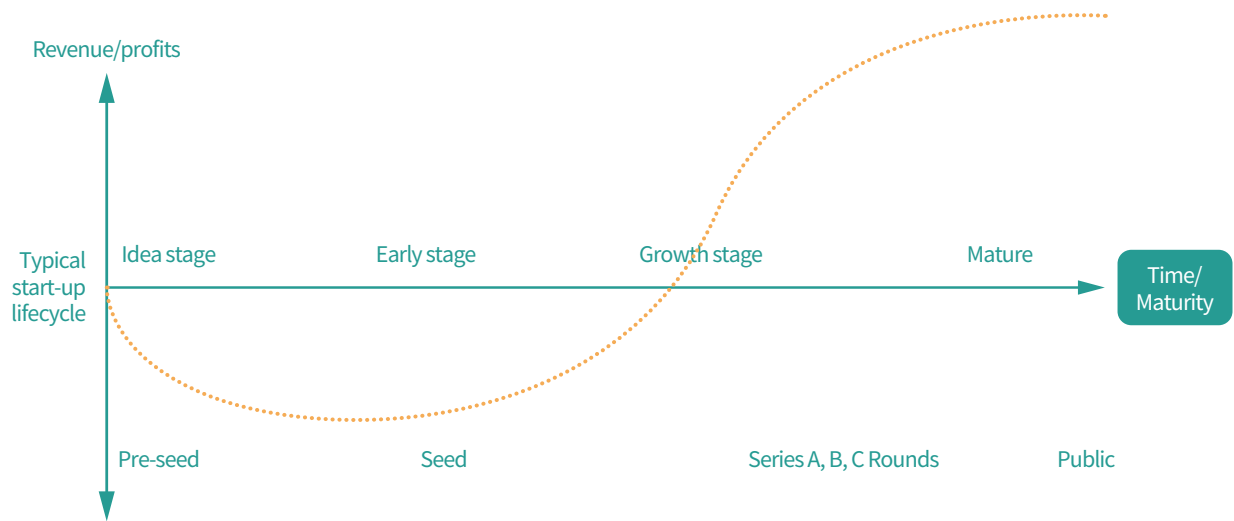


Figure 8 shows that sources of financing instruments can be clustered into four main categories depending on the financial return expectation.

67. (MECS & Energy 4 Impact, 2022)

Figure 8: Clustering financial instruments against financial return expectations

Source: Author's conceptualisation as per assessment of existing literature.

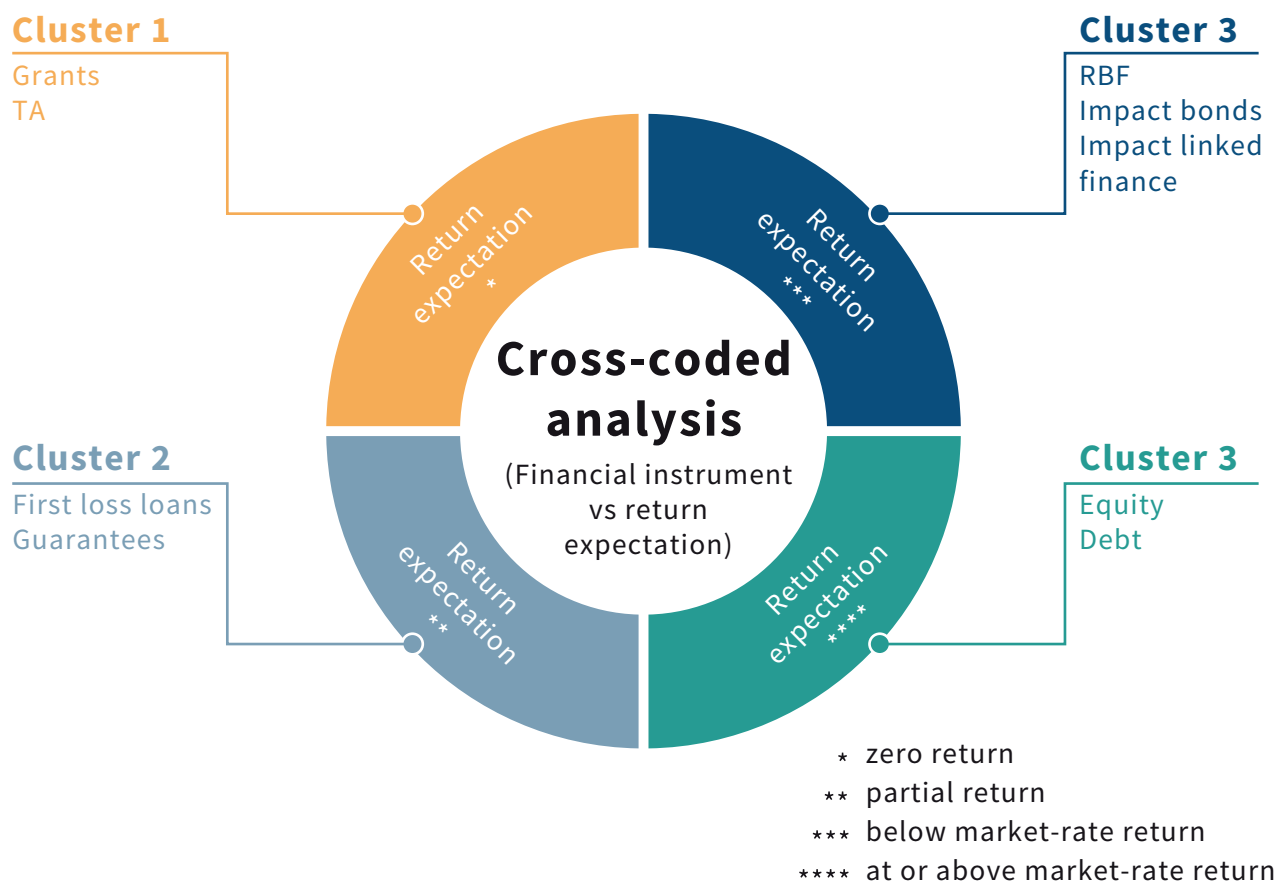


Figure 8 highlights the numerous forms of funding that are applicable to energy enterprises that integrate into their financing needs depending on their growth stage, as depicted along the financing S-curve in Figure 7. While an MSD approach is important in sustainably supporting energy enterprises in the clean cooking ecosystem, some financiers or funders offer first-loss loans instead of grants⁶⁸.

The clean cooking space has attracted various forms of financing, mainly in the form of grants, private equity, venture equity, outcome-based finance, debt, technical assistance, first-loss loans, and impact bonds. Most energy enterprises prefer patient and affordable capital structured as subordinate debt or quasi-equity blended with grants. This should also be layered with a market return rate, with the caveat of not prematurely putting pressure on the enterprises' financial returns⁶⁹. Table 3 presents a snapshot of the various forms of financing provided to

clean cooking SMEs. However, grants and increasingly equity have been the most common forms of funding in the clean cooking value chain, while debt financing is less preferred especially by early-stage enterprises lacking sufficient financial history for a loan and access to investor networks⁷⁰.

Equity financing

Equity investments are crucial for developing commercially viable and scalable clean cooking enterprises. Most clean cooking financing has come from equity and grants. There is a lack of impact investors willing to invest in early-stage businesses, preferring to invest at the stage of commercial viability. As a result, equity funds play a crucial role in the budding and early growth stages of an enterprise's development, helping to de-risk enterprises as they explore different business models and operations towards scaling up.

68. Author's conceptualisation as per assessment of existing literature.

69. (Global Alliance for Clean Cookstoves, 2021)

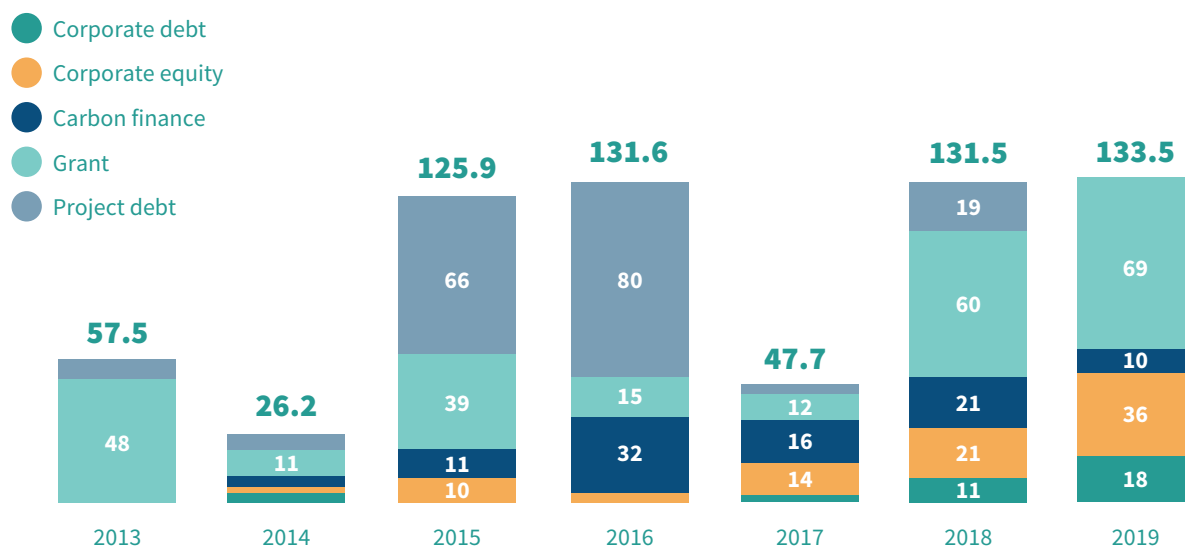
70. (MECS & Energy 4 Impact, 2022)

The clean cooking sector is nascent but is growing rapidly in high impact countries in SSA. In other energy access value chains, equity funds have played a significant role in the scale-up phase. Private equity funds are numerous and

actively growing in number. For instance, between 2015 and 2019, equity investment commitments constituted the majority of the commercial funding for clean cooking value chain enterprises in high impact countries (Figure 9).

Figure 9: Clean cooking commitments between 2013 to 2019 in high impact countries

Source: Sustainable Energy for All and Climate Policy Initiative, *Energizing finance: Understanding the landscape 2021*.



Debt financing

Debt financing refers to repayable loans issued to clean cooking enterprises, sourced locally or internationally, either directly or through local financial institutions. Affordability is a significant barrier to clean cooking in the informal settlement target market in high-impact countries (WHO, 2021). While most clean cooking enterprises sell their appliances for cash, affordability issues and low consumer credit have led to hire-purchase or pay-as-you-go schemes becoming the main payment plans. As a result, these enterprises seek debt financing to support their operations. The enterprises are mainly in the late-growth to mature stage and exhibit the following characteristics:

- Sales sustain initial business operations but not growth (late-growth stage).
- The business model is functioning, and the focus is on expansion into new geographies.
- The enterprise is profitable.

- The enterprise has created consumer demand.
- The brand is developed and recognisable.
- Strategic planning is embedded in business activities.
- The organisation has implemented systems to build organisational capacity to scale.

Debt financing is commonly used by capital providers and may include either traditional or concessional terms. Concessional debt offers advantageous financial conditions, including below-market interest rates, and longer grace periods. For instance, ResponsAbility, an impact investor, proposes flexible debt financing solutions for energy access companies in Africa and Asia Pacific⁷¹. Their offerings include flexible ticket sizes, maturities ranging from six to 36 months, funding in various currencies, and disbursement and repayment structures tailored to cash-flow projections.

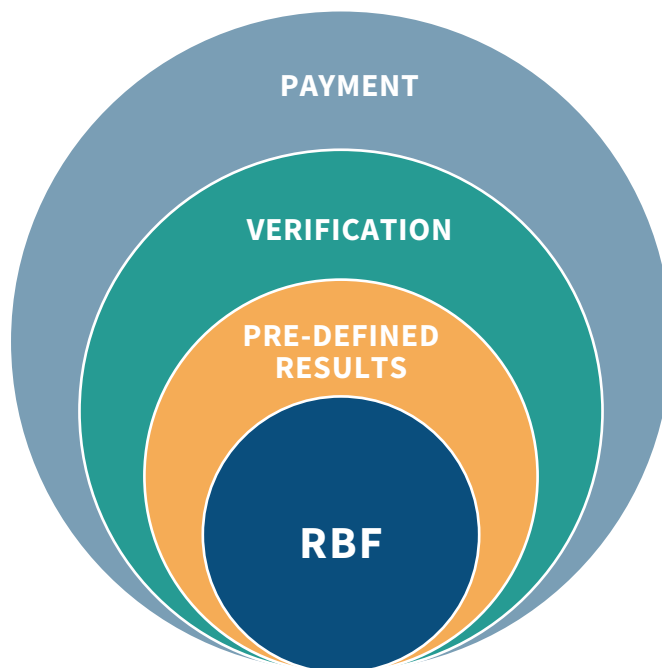
71. For more information, please see <https://www.responsability.com/en/asset-classes/private-debt>

Outcomes-based financing

This category comprises innovative solutions that channel donor funding to projects for verified outcomes. Examples are results-based financing (RBF) and impact bonds. These mechanisms vary in their focus on different stakeholders: impact bonds involve governments and NGOs, while RBF addresses market-based solutions. The clean cooking sector can leverage result-based financing schemes, a form of payment-by-results that could be offered by both public and private sector entities.

RBF is mainly implemented at the early growth stage of energy access projects to de-risk enterprise operations, incentivise product and service provision, create or expand markets, stimulate innovation, create awareness, and support market setup and development. Over the last decade, it has become an important funding tool for the sector. RBF is structured to prevent underperformance by ensuring that the financial risk of nonperformance lies with the enterprises, encouraging service providers to explore activities beyond their usual business scope, such as expansion into underserved regions like informal settlements, refugee camps, and urban underserved populations. The models' key principles include setting pre-defined targets that must be verified independently before payment is made, as described in Figure 10.

Figure 10: RBF concepts and principles



52. For more information, see <https://www.responsability.com/en/asset-classes/private-debt>

The Clean Impact Bond (CIB) and Charm Impact Bond are direct examples of outcomes-based financing mechanisms⁷². The CIB was launched in 2022 in Accra, Ghana, when Cardano Development, the impact manager, and the Osprey Foundation signed an outcomes contract, alongside a loan agreement between BIX Capital and Sistema.bio. The development impact bond aimed to bridge a financing gap by providing clean cooking solutions for low-income consumers. It was designed to crowd in funds from various partners to support the funding and scaling up the production of clean cooking solutions by quantifying and selling health and gender co-benefits to outcome buyers (organisations that commit to purchasing development impacts such as gender equality and health benefits).

The CIB consists of a consortium that includes BIX Capital, Osprey Foundation, International Finance Corporation, Sistema.bio, and Cardano Development. BIX Capital is the primary investor, providing \$300,000 to directly finance the clean cooking enterprise, Sistema.bio, in scaling up business operations and recruiting new customers. The bond leverages outcomes including reduced mortality, improved health, and increased quality time for women using biogas digesters from Sistema.bio.

The gender and health outcomes had a matching commitment of \$500,000 from Osprey Foundation, which is the outcome buyer subject to independent verification and certification of outcomes. The delivery cost of the CIB, inclusive of monitoring, evaluation, reporting, verification, and repayment of BIX Capital's investment, is covered by the outcome payments from Osprey Foundation.

The Charm Impact Bond between iGravity and Charm Impact is another investment approach aimed at funding impactful enterprises that would typically be unable to secure financing due to their stage of growth and size. Targeted enterprises are in the clean cooking space, and loans range from \$12,530 to \$438,443 with a three-year repayment period. Under this bond structure, enterprises that achieve high-impact rates are rewarded with lower interest rates. Moreover, the bond framework includes capital for a first-loss guarantee on every loan issued, de-risking private investors' capital and encouraging more risk-averse investors to crowd in commercial capital for budding and growing clean cooking enterprises^{73, 74}.

Crowdfunding

Crowdfunding is a relatively nascent financing mechanism for clean cooking enterprises targeting the informal settlement market. It consists of four main types, all of which can be implemented in raising funds for clean cooking solutions: donation crowdfunding, rewards crowdfunding, debt crowdfunding, and equity crowdfunding. In the energy access space, debt and equity crowdfunding tend to be suitable for highly innovative solutions and technology-centric enterprises. However, equity investors are primarily interested in financial returns over social impact, making them less likely to invest in cooking companies.

Clean cooking organisations raised nearly \$8 million through crowdfunding between January 2014 and September 2020. This compares to \$159 million in energy access crowdfunding investments over the same period, and a total investment of \$153 million in clean cooking between 2017 and 2019⁷⁵.

Crowdlending platforms offer several advantages not typically available from traditional financiers. Kiva lends directly to companies and Charm Impact mainly issues small-ticket loans highly suited for early-stage cooking companies. Bettervest and Kiva, drawn by the social impact, are the main crowdfunding platforms in the clean cooking space. Unlike traditional finance, crowdfunding offers advantages such as shorter transaction times (typically three months) compared to other funds, flexibility in campaign timing and funding tranches, and the diversification of funding sources⁷⁶.

Carbon credit financing

Carbon finance has helped unlock and scale up clean cooking enterprises. Considering the volume of carbon credits issued globally, approximately \$150 million in aggregate carbon financing has been generated by clean solutions between 2013 and 2022, with corresponding annual revenue flows exceeding \$36 million in 2020⁷⁷.

A new umbrella organisation called Improved Cook Stoves for East Africa (ICSEA) helps eligible stove suppliers earn carbon credits under the UN's Clean Development Mechanism (CDM). The stove suppliers receive support for their enterprises from the ICSEA Stove Support Facility,

72. (International Finance Corporation (IFC), 2023); (MECS & Energy 4 Impact, 2022)

73. (MECS & Energy 4 Impact, 2022)

74. (ESI Africa, 2022)

75. (Clean Cooking Alliance, 2021)

76. (MECS, 2021)

77. (MECS, 2023)

benefitting from a quick and affordable way of earning carbon credits, while retaining 100% of their credits. The money earned from selling the credits allows stove vendors to lower their prices and offer attractive benefits (CCA, 2012).

Additionally, carbon financing for renewable energy electricity projects (such as hydropower) licensed by Electricity Distribution and Supply Authority (EDSA) is eligible to generate carbon credits and in turn earn additional revenue through the CDM. Carbon Sink and International Lifeline Fund, in partnership with GET.Invest Finance Catalyst, aim to increase the impact of energy-efficient cookstove technologies. ESPs in Sierra Leone

specialising in the local manufacturing of improved cookstoves could leverage carbon credit financing by registering their products under the scheme to receive carbon certificates for every single cooker produced and sold. Reinvesting these credits in manufacturing will enable ESPs to scale operations exponentially, reach more homes and institutions with cost-effective solutions, and amplify the environmental benefits of reduced emissions.

Beyond these examples, sources or providers of direct financing include personal savings, public institutions, foundations, angel investors, venture capital funds, and capital markets.

Finance providers in Sierra Leone

Financial providers are crucial for energy access projects considering the limited funds available, especially in developing countries.

Table 2: Finance providers for clean energy access projects in Sierra Leone

Finance provider	Activities
Munafa	Social microfinance institution in Sierra Leone aiming to enable thousands of women and men facing complex challenges to improve their livelihoods. Offers access to appropriate financial services to help informal sector actors develop their businesses and improve their daily lives.
BRAC Microfinance	Microfinance institution in Sierra Leone launched in 2008. Loans worth \$20.6 million have been disbursed so far, targeting microfinance groups, small enterprises, agriculture and job holders. Energy service providers specialising in energy access can leverage these loans for further business development.
Clean Cooking Alliance (CCA)	Through its Venture Catalyst programme, CCA supports entrepreneurs in building innovative and scalable companies that accelerate clean cooking access. It aims to impact 6.3 million Sierra Leoneans by enhancing and encouraging healthy cooking in a healthy environment, with the goal of having a clean cookstove in every household by 2035.
Entrepreneurs du Monde	Supports the social and economic integration of people facing economic hardship in Sierra Leone. For energy access, it promotes the distribution of products such as gas stoves, improved wood or charcoal stoves, and solar kits. It fosters the development of a local network of independent businesses managed by local social entrepreneurs.
Apex Bank – Sierra Leone	Recipient of part of the \$300,000 grant from the United Nations Development Programme (UNDP) to develop and pilot new financial products for the informal sector.

LAPO Microfinance company	Offers a range of financial products and services to assist small and medium enterprises, particularly those from low-income households. Recipient of part of the \$300,000 grant by UNDP to develop and pilot new financial products for the informal sector.
Africa Development Bank	Through the Sustainable Energy Fund for Africa (SEFA) a \$1 million reimbursable grant was approved for development of bioenergy plants in Ghana and Sierra Leone. SEFA is a multi-donor special fund that aims to unlock private sector investments to provide universal access to affordable, reliable, sustainable, and modern energy services across Africa.
Spark+ Africa Fund	A \$70 million impact investment fund that invests in scalable, next-generation companies offering clean, modern distributed energy solutions for cooking to the mass market in SSA. Investees (companies) receive Technical Assistance (TA) through their partners Stitching Modern Cooking and Clean Cooking Alliance.
World Bank	The World Bank's Clean Cooking Fund (CCF) is a \$500 million fund, the largest dedicated to galvanising political commitment, scaling up public and private investment, and catalysing innovation through RBF to promote long-term market development and advance energy access for all. It is administered through the Energy Sector Management Assistance Program (ESMAP).
Innovation Fund – AECF (AECF) Initiative	Focused on expanding energy access in sub-Saharan Africa, the Innovation Fund tests new innovations or extreme iterations to existing innovations to validate market fit. This includes spotlighting emerging innovations in clean cooking and productive use of energy technologies and services.

Challenges and opportunities for finance providers

Challenges

1. **Results-based financing complexity:** The results-based financing business model is important in spurring the adoption of clean energy projects in Low- and Middle-Incomes Countries (LMICs) in SSA. Finance providers, however, face major challenges in deploying this model effectively due to the following:
 - RBF requires verification of targeted results before disbursing funds to the ESPs, meaning the project must reach the implementation phase to generate the pre-agreed results. This in turn locks out early-stage companies that require pre-financing for the initial business model design and set-up. It could also lead to companies pursuing loans, delaying the project implementation period due to slow disbursement.
 - The model requires project tracking, validation, disbursement and reporting, which can be challenging for both companies and funders.
 - Some beneficiary enterprises are unable to comply with the RBF principles of proving results.
2. **Data and information gaps:** Limited data on energy usage patterns, infrastructure, and market design conditions can be an impediment to the assessment and valuation of projects, leaving finance providers with reservations about the energy access projects.
3. **Currency risks:** African countries are characterised by volatile economies and unstable forex exchange rates against reserve currencies such as the US dollar, which could have negative effects on the return on investment, discouraging financial investments in the energy sector.

Opportunities

1. **Increased clean energy demand:** There are concerted global efforts around sustainable development and the clean energy transition, which provide significant opportunities for finance providers to invest in the energy sector. The transition to renewable energy has been prioritised by most countries, requiring substantial investment to meet the set targets.
 2. **Government and international support:** De-risking investments in the energy sector through incentives, subsidies and a conducive regulatory framework by the government and international organisations has the potential to attract more finance providers, as risks are mitigated, which makes the projects more appealing.
 3. **Impact investment and environmental, social and governance (ESG):** There is increasing focus on environmental, social and governance aspects in energy projects, with emphasis on impact rather than solely financial returns. Finance providers have greater opportunities to invest in energy projects that benefit the environment and social aspects of communities.
 4. **Innovative financing models:** Emerging financing models, such as green bonds, blended finance, and results-based financing, make it easier to attract private capital to the energy access sector by de-risking investments and offering flexible funding options. RBF schemes have been less utilised in the energy sector, compared to sectors such as transport, ICT and healthcare, highlighting the need to promote RBF models to encourage private sector investment in low-carbon opportunities.
 5. **Emerging markets and untapped potential:** Finance providers have a wide scope in terms of opportunities for growth and investment in clean energy projects. Africa is home to an urban population of over 600 million people, estimated to increase to over 1 billion by 2050. The market potential for clean cooking is under-documented in the urban space, making the goal of achieving universal clean cooking challenging to bridge⁷⁸. This points towards the need for financial support to implement clean energy access projects in these markets.
- Simplifying RBF model designs, which may be too complex for enterprises, presents an opportunity to attract more private sector participation and enhance success.
 - Other than financing based on the fulfilment of pre-agreed results, there is an opportunity for RBF models to strengthen local capacities, as complementary technical assistance is essential.

78. For more information, see <https://www.csis.org/analysis/achieving-universal-energy-access-africa-amid-global-decarbonization>

CONCLUSION AND RECOMMENDATIONS

Financing energy access in Sierra Leone and the broader SSA region is crucial for achieving the goal of modern, clean, affordable, and reliable energy for all, as outlined in SDG 7. Enterprises delivering energy products and services have a critical role in achieving this goal by providing clean energy solutions in renewable energy, as well as promoting clean cooking technologies (briquettes, efficient cookstoves, electric pressure cookers, liquified petroleum gas) among the urban underserved, most of whom live in informal settlements. These technologies not only aim to improve their livelihoods, but also protect the environment and address social issues such as gender equality.



Image: A cookery seller cooks cassava in oil on a LPG stove

Partnerships between the private sector, government institutions, NGOs, and financial institutions are critical for energy access projects. Most enterprises lack the financial capacity to seamlessly run operations, while also carrying out essential activities such as awareness creation, research and development, innovation, infrastructure development and community engagement, among others.

There is significant potential to increase financing for the private sector in urban informal settlements by implementing the following:

- **Innovative financial products:** Developing innovative financial products tailored to the needs of enterprises operating in informal settlements, which are characterised by high poverty levels. This could be achieved by implementing flexible loan terms with lower interest rates.
- **Public-private partnerships (PPPs):** Promoting and enhancing PPPs' development to provide the much-needed support and resources for the private sector enterprises working in urban informal settlements. Public financing through these partnerships is vital for de-risking investments, using incentives and subsidies to further attract private capital investors into the energy sector.
- **Tax incentives:** Government operationalisation of tax relief to enterprises providing clean energy technologies. Tax exemptions for local manufacturers and importers will help reduce the product cost, making clean energy solutions more affordable for people living in informal settlements, many of whom have low disposable income.
- **Awareness creation:** Awareness creation efforts must be robust, reaching consumers, government institutions, and financial providers, including local banks and microfinance institutions, about the importance and benefits of clean cooking. There is a need for enhanced collaboration between the national government and local authorities in promoting clean cooking technologies, hence the need for synchronisation to ensure all parties are aligned with what is required. There is also a need for more engagement with the community to disseminate information about the advantages (health, environmental and socio-economic) of using cleaner technologies, and support informed decision-making. Financial institutions have also been reluctant to finance energy access projects, preferring large-scale, low-risk commercial sector projects⁷⁹.

79. (AfDB, n.d.)

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APPENDIX: FUNDING OPPORTUNITIES FOR CLEAN COOKING ENTERPRISES IN SSA

Project/fund manager	Fund type	Funding size	Purpose/objective	Target countries	Time frame
Spark+ Africa Fund	Debt & mezzanine capital	\$500,000 – \$7m (only for entities that have commercialised their product or service and have traction in the market).	Impact investment fund financing companies that offer next-generation, distributed cooking energy solutions to the mass market in SSA.	Sub-Saharan Africa	Rolling fund
Productive Use Appliance Financing Facility	Debt instruments: Inventory- & receivables-backed loans, secured & unsecured, and working capital loans.	Minimum of \$500,000.	Support businesses in catalysing the growth of productive use appliance markets.	DRC, Ethiopia, Kenya, Nigeria, Sierra Leone, and Uganda	Rolling fund

Development Innovation Ventures	Grant funding (based on a tiered-evidence approach that maximises impact per dollar spent).	<ul style="list-style-type: none"> • Stage 1 grants: Pilot (up to \$200,000) • Stage 2 grants: Test and position for scale (up to \$1.5m) • Stage 3 grants: Transition to scale (up to \$15m) • Evidence generation grants (up to \$1.5m) 	Funds breakthrough solutions that aim to address the world's toughest development challenges.	No geographic specification	Rolling fund
USAID Climate Finance for Development Accelerator	Catalytic grants	\$250m initiative (designed to mobilise \$2.5b public and private investments by 2030).	Help countries meet their national commitments in alignment with the Paris Agreement through evidence-based solutions that respond to national contexts and address gaps in global, regional, and national climate finance ecosystems.	Countries where USAID works	2022 -2030
ESMAP-Clean Cooking Fund (CCF)	Catalytic grant	\$500m five-year funding target.	<p>Accelerate access to clean cooking by 2030 by providing financial & technical support primarily through results-based funding grants to help countries incentivise the private sector to scale up investments on modern cooking services.</p> <p>Develop an impact bond market to monetise health, gender, and climate impact outcomes to attract a broad range of capital.</p>	The first CCF project is the Energy Access Quality Improvement Project (EAQIP) in Rwanda, which is the largest World Bank-financed clean cooking project in Africa to-date. EAQIP will expand access to clean cooking to 500,000 households across Rwanda and leverage \$30 million in public and private sector investment. Other countries in the pipeline include Uganda, Burundi, Ghana, Myanmar, Niger and Mozambique.	Up to 2030.

AfricaGoGreen-Cygnum Capital Group	Debt	\$2m - \$10m	Promotes investments that mitigate or reduce greenhouse gas emissions in Africa.	Sub-Saharan Africa	Rolling fund
British International Investment	Debt	\$3m - \$10m	Funds renewable energy businesses and projects in priority sectors through project finance and corporate lending. Trade finance and lending to financial institutions.	Sub-Saharan Africa, Caribbean, South Asia	Rolling fund
Factor-E	Equity	\$100,000 - \$1m	Invests in early-stage companies with more than just capital, taking a more hands-on approach at the seed stage to provide companies with the resources and tools they need to scale their businesses and impact.	Sub-Saharan Africa	Rolling fund
Global Climate Partnership Fund (GCPF)	Debt	\$1m - \$10m	Leverages public funds to crowd in private investments renewable energy and energy efficiency in developing economies. The fund finances projects mainly via local financial institutions and directly as a debt provider. Equity investment may be provided in certain circumstances and to a limited extent.	Caribbean, sub-Saharan Africa	Rolling fund

InfraCo Africa	Equity	\$1m - \$10m	Provides equity to fund the development and construction of pioneering projects and innovative infrastructure businesses that need to scale up and demonstrate commercial viability.	Sub-Saharan Africa	Rolling fund
Multilateral Investment Guarantee Agency (MIGA)	Guarantee	N/A	Provides political risk insurance guarantees and credit enhancement to private sector investors and lenders. These guarantees protect investments against non-commercial risks and can help investors obtain access to financing on improved terms and conditions. Political risk insurance coverage products may be purchased individually or in combination.	Global	Rolling applications
Treehouse Investments	Equity	€100,000 – €3m	Provides direct investments in both publicly traded and private entities targeting market-rate returns to combat climate change, build the capacity of women, and catalyse a capital shift to sustainable investment practices.	Sub-Saharan Africa	Rolling fund

Clean Cooking Alliance - Venture Catalyst	Grant	€5,000 – €200,000	Provides a range of specialised support to selected companies, solidifying their commercial viability, enhancing their investment-readiness, and facilitating their access to growth capital.	Global	Rolling applications
Innovation Fund (AECF initiative)		\$1.2m	Expanding energy access in sub-Saharan Africa: testing new innovations or extreme iterations of existing innovations to validate market fit, including surfacing innovations in clean cooking and productive use of energy technologies and services.	Ghana, Nigeria, Burkina Faso, Sierra Leone, Liberia, Mali, Ethiopia, Kenya, Rwanda, Tanzania, Zambia, Malawi, Mozambique, Zimbabwe	