



United Nations Development Programme

Financial Aggregation for Distributed Renewable Energy in East Africa

Regional Assessment and Action Plan

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Financial Aggregation for Distributed Renewable Energy in East Africa



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Foreword

The distributed renewable energy (DRE) market in East Africa has witnessed remarkable growth over the past decade. Millions of people in the region now benefit from distributed energy solutions such as off-grid solar or mini-grids. These achievements are testament both to the regions' great potential for clean energy deployment and to the transformative power of DRE.

However, as we delve deeper into the dynamics of the DRE sector in East Africa, we recognize that there are still many hurdles to overcome on the path to universal energy access. The sector remains notably underfunded, with the bulk of investments being concentrated in a few geographies and market players.

With nearly half of the regions' population without access to electricity, we need to significantly ramp up the level of public and private investment in DRE to advance sustainable development. To achieve this, new approaches are needed to de-risk investments and crowd in new sources of capital.

Through initiatives such as the Climate Aggregation Platform (CAP), UNDP is committed to supporting the development and deployment of innovative business models and financial mechanisms to accelerate energy access and the clean energy transition.

This report on *Financial Aggregation for Distributed Renewable Energy in East Africa*, part of a report series on *Financial Aggregation for DRE developed by the CAP*, seeks to demystify aggregation and raise awareness about its potential to enable large-scale investments in East Africa by reducing the mismatch between DRE funding needs and investor requirements.

The report aims to advance our understanding of the key precursors of financial aggregation and the readiness of different sub-sectors (off-grid solar, mini-grids, captive power, and electric vehicles) in the region, shedding light on the key market barriers that persist and the opportunities that exist.

While the report highlights the complexity of financial aggregation instruments and the relative nascency of the market, it presents a possible pathway to unlock its full potential, with insights and advice for policymakers, development practitioners, the energy sector, investors, etc.

In 2023, two ground-breaking receivable securitization structures were announced involving market leaders in the off-grid solar sector in East Africa as the sole recipients.^{*} These transactions could potentially mark an inflection point and pave the way for future growth, but they also exemplify the concentrated nature of investments in the sector. This calls for greater efforts to make innovative financial structures and models such as aggregation more accessible and widely employed in the DRE sector, rather than confined to a few countries and market leaders.

By fostering innovative finance, we can increase the availability and reduce the cost of financing for clean energy, and ultimately, we can help make clean, reliable, and affordable energy accessible to everyone across East Africa and beyond. Sustainable energy is a key enabler for achieving the Sustainable Development Goals (SDGs) and it is a crucial element in our fight against climate change.

Finally, we would like to express our sincere appreciation to the authors, researchers, and contributors who have dedicated their expertise and time to produce this comprehensive report. We also extend our gratitude to the governments, institutions, and individuals who have supported the CAP and other UNDP initiatives in the clean energy, climate and sustainable finance sectors. Your partnership and collaboration are essential as we collectively strive to accelerate a just energy transition and build a resilient, low-emissions future.

Riad Meddeb

Director, Sustainable Energy Hub
UNDP

Cassie Flynn

Director, Climate Hub
UNDP

^{*} See the press releases of the transactions from Sun King and Citi [here](#), and from African Frontier Capital (AFC) [here](#) and d.light [here](#).

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Abbreviations

API	application programming interface
ALCB	Africa Local Currency Bond Fund
ARPU	Average revenue per user
BLK	Brighter Life Kenya Limited
BoSS	Bank of South Sudan
BRD	Development Bank of Rwanda
C&I	commercial and industrial
CAGR	Compound annual growth rate
CAP	Climate Aggregation Platform
CMA	Capital Markets Authority
CPIA	Country Policy and Institutional Assessment
DFI	development finance institution
DRC	Democratic Republic of the Congo
DRE	distributed renewable energy
DSE	Dar es Salaam Stock Exchange
DTA	double tax agreement
EAC	East African Community
EACREE	East Africa Centre for Renewable Energy and Energy Efficiency
EDCL	Energy Development Corporation Limited
ESMID	Efficient Securities Markets Institutional Development Programme
EV	electric vehicle
FDI	foreign direct investment
GDP	gross domestic product
GEF	Global Environment Fund
GOGLA	Global Off-grid Lighting Association
J-CAP	Joint Capital Markets Programme

kWh	kilowatt hour
LCOE	levelized cost of energy
MFI	microfinance institution
Mt	metric tonnes
MW	megawatt
NDC	nationally determined contribution
O&M	Operations and maintenance
ODA	official development assistance
OGS	off-grid solar
PAYGO	pay-as-you-go
PPA	power purchase agreement
RDB	Rwanda Development Board
REPP	Renewable Energy Performance Platform
RFL	Rwanda Finance Limited
RRA	Rwanda Revenue Authority
RSE	Rwanda Stock Exchange
SDG	Sustainable Development Goal
SFC	Solar Frontier Capital
SHS	solar home system
SPV	special purpose vehicle
STEM	science, technology, engineering and mathematics
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme
USD	United States Dollar
VAT	value added tax
WHT	withholding tax

Glossary

Application programming interface	A software intermediary comprised of a set of rules that allows two applications to communicate with each other.
Asset-backed securitization	Asset-backed securities are securities that derive their value from a pool of underlying assets, such as receivables.
Bridge loan	A short-term, stop-gap loan used to bridge a funding shortfall until long-term financing is obtained.
Collateral	An asset pledged as a security for a loan, for example, land and buildings, stock or accounts receivables.
Distributed renewable energy	Small-scale renewable energy usually smaller than 10 MW. Examples include off-grid solar, mini-grids and captive power.
Double tax agreement	An agreement signed between the governments of two countries to avoid the payment of income tax paid in both countries on a single income source.
Due diligence	A process of collecting and analysing information about a prospective investment before the investment is made to limit downside risk.
Financial aggregation	Securitization of DRE assets and the pooling of these into an on-balance sheet or off-balance sheet structure. This report only focuses on the pooling of accounts receivable (or receivables for short).
Fiscal deficit	When the total expenditures incurred by a government exceed the total revenue earned.
Gross domestic product	The total value of goods and services produced by a country within a specified time period, typically a year.
Junior debt	Also known as subordinate debt, junior debt is positioned below senior debt on the debt hierarchy. Repayment of junior debt is deprioritized below senior debt.
Levelized cost of energy	The cost of generating energy, calculated by dividing capital expenditure and discounted annual expenses by discounted energy generation. Expenses and generation are discounted using a discount rate.
Limited recourse loan	A form of debt where a lender's claims are limited to the assets to which the debt pertains. In the case of default, the lender does not have recourse over other assets belonging to the borrower. A key example is project finance, where the lender only has recourse over the assets of the project, and not the assets of the company behind the project.

Minimum ticket size	The minimum deal size that an investor is willing to fund.
Multi-jurisdictional aggregation	Aggregation of receivables from assets domiciled across a variety of countries.
Official development assistance	Government aid disbursed to developing countries for the purpose of economic development.
Off-balance sheet	Assets or liabilities not included in a company's balance sheet, but instead housed in an off-balance sheet structure, typically a special purpose vehicle. The company might or might not have an ownership stake in the special purpose vehicle.
On-balance sheet	Assets or liabilities included in the company's balance sheet, thus affecting the financial position of the company.
Open source	Typically used in software, open source refers to freely available source code which can be used, modified and distributed by any user. More generally the term is used to denote the public availing of all elements of a design, such as a term sheet or deal structure in the case of finance.
Power purchase agreement	A contract signed between an electricity generator and buyer (or off-taker) to agree on the long-term conditions for selling of energy by the generator to the buyer.
Private equity	Equity investment into companies that are not listed on a public stock exchange.
Receivables	In the DRE context, this can be future cash flows of different projects aggregated together into a portfolio to attain a larger deal size or future payments of off-grid solar.
Repo rate	The rate at which the central bank of a country lends money to commercial banks.
Rent-to-own	An arrangement in which the ownership of an asset (e.g. a solar home system) is transferred from the seller to the buyer following the buyer's completion of a pre-defined payment schedule. Payment intervals are usually monthly and instalment amounts are fixed.
Senior debt	Debt that is positioned on top of the repayment hierarchy. Senior debt takes priority over subordinate debt.
Special purpose vehicle	A legal entity, usually in the form of a limited liability company or a trust, set up by a corporate entity (typically termed the originator) to serve a specific purpose, for example to hold ownership of certain assets.
Stamp duty	A tax that a government levies on instruments or documents that transfer ownership of assets from one entity to another.

Key highlights

- The distributed renewable energy (DRE) market in East Africa has experienced considerable growth over the past decade. In the captive power market, the installed capacity of commercial and industrial (C&I) solar projects has almost tripled in three years, from only 39 megawatt (MW) in 2020 to 100 MW in 2023.^{1,2} By 2019, 38.5 million people in the region were using distributed energy systems, equating to four times more than the population using distributed systems in West Africa and eight times more than in Southern Africa.³ Annual sales of off-grid solar (OGS) products reached 2.8 million units in 2021.^{4,5} This indicates considerable growth since sales were first recorded in 2017, when annual sales amounted to 2.1 million units. The mini-grid market has grown to a total of 469 projects operating across the region as of 2022;

- Despite this growth, the DRE market in most individual countries of the East African Community (EAC)¹ is still nascent when it comes to financial aggregation. While pioneering transactions involving market leaders have taken place in the region, several barriers must be addressed if financial aggregation is to be more widely employed and scaled up, rather than confined to a few geographies and players;

- Deployment of aggregation instruments is hindered by sector-wide barriers that stretch across countries as well as by conditions that are country specific. At a country level, Kenya is the most attractive market for DRE financial aggregation, followed by Uganda and Rwanda in joint second place. Tanzania comes in third place. The Democratic Republic of the Congo (DRC), Burundi and South Sudan are the most nascent markets and the least ready for DRE financial aggregation;

- Considering current levels of industry maturity, the OGS sector is the DRE sector with the most developed financial aggregation maturity, followed by mini-grids, captive power and finally electric vehicles (EVs);

1 Countries included in this regional analysis include EAC member states: The Democratic Republic of the Congo, Burundi, Kenya, Rwanda, South Sudan, Uganda, and the United Republic of Tanzania. The limited scope of this assessment meant that countries that are not part of the EAC but still considered to be situated geographically in East Africa (e.g. Ethiopia, Somalia and Djibouti) were excluded. The EAC was selected by virtue of its economic integration which bodes well for aggregation of DRE assets across member states.



Figure 1: Future financial aggregation market opportunity of DRE sectors vs current readiness

- Aside from certain market leaders, the current operating DRE asset base as well as upcoming project pipelines in individual EAC countries are likely too small to justify the comparatively high costs involved in setting up and operating off-balance sheet securitization and aggregation transactions. These are complex and expensive financial instruments. This is however not an EAC-specific issue – it is highly likely that the majority of countries in sub-Saharan Africa do not yet have DRE asset bases sufficiently large to warrant financial aggregation;

- If off-balance sheet securitization and aggregation are to be more widely employed, multi-jurisdictional financial aggregation (aggregation of assets across EAC countries) will likely be required in order to pool together an asset base large enough to warrant the cost involved;

- On-balance sheet receivables financing – a simplified version of off-balance sheet securitization – is, however, viable without needing to aggregate assets across countries thanks to lower set-up cost and relative simplicity;

- Bulk procurement – another form of aggregation – can be employed to grow the overall DRE asset base;
-
- Financial aggregation, off-balance sheet and on-balance sheet alike, faces a wide range of financial, legal, and social barriers. The enabling environment is not yet conducive for off-balance sheet financial aggregation instruments in most EAC countries, DRE customer credit portfolios are generally of low quality and most DRE companies are not aggregation ready;
-
- Despite these challenges, there are also positive signs, in particular, high levels of public sector support (domestically as well as regionally in the EAC) for a more developed capital market. There is also a willingness from existing investors to participate in aggregation transactions when DRE portfolios become aggregation ready;
-
- Developing the market towards aggregation-readiness will require the following actions over different periods of time:
 - Open sourcing details of past successful DRE financial aggregation transactions;
 - Exploring approaches to reduce legal fees for originators of transactions;
 - Streamlining the structuring of transactions that involve domestic DRE assets and offshore holding facilities;
 - Engaging concessional funders to crowd-in commercial capital;
 - Upskilling investors to accept receivables as collateral;
 - Exploring cost-effective currency hedging strategies and local currency lending;
 - Compiling a common data reporting framework;
 - Creating awareness among less mature DRE companies about best practice around financial reporting, data management and customer creditworthiness assessment;
 - Appointing back-up service providers as a contingency in case of operations and maintenance (O&M) provider insolvency;
 - Working with public sector institutions to improve regulatory environments for asset-backed securitization;
 - Engaging credit rating agencies to rate the credit quality of DRE assets;
 - Bridging the gap between early-stage and late-stage funding for DRE companies;
 - Employing bulk procurement to grow the market;
 - Testing approaches to remedy low customer repayment rates;
 - Raising awareness about shared application programming interfaces (APIs) and standardization of DRE customer contracts.



1

Introduction

1.1 DRE financial aggregation 16



Photo: UNDP/Karin Schembrucker

Financial aggregation, defined in the context of this report as the aggregation of DRE receivables, holds great promise in reducing the mismatch between DRE funding needs and investor requirements and in turn increasing capital deployment in these sectors. When designed correctly and deployed in suitable markets, these instruments can offer faster and more affordable access to capital. However, financial aggregation instruments are complex and their successful implementation depends on a favourable enabling environment.

This report does not provide an in-depth assessment of DRE financial aggregation market readiness and potential in each individual country. Instead, it seeks to provide a high-level overview of the financial aggregation market readiness and potential in East Africa. It provides a high-level analysis of the key precursorsⁱⁱ to financial aggregation and the barriers that will need to be tackled if the potential addressable market is to be unlocked. Finally, it presents recommendations to systematically address these barriers, enable broader replication and achieve market scale-up.

The report is intended to serve as a reference for policymakers, investors, DRE companies, development finance institutions (DFIs) and other relevant stakeholders interested in the advancement of financial aggregation and other innovative financial solutions to address the DRE financing gap in East Africa. It was developed as part of the Climate Aggregation Platform (CAP), a Global Environment Facility (GEF)-funded project implemented by UNDP, which, in partnership with the Climate Bonds Initiative, seeks to promote the scale-up of financial aggregation for small-scale, low-carbon energy assets in emerging markets. The document is part of a report series including in-depth assessments for [Rwanda](#) and for [Uganda](#).ⁱⁱⁱ

The report opens with a brief explanation of DRE financial aggregation and its different manifestations. Chapter 2 follows with an overview of national-level factors that affect the potential of DRE financial aggregation in each EAC country. Chapter 2 is structured according to the PESTLE framework, with an analysis of Political, Economic, Social (demographic), Technological, Legal and Environmental factors that are relevant for DRE financial aggregation. Chapter 3 provides a brief overview of the current status of the energy sector in East Africa, while Chapter 4 focuses in more depth on the status of different DRE sub-sectors. Chapter 5 quantifies the market opportunity for financial aggregation in each DRE sub-sector, drawing on a wide range of carefully selected data points. Chapter 6 outlines the key barriers and opportunities for the future of DRE financial aggregation in the region, while Chapter 7 concludes with actionable recommendations.

The report brings together insights from an extensive desk-based research effort and insights from more than 50 interviews with DRE companies, investors, independent experts and government officials. As a result, perspectives from the supply-side (small-scale, low-carbon energy assets seeking financing), demand-side (investors in potential financial aggregation facilities) and the enabling environment for DRE sub-sectors and financial instruments (e.g. macro-economic conditions, regulations, support initiatives and infrastructure) are considered.

ⁱⁱ The report provides insights into a variety of sub-topics to assess the potential of DRE financial aggregation in East Africa. Each sub-topic covered in the report has been selected because it has a considerable effect on the potential for financial aggregation. Each sub-topic is only covered to the extent that is necessary for assessing how it affects DRE financial aggregation potential. Coverage of each sub-topic only includes factors relevant for DRE financial aggregation and is, thus, not in-depth nor exhaustive.

ⁱⁱⁱ A framework was developed in the context of the CAP, that guides stakeholders in conducting market assessments for DRE financial aggregation in individual countries. This framework was used to guide the assessments for Uganda and Rwanda and can be used to conduct assessments in other EAC countries as well as countries further afield in the future.

The following DRE industries are considered in the report:^{iv}



Off-grid solar (solar home systems (SHS) and standalone solar productive uses):

SHS are productized systems that include a solar panel, battery, lighting and mobile device charging. The smallest of systems are often termed pico-solar products or solar lanterns. Larger systems also include appliances such as TVs, fans and direct current refrigerators. Pico-solar products are also productized but are typically only used for lighting purposes. Standalone solar productive use systems are tailored for specific income-generating activities and include, for example, solar water pumps and solar threshers.



Mini-grids: Mini-grids are isolated grids that generate electricity at a centralized

point from one or a combination of sources (e.g. solar, diesel or hydro) and distribute to end-customers through a low- or medium voltage power grid. Installed capacities can vary widely from small direct current nano-grids of less than 5 kW to large regional grids in the MW range.



Captive power: Captive power systems are usually isolated power systems with the primary goal of supplying a single residential, commercial or industrial facility.

They are also referred to as embedded generation or behind-the-meter systems. These systems can be off-grid or grid-tied. If grid-tied, surplus energy is fed into the grid, typically on a feed-in tariff basis. Rooftop solar systems for commercial and industrial (C&I) facilities is the most common segment in this sector, and therefore the sector is commonly referred to as C&I solar.



Electric mobility: Electric mobility in this report refers to any electric-powered transport. This includes 2-wheelers, 3-wheelers, cars, trucks and boats.

While the report is focused on the aforementioned DRE sub-sectors, many of the findings and recommendations can also be relevant to other sectors such as clean cooking, energy efficiency, or other low-carbon assets.

^{iv} The report does not provide a comprehensive assessment of the DRE sector at large. Instead, it is focused specifically on financial aggregation of DRE. Its insights and findings do, however, also provide relevant information on the DRE sector more broadly.



1.1 DRE financial aggregation

Small-scale energy assets can be aggregated into portfolios to achieve scale and attract larger investment ticket sizes⁶ in a process defined as financial aggregation. It can take the form of securitization of future **cash flows** (accounts receivables) and the aggregation of these into pooling structures, typically special purpose vehicles (SPVs). It can also take the form of aggregation of **projects** into portfolios for project finance purposes. Securitization of receivables is more commonly performed in product-based sectors, for example SHS, while project aggregation is more commonly deployed in project-based sectors, mainly mini-grids and captive power.

Financial aggregation in its purest form involves complete transferral of the securitized assets into an off-balance sheet structure, such as an SPV, as Figure 2 indicates. This means that the DRE company, the originator of the assets, effectively sells the assets to the SPV.

In theory, this process reduces the risk of the securitized assets for an investor and ultimately the cost of capital for the originator by effectively separating the risks of securitized assets from that of the originator. Separation of risk also means that if the company who initially sold or developed the asset (the originator) fails and is liquidated, it will have no recourse over the assets held by the SPV.

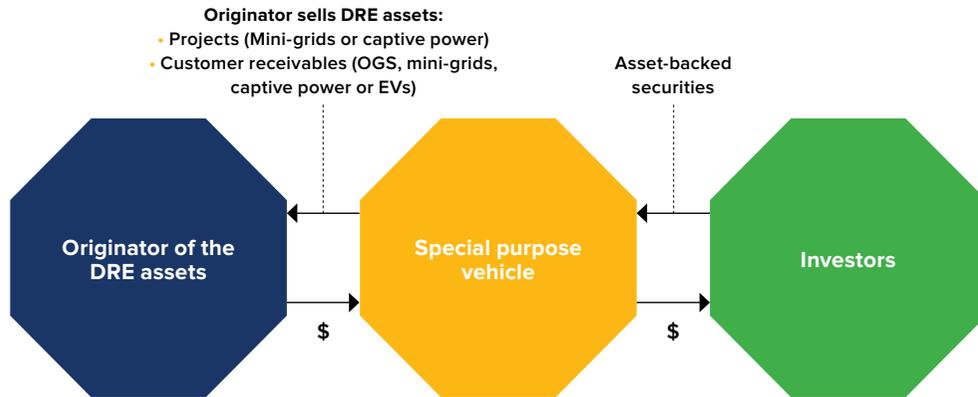
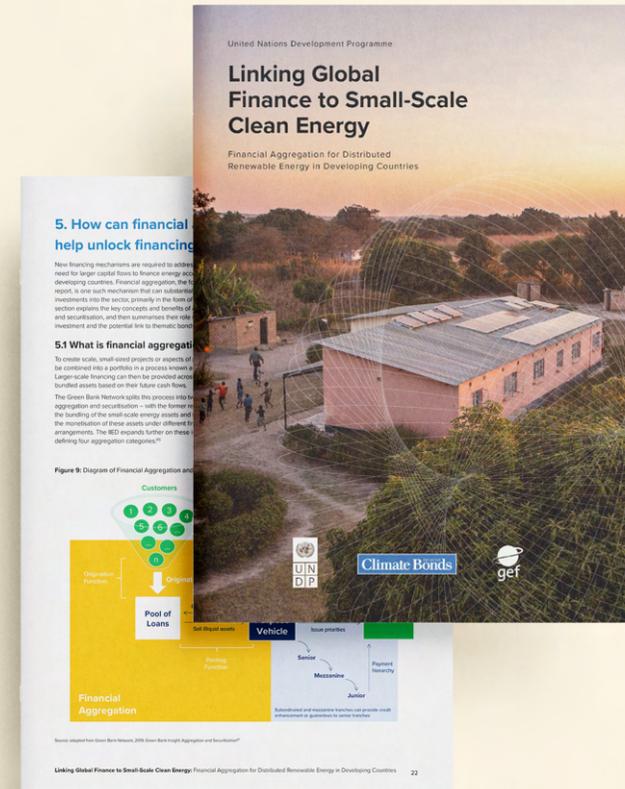


Figure 2: Basic off-balance sheet securitization structure



To learn more about financial aggregation please see UNDP's and the Climate Bonds Initiative report on "[Linking Global Finance to Small-Scale Clean Energy](#)". ▶

For more information about financial aggregation and other innovative financial instruments for DRE, see the CAP Knowledge Library [here](#). ▶
The library aims to be a one-stop-shop for key publications on innovative financing mechanisms for small-scale energy.

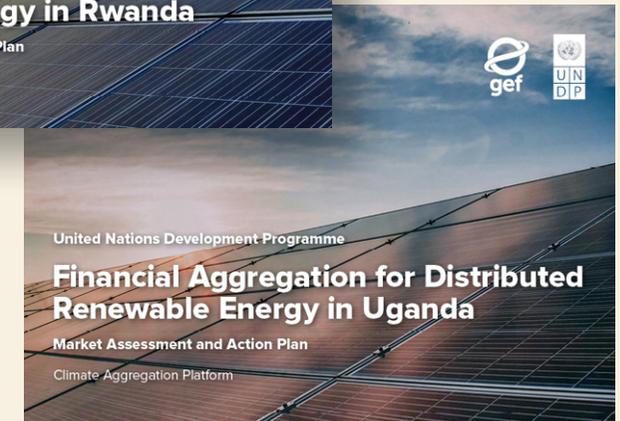
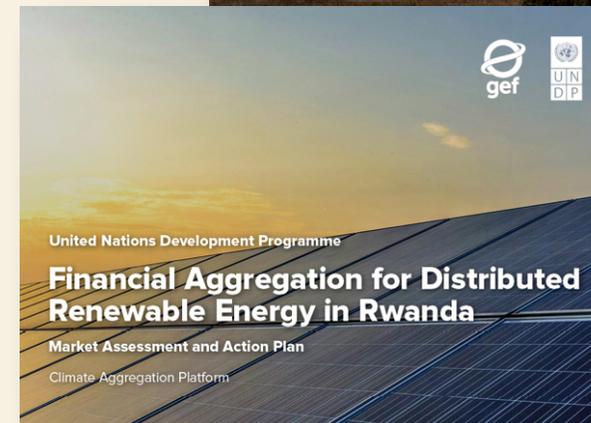
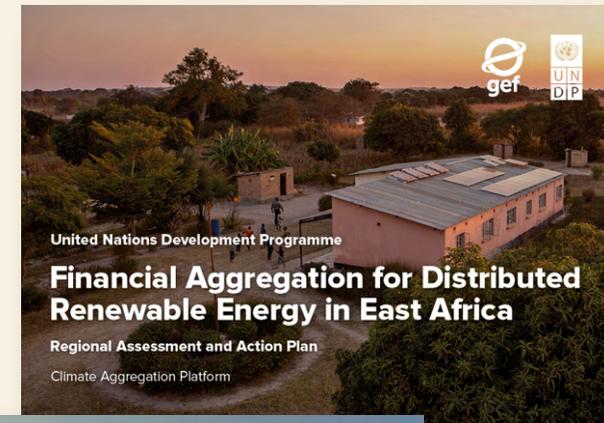
Instances of this level of sophistication in DRE transactions are rare. Only a handful of pure off-balance sheet transactions have been closed in the DRE sector in sub-Saharan Africa to date and these have mainly been in the OGS sector.^v Established players in this sector are relatively mature and are looking to leverage the value of their customer receivables to access debt to fund further growth. In contrast, other DRE sectors are still at a relatively early growth stage. More traditional financing instruments are still most appropriate in these sectors at this stage.

Successful attempts have been made in other markets, notably Kenya, to employ elements of pure off-balance sheet structures in what we term quasi off-balance sheet transactions. In these instances, originators sell their securitized assets to a limited liability partnership, which it co-owns with an entity responsible for arranging the facility.⁷ The originator, as a result, still has recourse to the assets. Finally, a more common approach due to the small size of the market, has been to securitize DRE receivables, without aggregating and transferring them to off- or quasi-off balance sheet structures. The assets remain fully on the balance sheet of the company. While not aggregation per se, the quantification of future cash flows improves the company's investor pitch and can be used as part of the collateral requirements for a loan or as the only collateral in cases where more progressive investors are involved. Deals can be smaller as transaction costs are significantly lower than off-balance sheet transactions.

“Financial aggregation and receivables sales can really shorten the working capital cycle for companies. The long cycles have kept companies on a hamster wheel of capital raising because the more you grow the more capital you need. The book of receivables needs to be financed up front, but the cash revenues only come in over months or years, so if you can front load the return of cash through the sale of receivables then that is very helpful in terms of cash flow.”

– Geoff Manley, BII

^v See for example: African Frontier Capital, d.light and SFC announce industry-leading USD 238 million multi-currency receivable financing facility, 2022 ([link](#))



For the status of DRE financial aggregation in Rwanda and in Uganda, see a parallel assessment for [Rwanda here](#) and [Uganda here](#). ▶

2

Regional overview

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Photo: UNDP/Karin Schermbücker

2.1 Political outlook & international relations

At the macro level, countries with effective and accountable governing institutions consistently perform better on a range of development issues from social cohesion to economic growth, sustainable human development and levels of conflict. Peace, inclusiveness and effectiveness of public institutions will determine the ability of countries to achieve the sustainable development goals (SDGs). Conflict, violence and corruption are major threats to sustainable development. More specifically, stable political environments are essential for the growth of DRE markets and successful implementation of financial aggregation facilities.

East Africa is one of the fastest growing regional blocs in the world. The region's economic, political, social and cultural integration is overseen by the EAC. However, protracted conflict in the region has created inimical effects on political and economic stability, particularly in countries like Burundi, the DRC and South Sudan. Burundi's political stability score is -1.41 on the Global Economy country rankings (-2.5 being weakest and 2.5 being strongest).⁸ Similar to Burundi, the DRC has one of the most fragile political environments in Africa. This largely stems from conflict, and the country is one of the five poorest nations globally.⁹ DRC's political stability score is -1.71 on the Global Economy country rankings.¹⁰ The DRC underwent a leadership change in 2018, leading to gradual structural reforms in the public sector with an increase in transparency and improved stability in the east of the country.¹¹ The situation, however, remains volatile.

The severity of South Sudan's political and economic instability differs from that of Burundi and the DRC as it is exacerbated not only from recurring conflicts (December 2013 and July 2016), but also droughts, floods and acute food shortages. This continues to undermine the country's overall development and worsens the country's humanitarian crisis. South Sudan's political stability has a score of -1.76 on the Global Economy country rankings. By comparison, Kenya has a score of -1.00, Rwanda 0.03, Uganda -0.78, and Tanzania -0.41.¹² Corruption assessment for each country is based on the Country Policy and Institutional Assessment (CPIA) transparency, accountability and corruption rating, on a scale of 1 to 6 (1 being low and 6 being high). Burundi has a CPIA score of 1.5, South Sudan 1.5, DRC 2.0, Uganda 2.5, Kenya 3.0, Tanzania 3.0 and Rwanda 3.5.¹³ **It follows that Kenya, Rwanda, Tanzania and Uganda have relatively stable political environments and are thus preferred jurisdictions for financial aggregation from a macro-political point of view.**

2.2 Demographic considerations

Countries with positive demographic trends tend to be poised for faster DRE market growth and increased likelihood of DRE financial aggregation. The EAC is home to 300 million people, 22% of whom live in urban areas.¹⁴ Figure 3 shows the population of each EAC country and the number of people of each population living below the international poverty line.



Figure 3: EAC countries' population size vs number of people living in poverty (2022)^{15,16}

Burundi's poverty rate has increased by 14.4% since 2013, chiefly due to low levels of economic diversification strained by inconsistent macroeconomic policies, environmental degradation and ongoing political instability.¹⁷ About one in six people living in extreme poverty in Sub-Saharan Africa live in the **DRC**.¹⁸ The country ranks 164 out of 174 countries on the 2020 Human Capital Index, reflecting decades of conflict, fragility, and constrained development.¹⁹ More than two-thirds (8.9 million people) of **South Sudan's** population are in need of humanitarian assistance as of 2022.²⁰ In 2021, 2 million people remained internally displaced (55% of which are women and young girls) and a further 2.3 million sought refuge in neighbouring countries due to the humanitarian crisis.²¹

Other EAC countries fare better on demographic grounds and are, as a result, poised for faster DRE market growth and increased likelihood of financial aggregation. Kenya has seen a progressive decline in poverty rates from 45.2 % in 2009 to 34.4% in 2019, with poverty expected to fall to 33.4% in 2022, below the pre-COVID-19 level of 34.4%.²² Sustained economic growth in **Tanzania** bolstered the decline in poverty from 34.4% to 26.4% between 2007 and 2018.²³

2.3 Economic status and outlook

Above-average gross domestic product (GDP) growth contributes indirectly to the growth of DRE markets, as it indicates an increase in consumer spending power, among other considerations. The EAC had a combined GDP of \$240 billion in 2019.²⁴ Before the pandemic, the region's GDP growth stood at 5.3%, well above the continent's average of 3.3% and the global average of 2.9%. GDP growth figures for the EAC compared to other regions are presented in Figure 4. Challenging economic conditions will however persist, as economies remain impacted by higher commodity prices, higher inflation, tightening of global financial conditions and reduced foreign financing flows into the region.²⁵

Figure 5 presents the GDP growth rates for EAC countries up to 2021. Estimates for Burundi in 2022 equate to 3.3%, with GDP growth in DRC estimated at 6.1% over the same period. Rwanda had an estimated growth rate of 6% in 2022 with Kenya close behind with an estimated 5.3% growth rate.²⁶ Tanzania's GDP growth was expected to reach 4.5% in 2022 due to an easing of COVID-19 restrictions.^{27,28} South Sudan's economy was estimated to grow by 6.5% in 2022, while the Ugandan economy is estimated to have grown by 4.4%. This data shows that all EAC countries are appearing to be recovering well from the pandemic, which bodes well for the overall investment climate in each country.

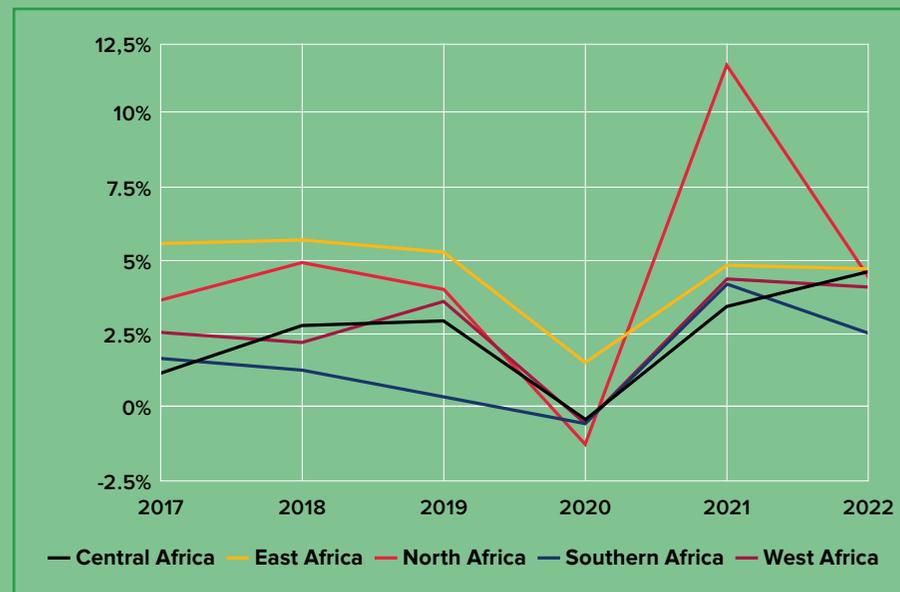


Figure 4: GDP growth of African regions (2017-2021)²⁹

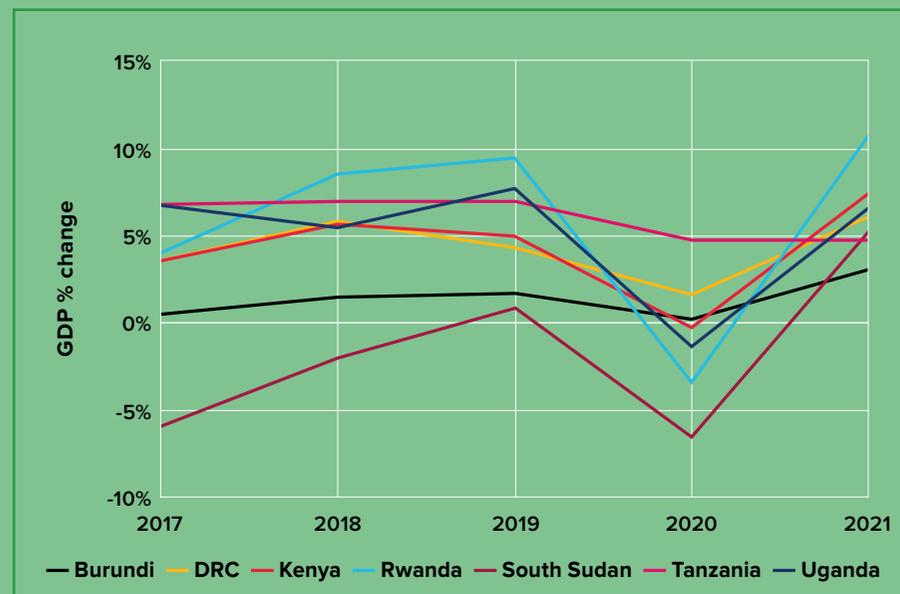


Figure 5: GDP percentage change of EAC countries (2017-2021)³⁰

2.3.1 Monetary policy

DRE revenues are generated in local currency while investments in DRE assets are typically made in hard currencies.^{vi} It follows that financial aggregation favours stable currencies, as this minimizes foreign exchange risk. The most volatile currency in the EAC, based on standard deviation of monthly currency fluctuations between January 2017 and June 2022, is the South Sudanese pound, followed by the DRC’s Congolese franc. By contrast, the Burundian Franc is the most stable currency, followed by the Tanzanian shilling. Figure 6 presents the exchange rates between United States Dollar (USD) and EAC local currencies from 2017 to 2022. Volatile currencies manifest as uneven lines, in contrast to the relatively even lines of stable currencies.

Consistent with worldwide trends, all EAC countries have been experiencing challenging monetary conditions throughout 2022. As Figure 7 indicates, 2022 inflation rates^{vii} surpass 2021 inflation rates in all EAC countries, accompanied by heightened repo rates in an attempt to curb inflation.

High inflation environments have a negative effect on the potential for DRE financial aggregation. It reduces the purchasing power of consumers, and in turn their ability to pay for energy services. Inflationary pressures also cause investment uncertainty, which ultimately leads to a decline in DRE investments.

To bring inflation down to acceptable levels, central banks have to increase repo rates, which generally increases the cost of capital in a country. Elevated repo rates could translate to both positive and negative consequences for financial aggregation. A higher repo rate means that the rate at which local financial institutions lend to DRE companies will also increase. Financial aggregation facilities will thus be more competitive against an elevated local rate, provided that capital is raised from institutions that are not affected by the domestic central bank rate. Conversely, an elevated repo rate will reduce the likelihood of local financial institutions investing in financial aggregation facilities as a result of higher return expectations.

^{vi} The preferred hard currency for DRE investments in sub-Saharan Africa is the US Dollar. Albeit less common, investments are also made in Euro and British Pound Sterling.
^{vii} 2022 rates represent the latest published inflation rates. In most cases, this is as recent as year-on-year November 2022.

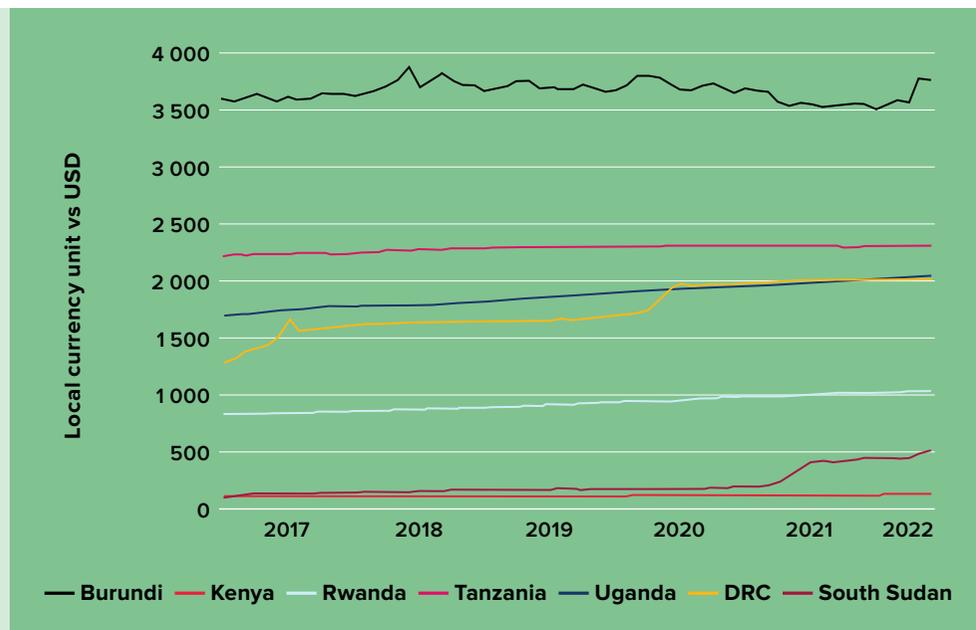


Figure 6: Exchange rate volatility of EAC local currencies vs USD³¹

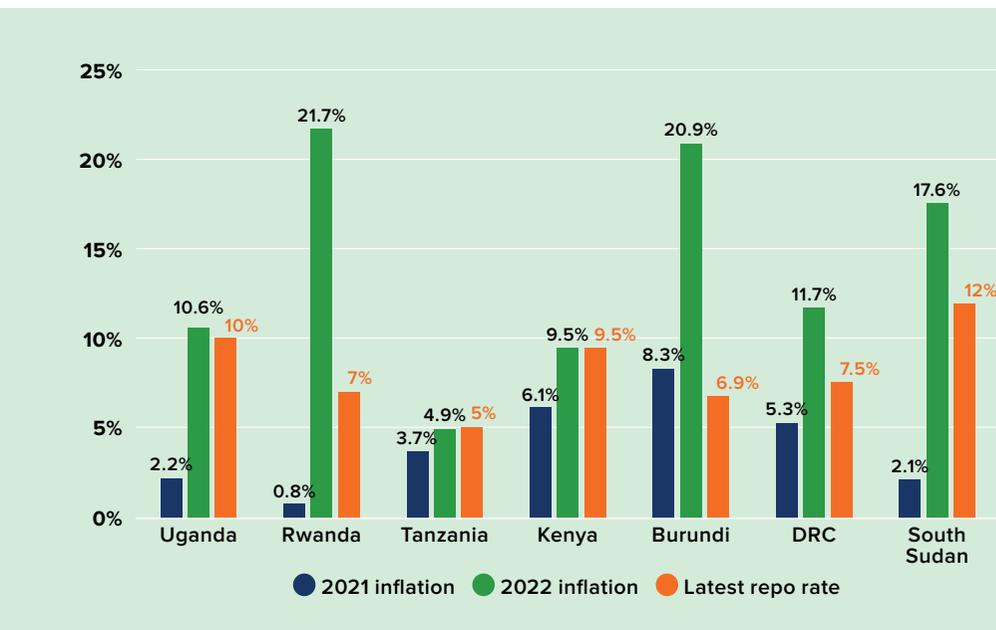


Figure 7: EAC countries’ inflation rates vs repo rates^{32,33,34,35,36,37,38,39,40,41,42,43,44}

2.3.2 Fiscal policy

High fiscal deficits adversely affect government support for DRE sectors and can also create difficult operating conditions for financial aggregation facilities and other private sector bonds and securities.

Governments need to fund their fiscal deficits, which is typically done through borrowing. Widening fiscal deficits would lead governments to borrow more, which increases government debt. Faced with the need to curb spending, governments need to make difficult policy choices and compromises. Subsidies and incentives towards DRE sectors may not always be prioritized, ultimately affecting the growth prospects of these sectors. On the other side of the coin, fiscal deficits could force governments to curb costly fossil fuel subsidies, which could indirectly benefit the DRE sector.

A widening fiscal deficit can also reduce lender confidence in a government's ability to repay. It follows that lenders will expect higher rates of return on government bonds to account for this elevated risk. This further increases expected rates of return on government bonds, which ultimately crowds out private sector bonds and securities such as DRE financial aggregation facilities that are not able to offer ever-increasing rates of return and that remain high risk.

All EAC countries have been experiencing fiscal deficits in 2021 and 2022 (see Figure 8).

Burundi's fiscal deficit is largely financed by domestic borrowing, equating to 73% of total public debt, which stood at 70.6% of GDP in 2021.⁴⁵ Debt to GDP improved slightly to 66% of GDP in 2022.⁴⁶ Despite this improvement, debt to GDP remains high, which has led the International Monetary Fund (IMF) to declare Burundi as being at high risk of debt distress.⁴⁷

Fiscal deficit in the DRC for 2022 is estimated to have increased to 2.7% of GDP, due to a high likelihood of government intervention partially insulating the country from increased oil and food prices. Increases in mining revenues are unlikely to offset these increased expenses.⁴⁸ Public debt is estimated to be a manageable 15% of GDP in 2022, which puts the country at moderate risk of debt distress according to the IMF.

Kenya's fiscal deficit in 2021 marked a decline from 2020 levels, mainly as a result of increased tax revenues as the economy began its recovery from the pandemic, and rationalized government

spending.⁴⁹ Still, however, public debt has been high at 69% of GDP in 2022, which led the IMF to declare that the country is at high risk of debt distress.^{50,51}

Elevated oil prices have been key in South Sudan's declining fiscal deficit from 2021 to 2022. Yet, despite this narrowing deficit, high levels of public debt (52% of GDP) means the country remains at high risk of debt distress according to the IMF.

Total revenue in 2021 was less than expected in Tanzania, which led to an increased fiscal deficit of 4.2% from 2020 levels, followed by an improvement to 2.7% of GDP in 2022.⁵² Public debt amounts to 40% of GDP in 2022, placing the country at moderate risk of debt distress.

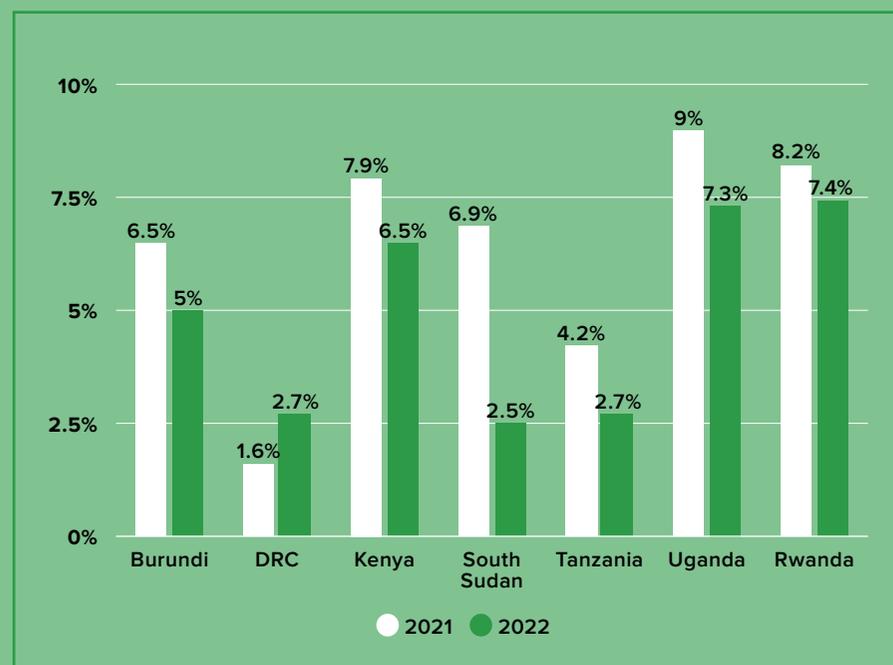


Figure 8: EAC countries' fiscal deficits (% of GDP)⁵³

Uganda's fiscal deficit is consistently narrowing over time; from 9% of GDP in 2021 to a projected 5.4% of GDP by 2023. This follows a strategy adopted by the government to curb unnecessary spending and investments. Public debt only increased slightly from 49% of GDP in 2021 to 52% of GDP in 2022, which places the country at moderate risk of debt distress.⁵⁴

Rwanda's fiscal deficit is expected to narrow to around 4% by 2024 due to revenue recoveries.⁵⁵ The country's debt-to-GDP ratio stood at 68% in 2022, placing the country at moderate risk of debt distress.⁵⁶

In conclusion, while all EAC countries except the DRC have achieved improved fiscal performance in 2022, gross government debt remains relatively high. Concerns around governments' ability to repay debt are reflected in the fact that all EAC governments either carry moderate or high risk of debt distress. As a result, the capacity of governments to support DRE sectors would be improved if debt can be decreased or if favourable terms for existing and new debt can be negotiated.



Taxation

Excessive taxation of DRE technologies generally reduces the financial viability of projects and products as it increases the cost base. While taxation is an important source of revenue for governments, experts generally advise governments to reduce or remove taxes on DRE businesses to enable these sectors to scale up.

Table 1 provides a summary of the status of taxation in EAC countries with a particular focus on policies relevant to the DRE sector.^{viii} Taxation of renewable energy in the EAC is relatively favourable – most technologies are exempt from value added tax (VAT) and import duties and reduced withholding tax rates apply. Financial instruments, however, enjoy less favourable tax arrangements as sections 2.3.4 and 2.5.2 point out.

^{viii} For more information on DRE taxation policies in East Africa, refer to: BDO East Africa Advisory Services, *The East African Regional Handbook on Solar Taxation, 2022* ([link](#))



TAX	UGANDA	RWANDA	KENYA	DRC	TANZANIA	BURUNDI	SOUTH SUDAN
Corporate tax	30%	<ul style="list-style-type: none"> • 30% (standard) • 15% (renewable energy and other priority sectors) 	<ul style="list-style-type: none"> • 30% (resident companies) • 37.5% (branches of foreign cos) 	<ul style="list-style-type: none"> • 30% (standard) • Flat taxes also apply 	<ul style="list-style-type: none"> • 30% (standard) • 25% (Newly listed cos) & 10-20% for priority sectors 	<ul style="list-style-type: none"> • 30% • Reduced by 2-5% if >50 Burundians employed 	30%
Withholding tax (WHT)	<ul style="list-style-type: none"> • 15% (interest, dividends and royalties) • Payments >UGX 1 million are taxed at 6%. • Unless exempted or imported from the EAC, imported goods are taxed at 6%. 	<ul style="list-style-type: none"> • 15% (interest, dividends and royalties) • 5% (government securities & listed company dividends paid to EAC beneficiaries) • 5% (all imports for commercial use) 	<ul style="list-style-type: none"> • Non-residents: 15% - 25% (depending on payment type) • Residents: 10% - 25% (depending on payment type) 	<ul style="list-style-type: none"> • 14% - 20% depending on payment type • Residents exempted from WHT on interest 	<ul style="list-style-type: none"> • 10% (dividends) • 5% (listed co dividends) • 10% (interest) • 15% (royalties) • Management, consulting & technical fees: • 5% (residents only) • 15% (non-residents) 	<ul style="list-style-type: none"> • 15% (interest, dividends, royalties & management and professional fees) • 3% (all imports) 	<ul style="list-style-type: none"> • Non-residents & residents: 10% (dividends, interest & royalties) • Non-residents only: 20% (management, consulting & technical service fees) • 4% (all imports except food items)
VAT	<ul style="list-style-type: none"> • 18% • Most solar products, whether panels or assembled into products, are exempt, except some pico-solar units. 	<ul style="list-style-type: none"> • 18% • Solar products, whether panels or assembled into products, are exempt. 	<ul style="list-style-type: none"> • 16% • Solar products, whether panels or assembled into products, are exempt. 	<ul style="list-style-type: none"> • 16% • 8% on certain food items and other basic items 	<ul style="list-style-type: none"> • 18% • Solar products, whether panels or assembled into products, are exempt. 	<ul style="list-style-type: none"> • 18% • Solar products, whether panels or assembled into products, are exempt. 	<ul style="list-style-type: none"> • 18% (Referred to as sales tax in South Sudan) • Solar products, whether panels or assembled into products, are exempt.
Import duties	<ul style="list-style-type: none"> • Depends on type of good • 10% on <3W lanterns, other solar products exempt, 25% on batteries. 	<ul style="list-style-type: none"> • Depends on type of good • 10% on <3W lanterns, other solar products exempt, 25% on batteries. 	<ul style="list-style-type: none"> • Depends on type of good • 10% on <3W lanterns, other solar products exempt, 25% on batteries. 	<ul style="list-style-type: none"> • Depends on type of good • 10% on <3W lanterns, other solar products exempt, 25% on batteries. 	<ul style="list-style-type: none"> • Depends on type of good • 10% on <3W lanterns, other solar products exempt, 25% on batteries. 	<ul style="list-style-type: none"> • Depends on type of good • 10% on <3W lanterns, other solar products exempt, 25% on batteries. 	<ul style="list-style-type: none"> • Depends on type of good • 10% on <3W lanterns, other solar products exempt, 25% on batteries.

Table 1: Taxation overview of EAC states^{57,58}

As Table 2 below indicates, EAC countries have signed a number of double taxation agreements (DTAs) with countries around the world. **DTAs are important for cost-effective financial aggregation in cases where the parties make use of off-balance sheet securitization and where the SPV is domiciled in an offshore jurisdiction. The DTA ensures that tax payment in both countries is avoided.**

	KENYA	UGANDA	RWANDA	DRC	TANZANIA
Belgium					
Canada					
Denmark					
France					
Finland					
Germany					
Iran					
Italy					
India					
Jersey					
Mauritius					
Netherlands					
Qatar					
S. Korea					
Norway					
Seychelles					
Singapore					
S. Africa					
Sweden					
Turkey					
UAE					
UK					
Zambia					

Table 2: Double tax agreements (DTAs) implemented by EAC states^{ix}

^{ix} South Sudan and Burundi do not have any DTAs in force (barring DTAs with other EAC states)

2.3.3 Inward investment

Investors tend to shy away from countries where operating conditions are unstable and where credit risk is high. High levels of inward investment can thus provide an indication that a country has been successful in creating a stable environment for investors to operate in. It follows that countries and regions that attract high levels of investment are better candidates for financial aggregation facilities.



Foreign direct investment (FDI)

East Africa FDI flows declined by 3.9% to \$6.5 billion in 2020 as the COVID-19 pandemic took its toll on investment flows to the continent. Despite the global economic slowdown, flows into Central Africa, the only region in sub-Saharan Africa that experienced FDI increases that year, increased from \$8.5 billion to \$9 billion. In comparison, 2021 saw a 35% increase in FDI flows to East Africa to \$8.2 billion, with all regions except North Africa attracting increased levels of FDI. This has been consistent with continent-wide trends – FDI to African countries hit a record of \$83 billion in 2021.⁵⁹

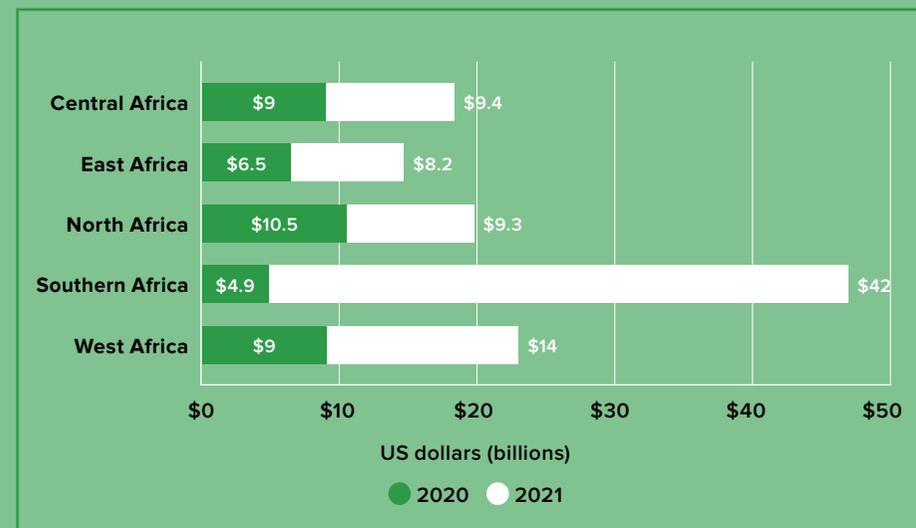


Figure 9: Regional comparison of FDI flows (2020-2021)⁶⁰



Official development assistance (ODA)

ODA to East Africa remained steady despite the COVID-19 pandemic – gross ODA between 2019 and 2020 increased across all countries in the region. The International Development Association (IDA) was the top donor organization in the region, with total funding of \$5.2 billion. Kenya received the largest share of donor funding in the region, receiving \$1.6 billion from the IDA and \$833 million from the US government.⁶¹ A large share of these funds are committed to renewable energy projects. Yet, as Figure 10 shows, over the past decade, most East African countries depended less on ODA for energy sector funding, either because they have become less reliant on ODA or due to a decline in ODA availability.

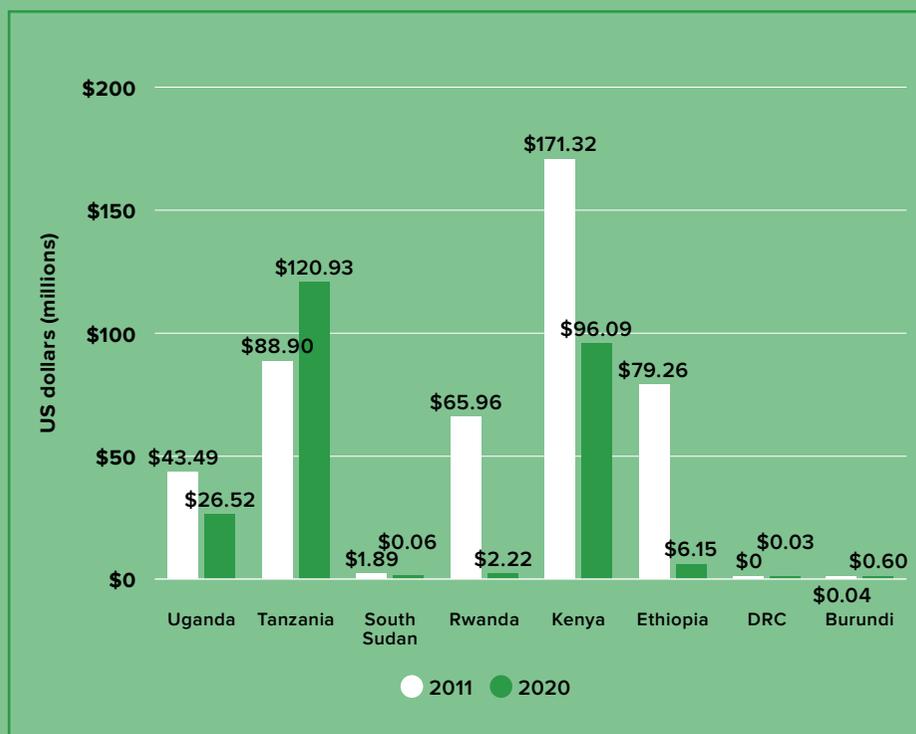


Figure 10: Bilateral ODA disbursed to energy sectors in East Africa (2011 & 2020)⁶²

2.3.4 Financial market trends

Successful closing of financial aggregation transactions requires a relatively mature financial sector, especially if off-balance sheet structures are being used. It follows that an overview of the financial sector is necessary for assessing DRE financial aggregation potential. Upward trends in financial sub-sectors such as banking and capital markets including bond and asset-backed securitization markets are a positive indication for the prospects of financial aggregation transactions.



Banking

Despite commercial banks accounting for the largest share of financial sector activity in the EAC, the majority of populations across the region remain unbanked. In 2020 bank branches for every 100,000 adults were three in Burundi, one in the DRC, four in Kenya, five in Rwanda, one in South Sudan, two in Tanzania and two in Uganda.⁶³ In the bigger economies of sub-Saharan Africa, access rates are higher – South Africa and Egypt have eight branches for every 100,00 adults. Customer deposits have however been experiencing upward trends. Deposits in Kenya grew by 13.7% in 2020.⁶⁴ In 2021, customer deposits grew by 17% in Tanzania and 9% in Uganda.^{65,66}



Bond market

East African bond markets are still nascent. The capital markets of East African countries are underdeveloped, and commercial banks dominate the lending landscape. There is also a limited pool of experts that can structure bonds and other securities and a need for a larger base of institutional investors (pension and mutual funds).⁶⁷

The Bank of **Burundi** regularly issues treasury bonds and bills with varying maturities and coupon rates ranging from about 5-10%. These securities are typically bought by local commercial banks.⁶⁸ To date, there have been no signs of any corporate bond activity. **The DRC** suffers from a fragile financial infrastructure and the bond market remains largely underdeveloped. Bonds in the DRC tend to be short-term and government issued. These are typically bought and held by local Congolese banks.⁶⁹ The institutional investor base is poorly developed, with only a single insurance company and a state pension fund as participants.

In **Kenya**, three corporate bonds have been issued respectively by Centum Investments Limited, Family Bank Limited and East African Breweries Limited. The bonds are listed on the Nairobi Stock Exchange. Treasury bonds are auctioned on a monthly basis by the Central Bank. By the time of

writing there were 224 issued treasury bonds being traded. Fixed coupon bonds are the most commonly issued bonds and have a high investor demand.⁷⁰

The Bank of **South Sudan's** (BoSS) Financial Markets department states that it has been issuing treasury bonds and bills through its debt management units.⁷¹ Yet, evidence suggests that none have been issued to date. By July 2022, the IMF stated that it intends to assist BoSS to introduce the issuance of treasury bills.⁷²

Rwanda's bond issuances are predominantly government based with a total of 28 bonds listed domestically on the Rwanda Stock Exchange (RSE).⁷³ As of December 2021, Rwanda had only one corporate bond listed on the RSE, issued by the independent power producer Energicotel. Treasury bonds are issued through the National Bank of Rwanda on a regular basis for maturity periods of 3 to 20 years.

Tanzania's bond market currently consists of over 100 active treasury bonds and 4 active corporate bonds. To date, the Dar es Salaam Stock Exchange (DSE) has facilitated the issuance of 16 corporate bonds, and all bonds have been traded through the DSE.⁷⁴ Treasury bonds are issued by the Bank of Tanzania in six maturities of 2 to 20 years.⁷⁵

Uganda's corporate bond market is still in its infancy, compared to an active government-issued bond market. By 2021, only 2 of the 26 bonds listed on the Uganda Securities Exchange were corporate bonds.⁷⁶ Private, non-listed issuances are negligible. Depending on the maturity period, treasury bonds in Uganda have an attractive return between 10 and 18%.⁷⁷



Green bonds

The green bond sector is still nascent in East Africa. Most notable initiatives and transactions include:

- Kenya's Green Bonds Programme supported the issuance of the first green bond in East- and Central Africa – a Kenyan shilling (KSH) 4.3 billion (~\$35.7 million) 5-year bond issued by Acorn Holdings at a coupon of 12.25%. Proceeds are used to build 5,000 environmentally friendly student houses in Nairobi;^{78,79}
- In October 2023, BURN Manufacturing announced the issuance of a \$10 million green bond designated for clean cooking financing. The proceeds will be used in part to increase its existing manufacturing capacity in Kenya.⁸⁰

Box 1:

Initiatives in support of growing bond markets in East Africa

Efficient Securities Markets Institutional Development (ESMID) programme

Across the region the ESMID programme (implemented by the IFC and World Bank and funded by SIDA) aims to develop well-functioning securities markets in Kenya, Uganda, Rwanda and Tanzania (as well as Nigeria).⁸¹ ESMID has facilitated \$950 million in new bond issues in East Africa by streamlining the regulatory and approval processes. This has helped reduce the time taken to approve bond issues to 45 days in Kenya and 60 days in Tanzania.

The Africa Local Currency Bond Fund

The Africa Local Currency Bond (ALCB) Fund supports local currency corporate bond issuances by acting as an anchor investor and through providing technical assistance. Technical assistance includes transaction support, building issuer capacity, product development, knowledge building and market studies.⁸² The fund is operational in Kenya, Uganda and 14 other African countries. Investors include FSD Africa, IFC, FMO, Calvert Impact Capital, AfDB and the DFC. The fund is sponsored by KfW and BMZ and managed by Lion's Head Asset Management.

- In Rwanda, the Development Bank of Rwanda (BRD), the FONERWA Rwanda Green Fund and Rwanda Finance Limited (RFL) recently launched Ireme Invest. The facility will use several types of financing instrument and could, in the future, use a green bond as an additional capitalization source. The facility will use a blended finance approach and will offer grants, equity, loans and credit guarantees to commercially viable green projects. The facility is aiming to raise \$110.5 million to start operations;^{83,84}
- There have been no explicit green bond issuances in Uganda, yet proceeds from the Kakira Sugar \$30 million 10-year bond issued in 2013 have been used by the company to expand its bagasse cogeneration plant.



Asset-backed securitization

While the market for asset-backed securitization in the EAC is still relatively nascent, considerable progress has been made to achieve integration between the capital markets of the different member states. The East African Securities Regulatory Authority and the East Africa Securities Exchange Association, although yet to be fully operationalized, are facilitating knowledge exchange towards attaining synchronous capital markets laws and structures, incentives and trading systems around asset-backed securities. Furthermore, under the East African common market protocol, East African investors are considered domestic investors by individual country regulations, rather than as foreign investors.

Kenya and Rwanda have established international financial centres, providing regulation and tax incentives in order to attract offshore investment from international investors, to rival Mauritius as the preferred domicile in Africa. At the same time, such hubs can provide onshore centres for foreign investors that value proximity to their investments, something that offshore centres such as Mauritius cannot offer. Additionally, onshore centres could target local pension funds who are interested in private equity as an asset class but are prohibited by law from investing in private equity funds domiciled offshore.

Box2:

Initiatives in support of capital markets development in East Africa

The World Bank Group's Joint Capital Markets Programme (J-CAP), operational from 2017 to 2022, has been building supportive enabling environments for thriving capital markets in Kenya and further afield. This includes improved regulatory frameworks, guarantee and local currency solutions. In Kenya, the programme, in partnership with local pension funds, has been developing a capital market vehicle that will provide long term financing for infrastructure projects.⁸⁵

FSD Africa's support programmes aim at developing infrastructure that financial sectors in Africa need to scale.⁸⁶ The Capital Markets Regulatory Support Programme assists policymakers to improve regulations and provides support to structure capital markets transactions.

2.4 Technological considerations

2.4.1 The mobile economy

Mobile cellular subscriptions and mobile money accounts are key enablers for pay-as-you-go (PAYGO) business models. Without these technologies, PAYGO would need to depend on scratch cards and other paper-based systems, reducing scalability. PAYGO (including both pay-per-use and rent-to-own models), in turn, is central to financial aggregation facilities as it creates the basis for future customer receivables. The alternative is outright sales of DRE assets, in which case there are no ongoing transactions with the customer, and thus no receivables to securitize.

The prevalence of mobile cellular subscriptions varies across East Africa. In relative terms, only Kenya exceeds the average number of subscriptions per 100 people in sub-Saharan Africa (see Figure 11).

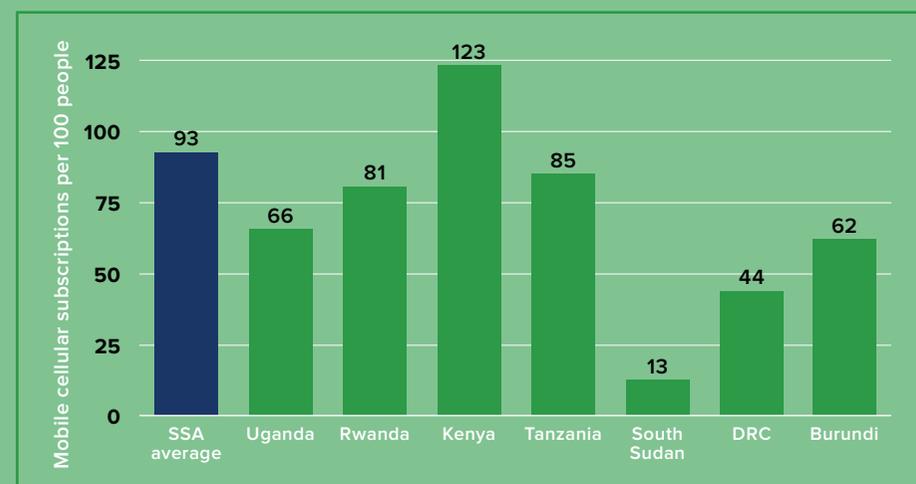


Figure 11: Mobile cellular subscriptions in EAC countries vs sub-Saharan Africa average (2021)⁸⁷

In absolute terms, Kenya, Tanzania, Uganda and the DRC exceed the African average of 21.72 million mobile cellular subscriptions.⁸⁸ Burundi has 6.63 million subscribers, the DRC 40.8 million, Kenya 61.41 million, Rwanda 10.61 million, South Sudan 1.34 million, Tanzania 51.22 million and Uganda 27.69 million.⁸⁹ However, the rollout of mobile services in cities and rural areas across sub-Saharan Africa remain hindered by high spectrum prices.

Mobile money uptake continues to grow rapidly in Africa on the back of the rapid increase of mobile cellular ownership. Sub-Saharan Africa accounted for 70% of all mobile money value transacted globally by the end of 2021 with a value of \$697.7 billion.⁹⁰ In 2020 the region accounted for 64% of total value, which shows that the industry continues to grow in the region relative to other regions in the world.⁹¹

East Africa accounted for 47% of total registered accounts in Africa in 2021, making it the largest mobile money market on the continent (followed by West Africa with 38% of registered accounts). By 2021, East Africa's mobile money market had 296 million registered accounts, 102 million active accounts and 24 billion transactions with a cumulative value of \$403 billion.⁹² Continued expansion of the mobile money market will further increase the scalability of PAYGO. It could also facilitate participation of local retail investment in DRE assets in a future scenario where DRE markets are mature, capital markets are more developed and incomes have risen.^x

The mobile money revolution in East Africa is illustrative of how digitalization can facilitate significant job creation due to spill over effects on households and businesses. In Kenya, for example, the number of active mobile money agents increased from 307 in March 2007 to over 290,000 in May 2021, and 185,000 women moved from subsistence agriculture to small business or retail occupations between 2008–2014.⁹³

^x This approach has been trialled in Kenya with M-Akiba, a retail infrastructure bond issued by the Government of Kenya and sold through the mobile money wallet M-PESA.

2.5 Legal considerations

2.5.1 Ease of doing business

DRE financial aggregation potential increases in countries where general business operating conditions are favourable. Clear operating conditions lead to increased business activity, which increases the rate at which DRE industries can grow and reach scale. Table 3 below seeks to clarify the main processes involved in setting up a business in each of the EAC countries as required by authorities. The reality, however, is often that setting up and operating a business in some EAC countries can be less straightforward. This is especially the case in countries that perform less well on political stability, demographic and economic grounds (see sections 2.1, 2.2 and 2.3 above). Such conditions can often spill over into the business operating environment and cause instability.



Photo: UNDP/Aurèlia Rusek

	BURUNDI	DRC	KENYA	RWANDA	SOUTH SUDAN	TANZANIA	UGANDA
Shareholding	Companies must have at least three shareholders. No local shareholding requirements.	In most sectors local shareholding is not required. All companies doing subcontracting work must have at least 50% local shareholding. ^{xi}	Some sectors in Kenya require local shareholding, including engineering.	100% non-local shareholding is allowed. There is no maximum number of shareholders. ⁹⁴	Companies must have at least two shareholders and a maximum of 50. Small-sized businesses may only be owned by South Sudanese citizens.	Certain industries require local shareholding, e.g. mining and telecommunications. All companies need at least two shareholders. ⁹⁵	No requirements for local citizens as shareholders are in place. Companies may not have more than 100 shareholders.
Company registration	Company registration is facilitated by the Burundi Investment Promotion Authority (API) and costs BIF 40,000 (\$20).	Company registration with the commercial registry (<i>Guichet Unique de la Création d'Entreprise</i>), taking approximately three days after all documents are submitted. Shelf companies are not available.	Registration is with the Registrar of Companies, taking about three weeks to be completed. Shelf companies are available.	The Rwanda Development Board (RDB) operates a one-stop shop for business registration. Investors can apply for company incorporation and obtain a tax identification number with the RDB. There are no shelf companies available in Rwanda.	Company registration with the Registrar of Companies takes approximately two weeks.	Companies must be registered with the Business Registrations and Licensing Agency, which takes approximately one month to complete. Shelf companies are not available.	Foreign companies must apply for an investment license from the Ugandan Investment Authority. Company registration is done with the Ugandan Registration Services Bureau. No shelf companies are available.
Tax registration	Registration with the Burundi Revenue Authority is mandatory and a tax identification number must be obtained. ⁹⁶	Companies must register with the DRC General Tax Directorate (<i>Direction Générale des Impôts</i>).	KenInvest issues investment certificates and assists investors to obtain required licences, permits and tax incentives or exemptions. ^{97,xii} Tax registration with the Kenya Revenue Authority to obtain a personal identification number.	All taxpayers must register with the Rwanda Revenue Authority, yet in most cases company registration with RDB leads to automatic registration with the revenue authority.	Companies must apply for a tax identification number from the National Revenue Authority. To benefit from tax exemptions and other incentives companies should register with the Southern Sudan Investment Authority.	Investors investing more than \$500,000 can apply for a certificate of incentives from the Tanzania Investment Centre. All companies must register with the Tanzania Revenue Authority and obtain a tax identification number.	Companies must register with the Ugandan Revenue Authority and obtain a tax identification number and a VAT number (if applicable). ⁹⁸

Table 3: Overview of requirements to set up for business in EAC countries¹⁰⁵

^{xi} Local shareholding requirements for certain sectors, notably oil, gas and mining are unclear.
^{xii} Tax incentives are only available to foreign investors investing more than \$100,000 in Kenya.

	BURUNDI	DRC	KENYA	RWANDA	SOUTH SUDAN	TANZANIA	UGANDA
Other mandatory registrations	Mandatory registration of employees for health and maternity insurance.	<ul style="list-style-type: none"> Ministry of Labour registration; Registration with the National Institute for Social Security; Notify the Labour Inspection Department and the National Office of Employment when establishing a company; Industry specific licences may be required as well as operating permits from municipal councils.⁹⁹ 	<ul style="list-style-type: none"> A unified business permit from the relevant City County, which consolidates five permits (fire clearance, advertising, etc); Registration with the National Social Security Fund and National Hospital Insurance Fund; Registration with the National Industrial Training Authority and the Directorate of Occupational Safety and Health Services.¹⁰⁰ 	<ul style="list-style-type: none"> Every company must register for a trading licence;¹⁰¹ Employers and employees must also be registered with the Rwanda Social Security Board. 	<ul style="list-style-type: none"> Operating licenses to be obtained from the Jubek State Revenue Authority; Companies located in Juba must obtain a trading license from the Juba City Authority; Registration with the South Sudan Chamber of Commerce is required to open a bank account and to receive tax clearance; Registration with the Ministry of Labour is required to obtain approval for employment contracts. 	<ul style="list-style-type: none"> Business licences must be obtained either from the Ministry of Industry, Trade and Investment or local government agencies depending on the type of business; Registrations with the National Social Security Fund, Workers Compensation Fund and Occupational Safety and Health Authority are required.¹⁰² 	<ul style="list-style-type: none"> Companies operating in select industries, of which energy generation is one, must first apply for a primary licence from the relevant ministry, before a general investment licence can be applied for from the UIA; Companies must apply for a trading license from the relevant local government authority that governs the municipal area in which the company is located.
Land ownership	Foreigners can obtain access to land via leasehold and partnership options. ¹⁰³	The state is the exclusive owner of land. Congolese citizens can obtain perpetual leases and foreign investors renewable 25-year leases.	Foreigners can own land on a 99-year lease, except agricultural land, which foreigners may not own.	Land ownership is granted to foreigners through 49- or 99-year leases.	Land cannot be purchased by foreigners, but 99-year leases are permitted.	Foreigners own land through a granted right of occupancy, which can be obtained from the Tanzania Investment Centre. A 99-year lease applies.	Ugandan citizens can own land, while foreign investors can access land through long-term leases of up to 99 years. ¹⁰⁴

Table 3: Overview of requirements to set up for business in EAC countries¹⁰⁴

2.5.2 Regulations affecting asset-backed securitization

Asset-backed securitization, like many other capital market instruments, needs a clear regulatory framework to provide guidance to arrangers and investors on practices that are allowed and not allowed when it comes to structuring and closing transactions. Securitization transactions, especially off-balance sheet ones, are unlikely to take place in markets where governments do not provide clear regulatory guidance.

Kenya (2007), Uganda (2011) and Rwanda (2013) are the only countries in the EAC that have published regulations on asset-backed securitization. Kenyan and Ugandan laws make explicit mention that both private placements and public listings of securities are permitted. Legislation in Rwanda only refers to public issuances, though it is assumed that private placements are invariably permitted. In Kenya, issuers of private placements must inform the Capital Markets Authority of each placement and submit details of the transaction ranging from value of the assets to the use of the proceeds.¹⁰⁶ Regulations in all three countries allow for the establishment of SPVs, in the form of either companies or trusts. In Kenya, originators are allowed to hold a maximum stake of 20% in the SPV.¹⁰⁷ In Rwanda the limit is set at 10%, while originators in Uganda are not allowed to have any ownership stake in an SPV.

“Lobbying for enabling securitization tax laws requires an ecosystem approach through the involvement of central banks, capital markets authorities and tax authorities. There should also be demonstrative transactions that illustrate how the securitization tax laws would operate effectively in order to make an issuance economically feasible. That’s how FSD Africa has managed to catalyse capital market development – through supporting both regulatory development and providing transaction support to issuers for demonstration transactions that test the efficacy of the enabling environment.”

– Mary Njuguna, FSD Africa



Securitization tax legislation in the EAC

Investment facilities using securitization are expensive to set up and operate. For these instruments to be cost-effective, minimal taxation is advised. SPVs should ideally be seen as pass-through vehicles, meaning that the buying and selling of assets to and from the SPV are seen as a mere transfer, instead of as a normal transaction that would be liable for tax.

Only Kenya’s law considers SPVs as pass-through vehicles, in effect exempting asset transfers from originators to SPVs from stamp duties and other taxes. Investment incentives in Rwanda have also exempted asset transfers into SPVs from taxes. Transfers in Uganda are liable for a 1.5% stamp duty. Real estate investment trust interest payments in Kenya are exempt from withholding tax and it is likely that the same exemption is applied to interest payments from asset-backed securities.^{xiii} SPV-related interest payments in Rwanda are exempt from withholding tax (assuming the parties benefit from Kigali International Financial Centre investment incentives), while the standard 15% applies in Uganda.

2.6 Environmental considerations

Carbon emissions in East Africa have nearly tripled from 17 metric tonnes (Mt) in 2000 to 47.6 Mt in 2017.¹⁰⁸ Kenya is the highest emitter and accounts for the fastest emission growth rate alongside Tanzania. Uganda’s emissions on the other hand are volatile, exhibiting a spike between 2013 and 2015. Combined emissions from Kenya, Tanzania, Uganda and Ethiopia account for more than 80% of emissions in East Africa.¹⁰⁹ Rwanda’s notable progress on developing a low-carbon development pathway has meant that its emissions are significantly lower than most countries in the region.

EAC countries have committed to greenhouse gas emission reductions ranging from 20% to 65% by 2030 (compared to the business-as-usual scenarios),¹¹⁰ with almost all emphasising the improvement of energy efficiency and increasing the share of electricity generated from renewables.

^{xiii} No official guidance on this matter was identified in Kenya’s legislation.

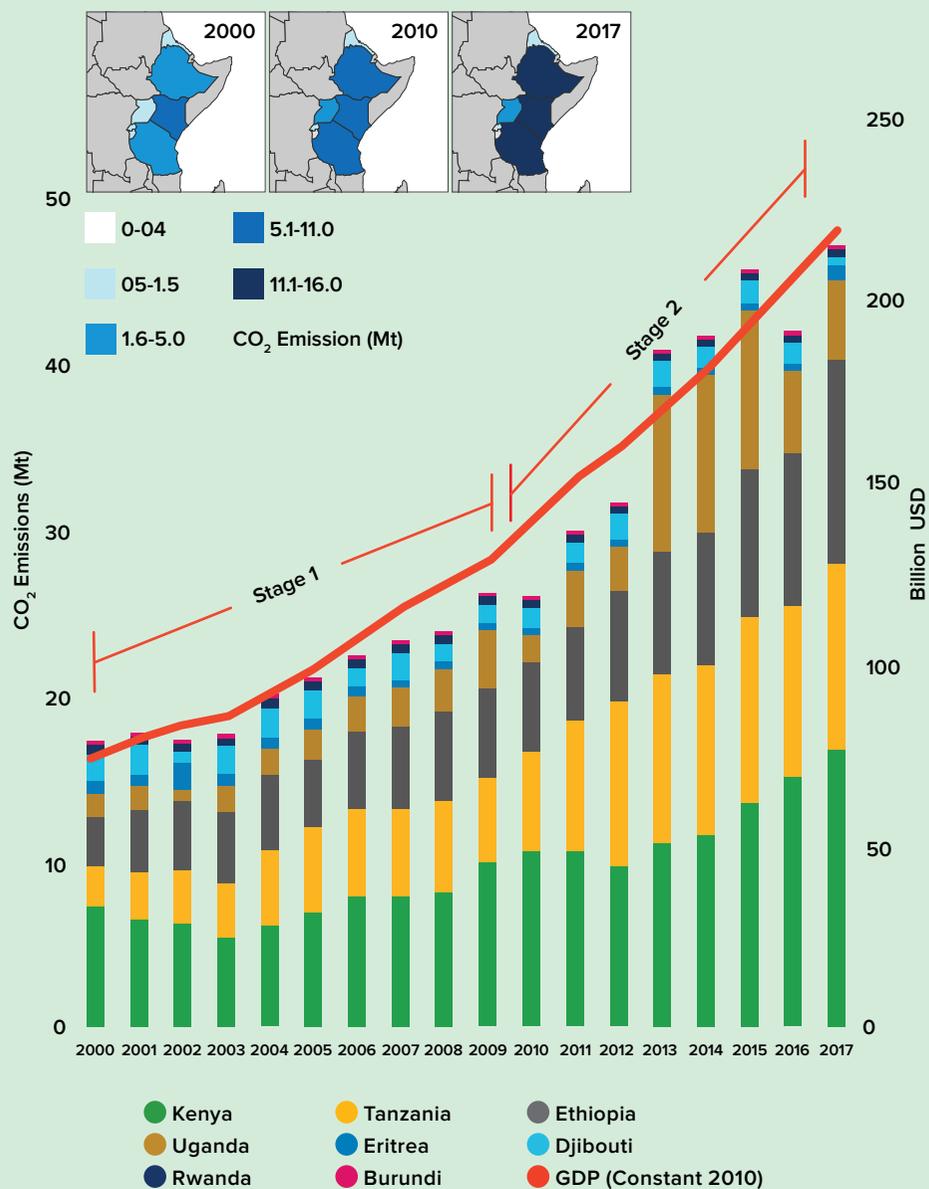


Figure 12: Evolution of CO₂ emissions in the East African region (2000-2017)¹¹¹



Quality of environmental agencies and environmental policies

Articles 111, 112 and 114 of the EAC Treaty make provision for cooperation between EAC member states in addressing climate change and environmental protection.¹¹²

Priorities of the EAC's environmental protection efforts include climate change adaptation and mitigation, natural resource management, biodiversity conservation, pollution control and waste management.



Climate change mitigation and adaptation funding in the EAC

East Africa's mitigation funding needs are estimated to be \$7.12 billion,¹¹³ equal to \$890 million per year. This is only 1% of total mitigation needs across Africa, as the overwhelming majority of mitigation will take place in Southern- and North Africa. East Africa's mitigation funding needs are also significantly smaller than its adaptation funding needs.

Adaptation funding needs (costs of planning, preparing for, facilitating, and implementing adaptation measures, including transition costs) are between \$91-\$143 billion leading up to 2030.¹¹⁴ Countries in the region are however unlikely to cover these costs without international funding. The region will need international contributions to the value of \$58-\$92 billion to meet its adaptation needs – the highest of all African regions. This equates to at least \$7.25 billion per year. Total climate finance flows to the region in the 2013-2017 period however only amounted to \$2.42 billion per year, 75% of which was disbursed in Kenya, Tanzania and Rwanda.¹¹⁵ DRE assets, low carbon by nature, can thus be a key asset to channel much-needed climate finance to the region. The overall environmental impact of DRE assets can be further increased through the increased investment that aggregation facilities offer, in turn leading to the scaling of the sector.



Carbon financing and exchange initiatives

Carbon trading and financing in the EAC is still nascent. There is no explicit mention of carbon pricing in any EAC nationally determined contributions, however, there have been preliminary initiatives undertaken such as the following:

- The East African Alliance on Carbon Markets and Climate Finance was established in 2019 to promote the participation of EAC countries in international carbon markets. It focuses on supporting the transition from the Kyoto Protocol Clean Development Mechanism to Article 6 of the Paris Agreement and implements a variety of capacity building activities and regional knowledge exchanges on carbon markets and climate finance;
- Kenya's Finance Act Nr 22 of 2022 introduced a tax incentive that encourages the use of market approaches for low carbon development. The Act introduces a reduced corporate tax rate of 15% for companies operating a carbon market exchange or emission trading system that is certified by the Nairobi International Financial Centre.¹¹⁶

3

Energy sector snapshot



Photo: UNDP/Louis Fourmentin

Only 46% of the population in East Africa is electrified, making it the second least electrified region on the continent. East Africa currently has an approximate installed capacity of 9,360 MW, the majority of which is generated from renewable sources.^{xiv} The region’s heavy reliance on hydropower (see Figure 13) is a risk for energy security especially as droughts become more severe and more frequent due to climate change. This often forces governments in the region to opt for expensive stop-gap solutions to cover shortfalls.¹¹⁷ Despite considerable growth in installed capacity over the past decade, grid reliability remains an issue in all countries in the region and reports of frequent outages are common. There is thus a need for DRE solutions, both on-grid and off-grid, to fill energy security gaps for on-grid customers and bring electricity to households and businesses that currently do not have any access.

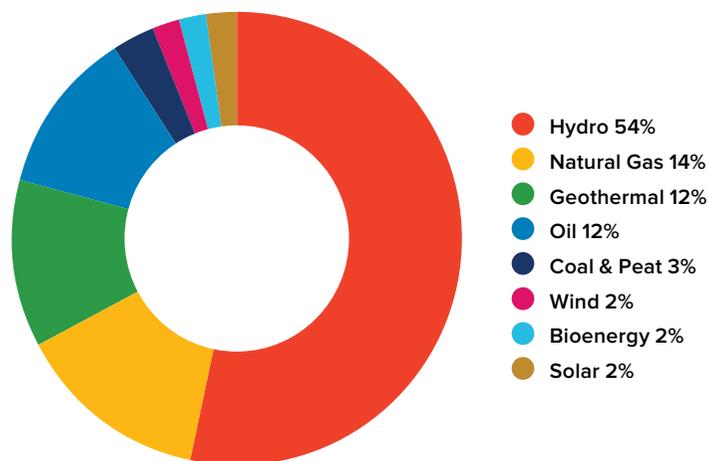


Figure 13: East Africa regional energy mix¹¹⁸

Effective regulation is key to energy sector growth. According to the 2021 Africa Electricity Regulatory Index, performance of energy sector regulators is mixed across the region. Uganda, Kenya, Tanzania and Rwanda are all ranked within the top ten countries with the best electricity governance performance in Africa, while the DRC and Burundi perform less well (see Figure 14).^{xv}

^{xiv} TFE analysis conducted by calculating the total installed capacity across EAC member states.
^{xv} South Sudan was not assessed.

The index reviews current performance of electricity regulators across Africa on the following grounds:

- Clarity and credibility of the regulatory framework;
- Efficiency with which regulators carry out their mandates;
- The effect of regulators on the market in terms of competitiveness, access and reliability.



Figure 14: Ranking of EAC countries in the 2021 Africa Electricity Regulatory Index¹¹⁹

4

Status of DRE sectors

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Photo: UNDP/Karin Scherbrucker

A key requirement for successful DRE financial aggregation is that DRE industries need to be mature. They need a large existing asset base, an extensive pipeline, and should already have attracted substantial levels of standard debt and equity. Conversely, industries that are nascent and still relying on grant funding are less suitable for financial aggregation. Developers and operators also need a minimum level of sophistication concerning PAYGO operations, data management, fundraising experience and financial reporting.

4.1 Key takeaways across DRE sectors

By 2019, 38.5 million people in the region were using distributed systems, equating to four times more than the population using distributed systems in West Africa and eight times more than in Southern Africa.¹²⁰ 75.6% of the 38.5 million-large population use solar lanterns and 22.5% SHS. The remaining 1.9% consists of small-scale hydro, biogas and solar mini-grids. Kenya accounted for the majority share (42.4%) of people in East Africa using distributed systems, followed by Ethiopia (20.5%), Uganda (16%), and Tanzania (9.5%).¹²¹ Investments in off-grid systems in Africa are still relatively small, amounting to \$380 million in 2020, with East Africa accounting for over half of these investments.¹²²

Deal sizes that most DRE companies can meet continue to be too small to be appealing to the average DRE investor. Minimum deal sizes vary between DRE sub-sectors, but averages reported by investors range from \$1 million to \$10 million, which only more mature DRE companies are able to absorb. Investors tend to be more comfortable with levels of around \$25 million, while real interest is generated at ticket levels exceeding \$50 million.¹²³ Pipelines that meet ticket sizes above \$50 million are hard to come by. The seemingly high minimum ticket sizes are,

“ There is a general lack of good financial reporting. We can't take audited financial statements at face value, and that's the very start of any due diligence. Companies also struggle to articulate to us what they want. Projections are often not there. ”

– Anonymous DRE investor

however, understandable. Investors' due diligence costs are relatively fixed irrespective of deal size. Minimum ticket sizes represent transaction values that enable investors to cover their due diligence costs and to make an acceptable return on investment. Neither the current operating asset base nor the pipeline of DRE assets in East African countries meet or exceed these minimum ticket sizes, with the exception of the asset bases and pipelines of market leaders.

Investment into the DRE sector is concentrated in a few large, established multinational companies. This is true in terms of both the number and size of transactions. This is likely due to these companies' proven track records and their ability to raise follow-on funding from early-stage financiers and financier partners. Small, locally owned companies represent the largest share of companies in the market by number, however these businesses struggle to raise the capital required to scale their operations. Investors note that local DRE companies often lack adequate financial management systems and fundraising experience.

Debt comes at a high cost, with collateral requirements often reaching 100% of loan value and local currency-denominated interest rates of about 15%-25%. For debt denominated in USD, interest rates are in the range of 6-12% as exchange rate risk is then borne by the borrower.

Most examples of financial aggregation in the DRE sector come from Kenya. This includes the Brighter Life Kenya transactions arranged by Solar Frontier Capital with d.light (see Box 3) and earlier pilot efforts by Persistent Energy to apply asset-backed securitization to Bboxx receivables.¹²⁴ Elsewhere, Winch Energy applied project aggregation to its mini-grid portfolio in Uganda, while PowerGen Renewable Energy, in partnership with CrossBoundary announced plans in 2019 to aggregate 60 mini-grid projects in Tanzania.¹²⁵

In mid-2023, two new receivable securitization structures were announced involving market leaders in the off-grid solar sector in East Africa as the sole recipients. The first one, a \$130 million securitization transaction to finance the pooled expected future payments from Sun King customers in Kenya, was arranged by Citi and involves participations from development finance institutions and commercial lenders.¹²⁶ The second involves Solar Frontier Capital and expands d.light's securitization financing facilities presented in Box 3¹²⁷ beyond Kenya, into Tanzania, and brings the total value of local currency structures financed by African Frontier Capital LLC (AFC) to \$490 million.¹²⁸ These transactions highlight the ever-evolving nature of the DRE sector in East Africa and its potential for aggregation but also the concentrated nature of investments in the sector.

4.2 Mini-grids

East Africa has been a hub for mini-grid activity over the past decade, mostly due to early movements in Kenya and Tanzania. Today, approximately 41 companies operate across the region,^{xvi} offering a host of services from engineering, procurement and construction and O&M to full vertical integration. The overwhelming majority of mini-grid investments in sub-Saharan Africa have collectively been disbursed in the East- and Southern African regions, far outstripping investment in other regions on the continent (approximately \$50 million cumulative by the end of 2019).¹²⁹ An estimated 469 mini-grids operate across the EAC region (see Figure 15).

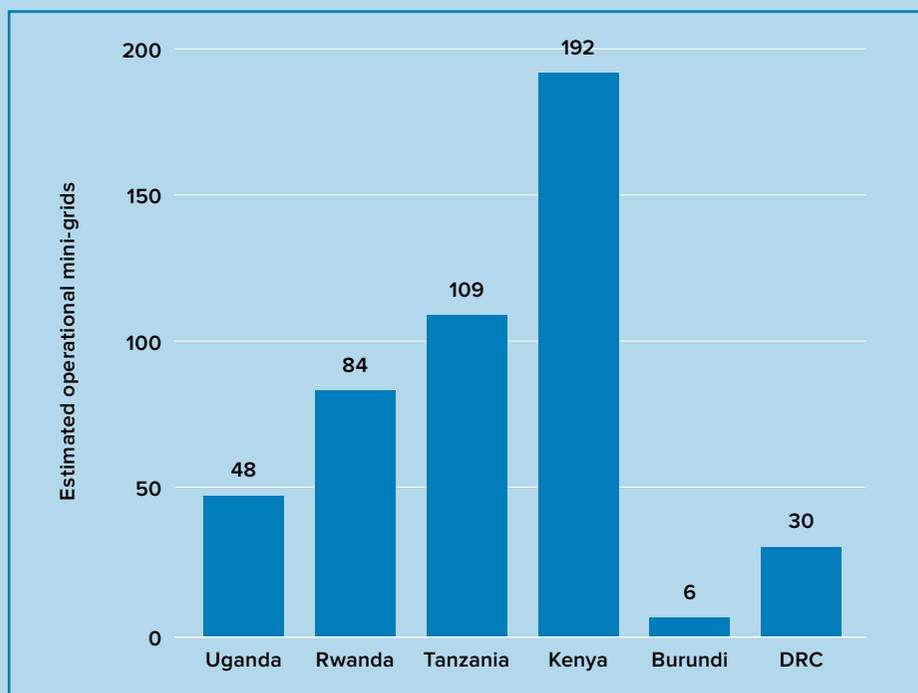


Figure 15: Mini-grid market size in terms of estimated number of operational sites^{134,135,136,137,138,xvii}

Mini-grid development is one of the more complex DRE sectors due to the infrastructural nature of the technology (compared to product-based technologies) and the diversity of assets that need to be deployed on the ground (generation, distribution and metering). Given this complexity, regulatory frameworks play a key role in shaping a mini-grid industry. In Kenya, draft mini-grid regulations have been published, and Uganda enacted regulations in 2020. Despite these moves, there is still room for improvement. In Uganda, mini-grid developers rarely obtain approval for tariffs exceeding \$0.30/kilowatt hour (kWh),¹³⁰ despite no tariff guidelines being written in the legislation. Tariffs below this level are regarded as not being cost reflective, which limits cost recovery on mini-grids and, in turn, the investment case. In Tanzania, politically motivated regulatory changes, chiefly the institution of a low tariff cap, have created an uncertain operating environment for private operators.¹³¹ Rwanda also has regulations for mini-grids in place, but the country’s national electrification plan specifies that only 182 villages will be electrified with mini-grids.¹³²

The mini-grid sector will likely remain driven by concessionary capital in the near term, as most transactions identified during this research included some proportion of donor grants. It is also well established that mini-grids require subsidies to match the ability to pay of customers while also ensuring a reasonable return for developers. Barring large outlier infrastructure projects and a handful of portfolio investments, all other transactions identified are relatively small (around \$1 million) and financed almost entirely through grant funding.¹³³

4.3 Off-grid solar products (solar home systems & standalone solar productive use)

80 companies operating in the SHS sub-sector were identified in East Africa through this assessment, many of which also sell standalone solar productive use systems such as solar water pumps. In addition, approximately 25 companies specialize exclusively in the supply of standalone solar productive use systems. While these mostly include solar water pumps, they also cover solar-based agricultural processing equipment and solar-based equipment for non-agri business such as barber kits. Based on Global Off-Grid Lighting Association (GOGLA)-affiliated sales data from 2018 to 2020, Kenya is the largest market for off-grid solar products in the EAC region, followed by Uganda, as Figure 16 indicates.^{xviii}

^{xvi} The number of operational companies is derived from a database compiled as part of this research. As such, there could be companies that did not appear in this research.

^{xvii} South Sudan has been omitted due to lack of data availability.

^{xviii} Detailed data is not available for Burundi and South Sudan. Figure 16 includes both PAYGO and cash sales.

PAYGO business models, a key requirement for aggregation facilities, have attracted 91% of investments from 2010 to 2018 globally,¹³⁹ indicating strong investor appetite. As Figure 17 indicates, PAYGO business models are most prevalent in Uganda and Rwanda, followed by Kenya.^{xix} Yet, a closer look at the data indicates growth in Kenya and decline in Uganda and Rwanda. From 2018 to 2020, the market share of PAYGO business models increased from 41% to 57% in Kenya, while Uganda experienced a decline from 61% to 49% and Rwanda from 75% to 32%.¹⁴⁰

OGS companies have been more successful at raising debt than companies in other sectors. The product-based business model is simpler by comparison to mini-grids. The OGS sector resembles other fast-moving consumer goods sectors, something banks and other lenders understand well. Globally, there are signs of increased maturity among a larger number of companies in this sub-sector. The top ten companies in the market in terms of funds raised collectively received 90% of all investments (all types) in 2019, which declined to 68% of all investments in 2020.¹⁴¹ This points to greater maturity of the sector as a whole, as there are now more companies that meet the due diligence requirements of investors. Indeed, the number of companies receiving at least one investment has increased from 49 in 2019 to 78 in 2020.¹⁴² If this trend continues, it is likely that more investors will enter into the sector. **This maturity implies that the OGS sector is the most likely candidate for aggregation facilities.** There have also been a few examples of off-balance sheet securitization-based deals in this sector (see for example Box 3).

One trend that does remain intact is the ability of multinationals to close bigger deals than local ones. The multinationals referred to here have already reached large-scale operations and can thus absorb large amounts of capital. Their large-scale operations typically stretch beyond a single country. This implies that it is not necessarily a lack of investability only that is impeding access to finance among local companies, but that they serve a smaller addressable market, confined by national borders. Operating in more than one country by default expands a company’s addressable market. Research indicates that multinationals operating in Uganda have closed deals with an average value of \$18.4 million.¹⁴³ This is four times higher than the average deal size closed by local companies. Similarly, multinationals operating in Rwanda have an average deal size of \$22 million.

While East Africa has been the main target for OGS investments for many years, recent data suggests that this trend is changing. Investments into the East African OGS sector was only 22% of global OGS investments in 2020, down from 32% in 2019, 44% in 2018 and 58% in 2017.¹⁴⁴ While the reasons for this remain unclear, a strong hypothesis could be increased focus in West Africa; a regional market that has been lagging behind East Africa.

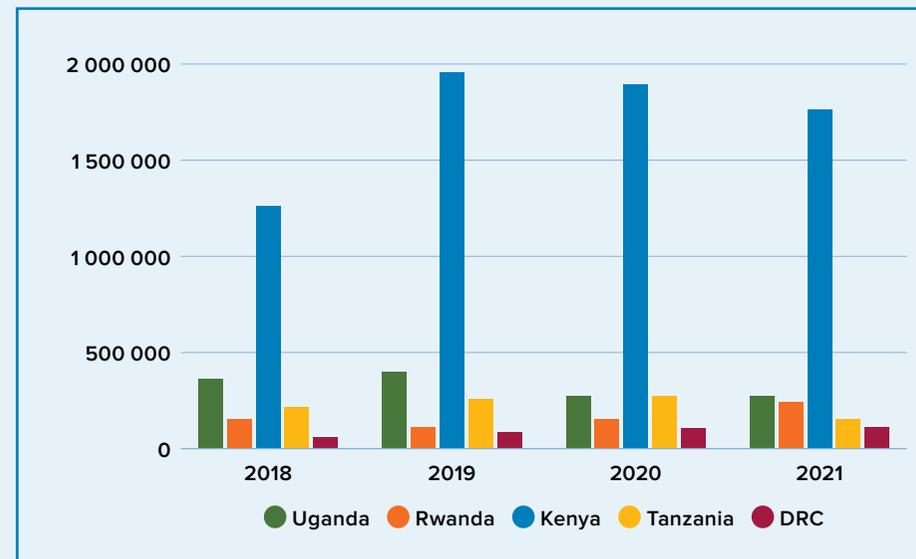


Figure 16: GOGLA-affiliated total OGS sales per country^{145,146,147,148,149,150}

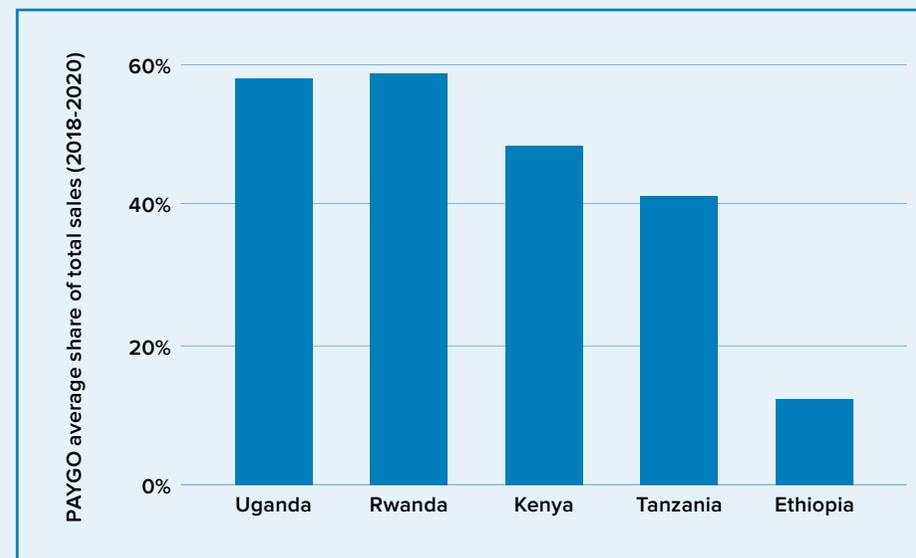


Figure 17: Average market share of PAYGO business models in total OGS sales (2018-2020)

^{xix} Note that these figures likely overestimate the share of PAYGO, as the majority of non-affiliated sales are likely outright sales. PAYGO data for 2021 has not been reported by GOGLA.

Box 3:

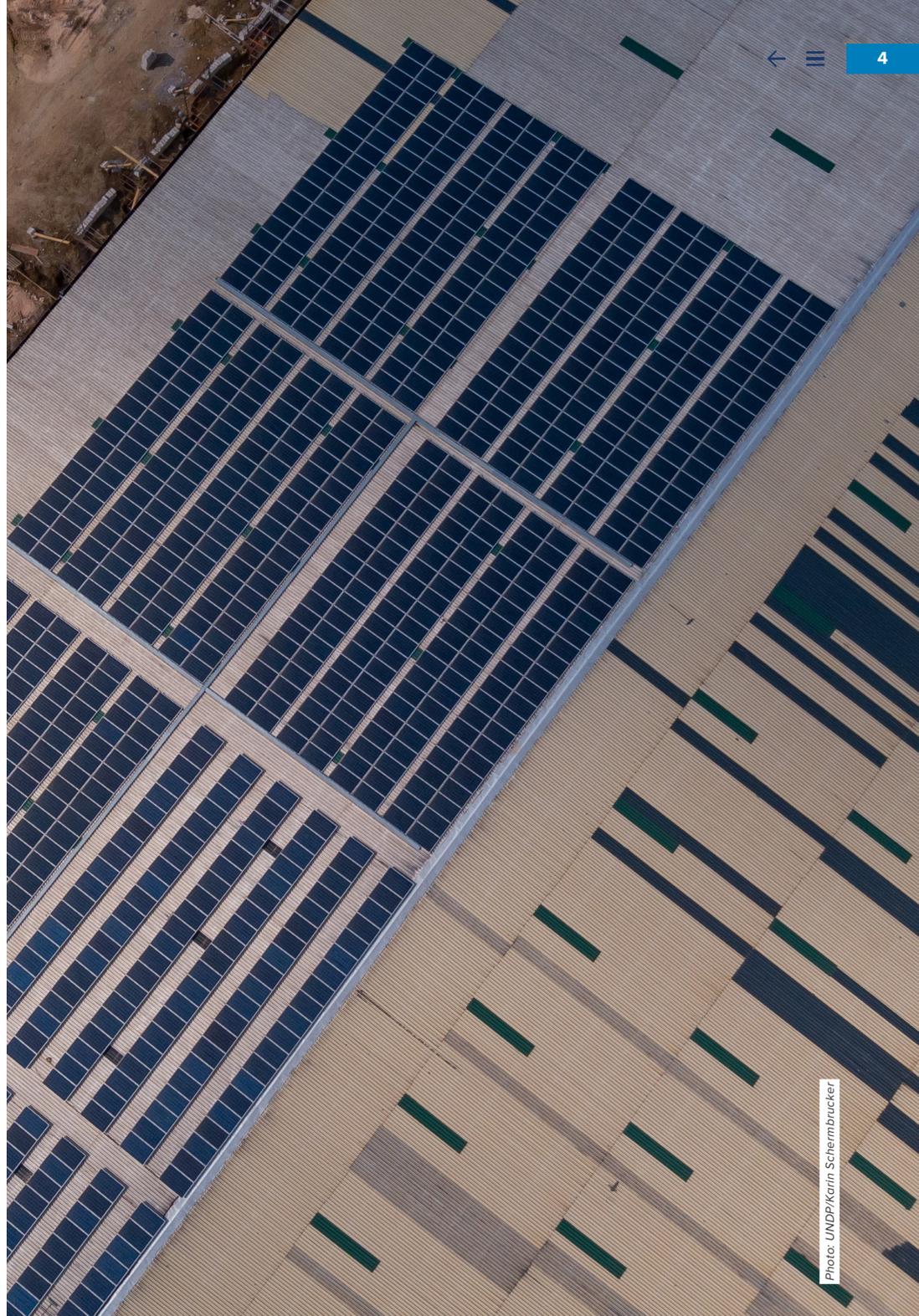
Landmark off-balance sheet financing facility for OGS company d.light

In June 2022, Solar Frontier Capital Limited (SFC), a wholly owned subsidiary of African Frontier Capital LLC (AFC) announced the establishment of Brighter Life Kenya 2 Limited (BLK2), the largest off-balance sheet facility in the DRE sector to date. The facility has been structured to provide d.light design Inc. (d.light) with multi-currency financing of up to \$238 million over a two year period.¹⁵¹ The transaction is backed by equivalent PayGo receivables from d.light's Kenyan operations. This facility follows a \$127 million Brighter Life Kenya 1 (BLK1) in 2020 which was structured under identical terms. BLK2 will provide d.light quick and flexible working capital to enable the company to continue providing consumer finance for its OGS products.

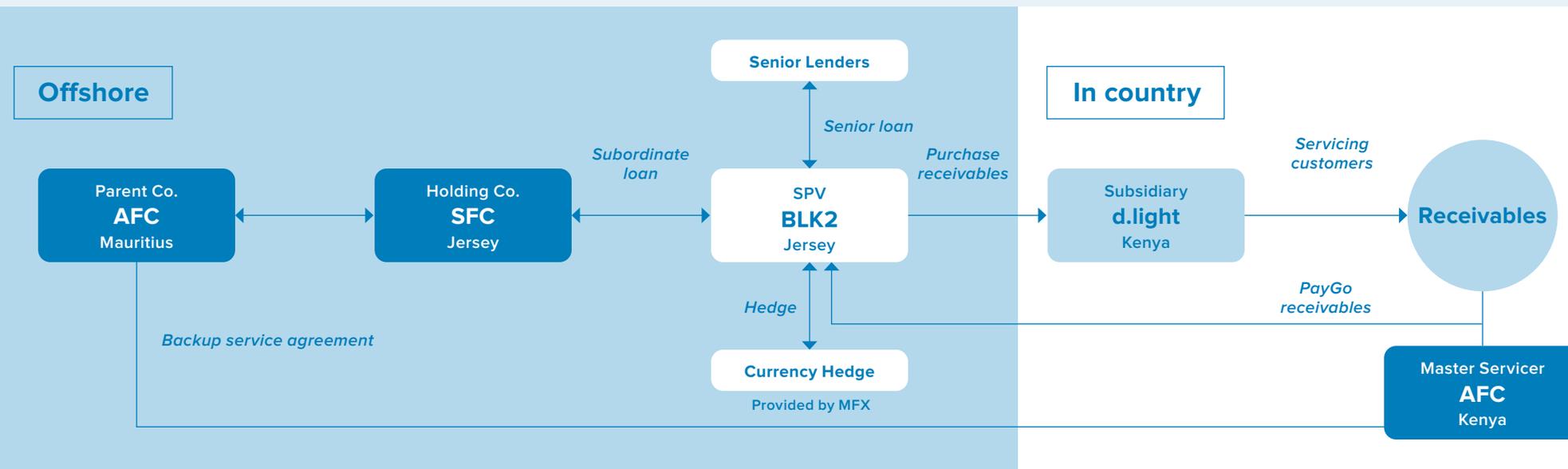
BLK2 is being partially financed through a \$62 million senior lending facility from U.S. International Development Finance Corporation (DFC), Norfund, responsAbility's managed funds, and Oikocredit¹⁵² all represented by law firm Hogan Lovells. AFC is the subordinated lender.

The \$238 million represents the face value of the receivables that SFC expects to buy from d.light over a 2-year period in monthly intervals. Consequently this is not a once-off transaction. The mechanics of the facility follow that of a traditional off-balance securitization instrument. Under the agreement, SFC alongside its senior lenders capitalized the BLK2 SPV domiciled in Jersey. This SPV will purchase PAYGO receivables up to the value of \$238 million from d.light in Kenya in return for capital upfront. The structure is supported by a currency hedging facility provided by MFX and a backup servicer in Kenya appointed by AFC. The facility has a service agreement with d.light who will continue servicing the end users. End user payments (Paygo receivables) are made directly to the SPV. D.light received legal assistance for this and the transaction more broadly from Norton Rose paid for through a Power Africa grant.

In August 2023, AFC and d.light announced the establishment of a \$125 million financing vehicle, Brighter Life Tanzania 1 Limited (BLT1), an off-balance sheet securitization structure that provides local-currency financing to the Tanzanian subsidiary of d.light.^{153,154} This adds to AFC's existing securitization structures in Kenya (BLK1 and BLK2), bringing the total value of securitized financing provided to d.light to \$490 million.¹⁵⁵



Box 3:
Landmark off-balance sheet financing facility for OGS company d.light



The commercial term structures that product based PAYGO securitization facilities follow do not vary widely. Typically if a product sells for \$110 to the end-user, the end-user pays a down payment of about \$10 to the DRE company. The end-user then owes the DRE company \$100, which is termed accounts receivable (AR). The DRE company can then sell the \$100 AR to the financier. The financier will, however, typically only finance a portion of the AR, for example 50%, which equates to \$50. The financier would pay the DRE company the full amount of the portion that it finances upfront, in this case \$50. The DRE company would now have collected \$10 from the customer and \$50 from the financier. The DRE company’s profit is what remains after the company has repaid the financier the AR portion that was financed plus associated financing costs. DFIs which fund securitization deals are typically targeting financing costs of 6%.

What is unique to the OGS sector is that AFC has to play additional roles which do not exist in other sectors and are usually not undertaken by a project sponsor. In addition to acting as a sponsor and subordinated lender, AFC acts as a “Master Servicer” responsible for collecting and managing independent sales and collection data as well as providing independent oversight of the daily “cash sweeps” (cash collection from d.light, who continues to collect payments from

customers on SFC’s behalf). AFC also has a separate Kenyan entity which is responsible for playing the role of back up servicer in the event of a d.light bankruptcy.

In addition to employing an independent data management system, instituting frequent cash sweeps and playing the backup servicer role, SFC has taken some additional steps to de-risk their instrument. SFC uses advanced tranching methodologies to accurately evaluate, select and price high quality receivables. The company also has foreign currency hedging agreements in place and keeps its foreign currency in its holding company, only drawing down when necessary.

AFC and its CEO Eric de Moudt remain bullish on the commercial potential of OGS receivables, as they have found that “solar home system revenues remained robust and predictable through COVID, locust infestations and soon enough we will even know whether or not through election cycles.”

This transaction exemplifies how African DRE receivables can be leveraged by corporate entities in (international) mature financial markets to finance African operations and ultimately African customers.

4.4 Captive power

The national grids of most countries in East Africa struggle to supply reliable power to their customers. In Kenya, for example, 65% of enterprises report 4 to 14 interruptions per week, while in Uganda 30% of households report never having electricity services despite being connected to the grid.¹⁵⁶ As such, captive power installations have an important role to play in ensuring energy security for C&I facilities in the region.

In addition to energy security, these systems can often reduce energy bills for all types of off-takers. As Figure 18 elaborates, the levelized cost of energy (LCOE) of grid-tied solar plus storage systems are in many cases more affordable than grid tariffs in East African countries. When considering that most utilities heavily subsidize grid tariffs (the average tariff that utilities would need to cover costs is \$0.27/kWh¹⁵⁷), the cost difference between grid tariffs and captive power systems becomes even greater.

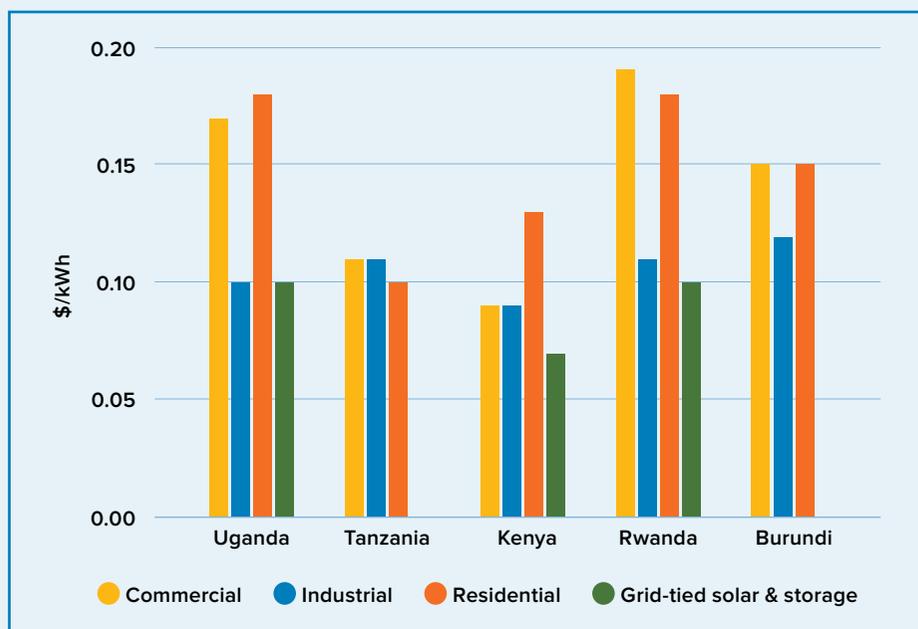


Figure 18: East Africa grid tariffs and indicative grid-tied captive power LCOEs^{158,159,160}

These drivers have meant that market growth has been picking up speed. The installed capacity of C&I solar projects has almost tripled in three years in EAC countries, from only 39 MW in 2020 to 100 MW in 2023.^{161,162} Across the region, an estimated 105 companies operate in this sub-sector. Barriers to entry are typically lower than that of mini-grids, as regulations tend to be lighter. In Kenya, there are now an estimated 184 captive power projects (all system types and all off-taker types) with an approximate total installed capacity of 39 MW, up from 7 MW in 2015.¹⁶³ The overwhelming majority of these systems are installed at manufacturing facilities.¹⁶⁴ In Uganda, C&I users also comprise most of the captive power installations, typically smaller-sized farming operations and office blocks and larger-sized manufacturing facilities and sugar processing plants.

Despite this growth, financing remains one of the key hurdles to scale, in particular lack of access to credit. This applies particularly to smaller, often locally based companies. Kenyan companies, for example, typically do not have working capital needs exceeding \$1 million.¹⁶⁵ Investors generally avoid funding small capital needs as due diligence costs tend to be fixed, irrespective of potential returns involved. It follows that investors are more interested in larger projects where transaction costs like due diligence account for a smaller proportion of total project costs. **This observation however adds impetus for an aggregation facility that pools projects and borrows at the portfolio level, and investment transactions costs can therefore be spread across several smaller projects.**

The sector primarily employs three relatively proven business models: Outright sale, PAYGO (lease to own) and energy as a service (power purchase agreements). Only PAYGO and power purchase agreement (PPA) business models are suitable for financial aggregation. The extent to which each model is used in the region is unclear. In Kenya, the outright sales model constitutes about 65-70% of installations.¹⁶⁶ In Uganda, 38% of transactions are done on an outright sale basis.¹⁶⁷ A deduction from this data would thus suggest that the share of lease to own and PPA models in the market would be around 50%.

Outright sales to customers are not suitable for financial aggregation facilities due to the need on the part of aggregation facilities to transfer receivables (ongoing cash flows) or entire projects into SPVs or portfolios as appropriate. A key consideration for this sub-sector would thus be to increase the use of PPAs, lease-to-own or any other models that do not involve immediate ownership transfer to the customer. Companies interviewed however point out that financing the entire cost of a system is an expensive endeavour and collateral requirements are difficult to meet.

4.5 Electric vehicles

The EV market in East Africa is dominated by the 2 and 3-wheeler vehicle segments, with battery swapping being a popular service offering among operating companies. The sector is still nascent. In Uganda, there are only an estimated 500 registered electric bicycles and motorcycles,¹⁶⁸ while Kenya only has an estimated 350 EVs registered.¹⁶⁹ As of 2021, 86% of EV companies in Kenya have only been in operation for three years or less.¹⁷⁰ 35 companies operating in the EV sector were identified in East Africa through this assessment. Most are based in Kenya. The sector across all countries in the region remains grant and equity funded, however this is characteristic of any nascent sector. Debt financing will be necessary to enable the growth of this sector, one which is particularly capital intensive. It is likely, however, that debt will only become a standard funding route for EV companies once they can generate sufficient cash flows to service this debt. This is not only the case in East Africa but across EV sectors in developing markets worldwide.

The market for EVs in East Africa is mainly constrained by a lack of infrastructure (charging stations, underdeveloped road networks and limited local assembly capacity) and a small pool of companies supplying vehicles and ancillary services. Indeed, first mover companies must often operate a vertically integrated model due to the lack of ancillary services offered by specialist service providers.

Table 4 shows the variety of EV uses and business models employed across Africa – these apply to a variety of technologies (e.g., electric vehicles, electric motorcycles or bicycles, electric boats, etc.). These can be further delineated by inter and intracity, by rural and urban focus and by charging and battery swapping technologies. The wide array of business models in use represents a challenge for financial aggregation, which requires uniform and standardized receivables as a basis for transparency and modelling. As the sector matures and grows, there will likely be a convergence towards the most promising business models as observed in other sectors. This convergence is required to improve the viability of financial aggregation in this sub-sector.

Despite its nascency, the sector holds considerable potential. While upfront costs can be prohibitive, the total cost of ownership of EVs compares favourably to internal combustion engine vehicles in East Africa.¹⁷¹ There are an estimated 5 million petrol-powered motorcycle taxis in East Africa.¹⁷² This signifies a large addressable market for converting petrol engines to electric, as well as replacing them with new electric-powered motorcycles at their end of life.

USE \ BUSINESS MODEL	BUSINESS MODEL		
	Lease to own	Mobility as a service	Outright sale
Logistics (Delivery of goods)	X	X	X
Taxi service	X	X	X
Personal transport	X	X	X

Table 4: EV uses and business models

The region's governments are largely supportive of the sector. Rwanda, for example, subsidizes grid electricity designated for EV charging (with end-user tariff at about \$0.10/kWh), removed all duties, VAT and withholding taxes from EVs, parts, batteries and charging station equipment and instituted a host of other non-fiscal incentives.¹⁷³ The government aims for 20% penetration of electric buses (of all buses) by 2030.¹⁷⁴ Kenya recently reduced excise duties on imported EVs from 20% to 10%,¹⁷⁵ and aims to have at least 5% of all vehicle imports to be electric by 2025.¹⁷⁶ The Ugandan government is also currently planning to implement similar incentives.

4.6 Applying a gender lens to DRE and financial aggregation

Women comprise 60% of the EAC population, but remain largely excluded from the productive sectors of EAC economies. Women typically have limited access to education, finance, information and communication technologies and are disproportionately affected by climate change.¹⁷⁷ This is despite notable progress in some EAC countries and at the EAC level to address gender equality issues. The EAC adopted a regional gender policy in 2018 focused on harmonizing efforts by member states in mainstreaming gender.¹⁷⁸ At the regional level, Article 5(e) of the treaty covers issues of mainstreaming gender into all EAC endeavours, while Article 121 and 122 emphasize the role of women in socio-economic development in EAC countries.¹⁷⁹

4.6.1 Gender issues in the energy sector

Following the trend of other productive sectors, women, for the most part, tend to be underrepresented in EAC energy sectors. **Rwanda's** energy sector remains largely male dominated with only 5% of women occupying the workforce, most of which take on sales or middle management roles.¹⁸⁰ A key reason for this relates to women in tertiary educational institutions in Rwanda only making up 9% of science, technology, engineering and mathematics (STEM) programme graduates.¹⁸¹ Conversely, in **Tanzania**, the energy sector has a balanced representation and participation of women in high-level decision-making positions. Women make up 44% of employees in the Ministry of Energy, 20% at the Tanzania Electric Supply Company and 26% in the Rural Energy Agency.¹⁸² Female representation in energy and low carbon sectors in **Uganda** remains low due to a limited number of women graduating from STEM courses, limited access to finance, and socio-cultural gender norms which view technical sectors as inherently 'male'.¹⁸³ However, opportunities to take on more senior and managerial positions within the public sector agencies are being facilitated. The heads of the Rural Electrification Agency and the Electricity Regulatory Authority, the Minister and Permanent Secretary of the Ministry of Energy and Mineral Development and the Managing Director of the Uganda Energy Credit Capitalization Company are all female.^{184,185}

In 2019, **Kenya** launched the first national gender policy for the energy sector in Africa. The policy provides a framework to mainstream gender in policies and programmes in the Kenyan energy sector.¹⁸⁶ This follows energy sector gender policies implemented by regional organizations such as the African Union and could set the pathway for other national governments to follow.

4.6.2 Addressing gender mainstreaming barriers

Gender inequality and the foundations that underpin its existence operate not in isolation but across all facets of society, from attitudes that women have about themselves, to attitudes towards women in households and in the formal economy. It follows that any initiative aiming at gender mainstreaming should not only consider the manifestations of gender inequality in a particular context, but also its most basic foundations.



A number of initiatives aimed at addressing these issues at various levels have emerged in the region over the past few years. In the energy sector specifically, the East Africa Centre for Renewable Energy and Energy Efficiency (EACREEE) launched the EACREEE-GEN project on gender equality, Women's & Youth Empowerment in Sustainable Energy.¹⁸⁷ EACREEE recognizes the pivotal role women will play in helping to create an enabling environment for a competitive sustainable energy market.

To address the disproportionate effect of climate change on women, efforts towards including gender perspectives in climate finance in low- to middle-income countries are key. There has been an emergence of gender-responsive climate finance in Africa, with funding from various sources increasing from an average of \$80 million in 2010 to \$1.6 billion in 2019.¹⁸⁸ Prior to the pandemic between 2010-2019, 50% (around \$720 million) of gender-responsive climate finance in Africa was annually channelled towards mitigation, 37% (around \$545 million) towards adaptation and 13% (\$194 million) towards mitigation and adaptation combined.¹⁸⁹

4.6.3 Gender mainstreaming action points for financial aggregation in the DRE sector

Build more enabling environments for women within DRE enterprises:

- Increase female educational access to STEM programmes;
- Facilitate roles for women in the planning, design and execution of energy programmes, inclusive of roles addressing energy efficiency;
- Implement gender quotas within low carbon enterprises to encourage the employment of women;
- Raise awareness using female role models in technical and leadership roles;
- Train entrepreneurs on the business case for employing women and train female entrepreneurs;
- Carry out in-house training on gender awareness for both male and female staff in energy enterprises;
- Implement programmes to support a gender inclusive environment, for example human resources policies that go beyond basic regulatory requirements such as provision of childcare or flexible working hours;
- Apply a gender lens in after-sales service to ensure both female and male end-users remain satisfied;

- Increase data collection and use frameworks such as and [ICRW Gender Scoring Tool](#), USAID [evidence-based methodology](#) to improve gender dynamics;
- Increase the level of data collection on gender dynamics with the energy sector.

Build a more enabling institutional environment for women:

- Identify alternative ways to provide guarantees/collateral for loans that are accessible to women;
- Deploy subsidies for female-owned low-carbon enterprises;
- Design strong gender policies for financial institutions to guide institutions in ensuring equity and financial inclusion;
- Design strong gender policies specifically for the energy sector, including the low-carbon sectors institutions, to guide gender mainstreaming;
- Recommend gender screening for investors to ensure gender smart investment, for example: [British International Investment Gender Toolkit](#).



Photo: UNDP/Joyous Begisen

5

Quantifying the market opportunity for financial aggregation

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- 5.2 Conservative scenario 49



Photo: UNDP/William Seal

In an effort to estimate the market opportunity for DRE financial aggregation in East Africa, we present the total estimated financial aggregation investment opportunity in each DRE subsector.^{xx} Two scenarios, the conservative scenario and ambitious scenario, are modelled across three different time frames; base case (2022), mid-term (2025) and long term (2030). Market size is determined by assessing the estimated total annual cash flows generated by each of these sectors in 2022, 2025 and 2030. These cash flows represent all DRE revenues that can be aggregated in theory. The base case market size is derived from historic market performance in 2022 and as such the aggregatable market size in this time frame is uniform across the two scenarios. Conversely, the market size in the mid-term and long-term time frames differ vastly between the two scenarios as the sections below explain.

Note that this market size quantification assumes that DRE cash flows are used to pay off debt secured to develop projects (in the case of mini-grids and captive power) or to buy or manufacture stock and incur related upfront expenses (in the case of OGS). Yet, in cases where equity or grants are used to finance upfront expenditure, the methodology to quantify the market size would be different. In such cases, the value of upfront expenditure would be the suitable metric. We note, however, that this report considers financial aggregation as debt secured against future asset cash flows and that this is also the funding direction that the sector should increasingly take. It is for these reasons that annual cash flows generated by DRE assets is the most suitable metric of future financial aggregation market value.

5.1 Ambitious scenario

The total DRE aggregatable asset base across the mini-grid, OGS and captive power subsectors in the baseline period (2022) is \$248 million annually (see Appendix C for methodology followed in calculating each DRE subsector’s aggregation market size).

In the ambitious scenario, the market is estimated to grow consistent with the following growth projections:

- All potential sites identified for mini-grids are operational across the EAC by 2030;
- The historic compound annual growth rate (CAGR) of PAYGO OGS systems (7.1% from 2017 to 2021) is maintained up to 2030;^{xxi}
- The high historic CAGR of C&I solar across the EAC (59.9% from 2020 to 2022) is maintained up to 2030.^{xxii}

Assuming these ambitious growth projections as well as other necessary precursors (e.g. full coordination and sufficient standardization between originators and a sufficiently developed capital market), the total aggregatable asset base could grow to \$533.5 million per annum by 2025 and \$1.6 billion by 2030. Naturally these estimations are based on a number of assumptions^{xxiii} and as a consequence the results can only be used as a high-level opportunity assessment. The estimates include the value of all DRE assets that could possibly be aggregated in theory. Yet, in reality the aggregatable asset base is likely to be smaller due to practical constraints impeding the precursors for the best-case scenario from being realized.

^{xx} The EV market is the most nascent of all DRE industries studied in this report and there is very little data to base any projections on. As a result, the projected aggregatable revenue base has not been quantified.

^{xxi} Derived from GOGLA OGS sales data.

^{xxii} Derived from AFSIA Annual Solar Outlook reports.

^{xxiii} Assumptions provided in Appendix C.

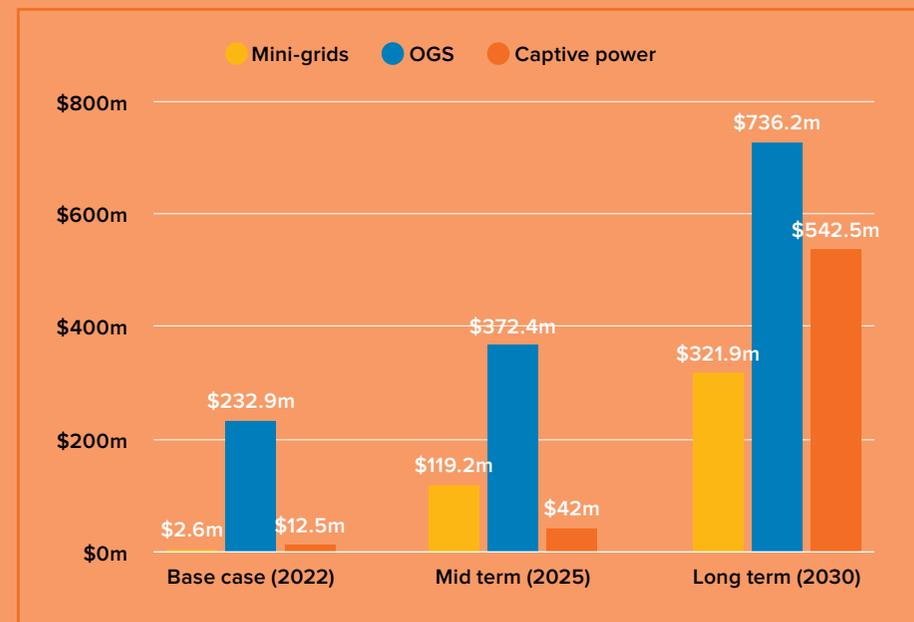


Figure 19: Estimated annual aggregatable revenue per DRE technology in East Africa (ambitious scenario)¹⁹⁰

5.1.1 Mini-grids – ambitious scenario



Our results indicate that the East African mini-grid market currently has a total annual aggregatable revenue base of \$2.6 million. This is estimated to increase to \$119.2 million by 2025 and \$321.9 million by 2030 under the ambitious scenario. The calculation takes into consideration the estimated number of mini-grid connections in each time period and the average revenue per user (ARPU). It assumes that the respective national mini-grid electrification targets in each EAC country is reached in the medium term and long term.^{xxiv}

Translating into practical terms, this ambitious scenario suggests that by 2025 there would be 16,426 operational mini-grids, assuming 100 connections per mini-grid. This is equal to approximately 657 portfolios of 25 mini-grids each. Each portfolio would be worth \$3.6 million, which is the total aggregated revenue potential of 25 mini-grids stretched over 20 years. If all ambitious mini-grid targets across EAC countries are to be reached by 2030, there would be a need for 13,161 more mini-grids. This is equal to approximately 526 portfolios of 25 mini-grids each. Each portfolio would be worth \$5.4 million.

5.1.2 Off-grid solar – ambitious scenario



The aggregation potential for OGS is orders of magnitude larger than other DRE markets, due to its existing relative maturity. Baseline annual aggregatable revenue is estimated to be \$232.9 million based on estimated GOGLA-affiliated PAYGO sales for 2022.^{xxv} The medium-term annual aggregatable revenue base is \$372.4 million. This assumes that the historic 4-year CAGR of OGS sales in the EAC is maintained up to 2025 and it assumes that 55% of all OGS solar sales are PAYGO-based.^{xxvi} Assuming the same growth rate up to 2030 and maintaining a 55% PAYGO share, annual estimated aggregatable revenue by 2030 amounts to \$736.2 million.

^{xxiv} Note that some long-term targets are still only tentative projections. Not all targets used in the calculation are set in policy. Data sources are presented in appendix C.

^{xxv} Sales are estimated because data for the whole of 2022 has not been published by the time writing.

^{xxvi} TFE analysis. See Appendix C for details.

^{xxvii} Data on current country-wide installed capacity of all captive power technologies (e.g. standalone hydro, bagasse cogeneration etc.) in EAC countries is unavailable.

^{xxviii} See Appendix C for more details.

5.1.3 Captive power – ambitious scenario



Our calculations indicate baseline annual aggregatable customer receivables with a value of \$12.5 million in the captive power sector, acknowledging that only C&I solar systems have been considered.^{xxvii} This is estimated to grow to \$42 million per annum by 2025, followed by a significant ramp up to \$542.5 million by 2030. Projected cash flows are based on an estimate of the potential C&I solar captive power installed capacity by 2030. Under the ambitious scenario it is assumed, optimistically, that the high historic CAGR of C&I solar installed capacity of 59.9% is maintained up to 2030.^{xxviii}

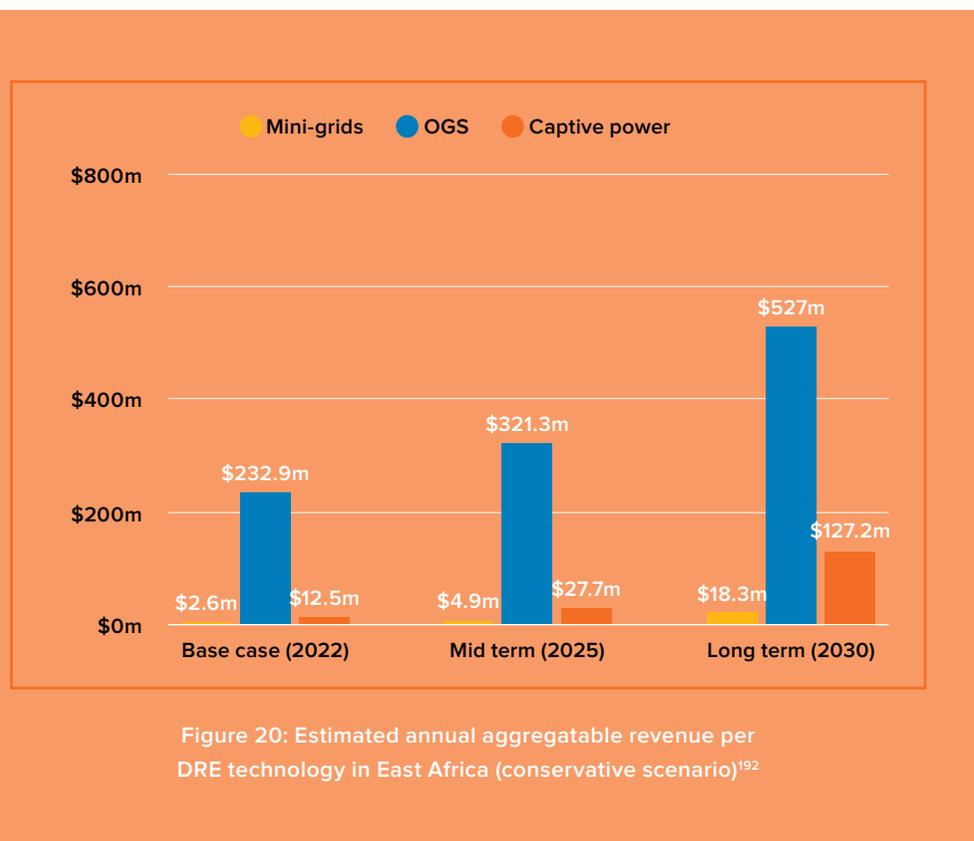
Translating into practical terms, assuming that the average size per project is 100kW in 2025, the ambitious scenario suggests that by 2025 there would be 1,543 C&I solar projects operating on an energy-as-a-service model. This is equal to approximately 103 portfolios of 15 projects each. Each portfolio would be worth \$8.2 million, which is the total aggregated revenue potential of 15 projects stretched over 20 years. If the projected ramp-up in projects does occur between 2025 and 2030, there would be an additional 11,016 projects operating on energy-as-a-service models by 2030 (with an increased average capacity of 150kW). This is equal to approximately 734 portfolios of 15 projects each. Each portfolio would be worth \$13 million.



5.2 Conservative scenario

The total baseline aggregatable asset base in the conservative scenario remains the same as in the ambitious scenario. In the conservative scenario, the market is estimated to grow consistent with the following growth projections:

- The mini-grid market is assumed to grow at a generally accepted CAGR of 20% year-on-year;¹⁹¹
- A reduced CAGR of PAYGO OGS systems (2%) is used to estimate PAYGO sales by 2025 and 2030;
- A reduced CAGR of C&I solar (30%) is used to estimate installed capacity by 2025 and 2030.



Assuming these relatively conservative growth projections as well as other necessary precursors (e.g. full coordination and sufficient standardization between originators and a sufficiently developed capital market), the total aggregatable asset base could grow to \$353.9 million per annum by 2025 and \$672.5 million by 2030. As is the case with the ambitious scenario, these estimates are based on a number of assumptions^{xxix} and as a consequence the results can only be used as a high-level opportunity assessment. These estimates also include the value of all DRE assets that could possibly be aggregated in theory. Thus, while this scenario is more conservative, the total aggregatable asset base might be even smaller due to practical constraints impeding the precursors for the best-case scenario from being realized.

5.2.1 Mini-grids – conservative scenario

 The current total annual aggregatable mini-grid revenue base of \$2.6 million is estimated to increase under the conservative scenario to \$4.9 million by 2025 and \$18.3 million by 2030. The calculation assumes 20% year-on-year growth up to 2030.

Translating into practical terms, the conservative scenario suggests that by 2025 there would be 675 operational mini-grids. This is equal to 27 portfolios of 25 mini-grids each. Each portfolio would be worth \$3.6 million, which is the total aggregated revenue potential of 25 mini-grids stretched over 20 years. If the same growth rate continues up to 2030, there would be 1,005 more mini-grids operating in 2030. This is equal to approximately 40 portfolios of 25 mini-grids each. Each portfolio would be worth \$5.4 million.

5.2.2 Off-grid solar – conservative scenario

 The aggregation potential for OGS in the conservative scenario remains orders of magnitude larger than other DRE markets, due to its existing relative maturity. Baseline annual aggregatable revenue of \$232.9 is estimated to increase to \$321.3 million by 2025 and \$527 million by 2030, assuming a reduced CAGR of 2% up to 2030.

^{xxix} Assumptions provided in Appendix C.

5.2.3 Captive power – conservative scenario



Baseline captive power annual aggregatable customer receivables of \$12.5 million is estimated to grow to \$27.2 million per annum by 2025 and \$127.2 million by 2030. Projected cash flows are based on an estimate of the potential C&I solar captive power installed capacity by 2030. Under the conservative scenario, the East African C&I solar CAGR of 59.9% has been revised downwards to 30% and it is assumed that this CAGR is maintained up to 2030.

Translating into practical terms, assuming that the average size per project is 100kW in 2025, the conservative scenario suggests that by 2025 there would be 1,019 C&I solar projects operating on an energy-as-a-service model. This is equal to approximately 68 portfolios of 15 projects each. Each portfolio would be worth \$8.2 million, which is the total aggregated revenue potential of 15 projects stretched over 20 years. By 2030, the conservative scenario estimates that there would be an additional 1,924 projects operating on energy-as-a-service models (with an increased average capacity of 150kW). This is equal to approximately 128 portfolios of 15 projects each. Each portfolio would be worth \$13 million.

Box 4:

A note on the market potential of EV financial aggregation

The EV market is the most nascent of all DRE industries studied in this report and there is very little data to base any projections on. As a result, the projected aggregatable revenue base has not been quantified. It is useful to note, however, that the automotive sector across the continent is projected to grow at a CAGR of 5.55%¹⁹³ and EAC countries will likely aim to increase the share of EVs in annual vehicle sales. As a result, the theoretical addressable market could be substantial.



6

Looking ahead: Aggregation transactions in East Africa

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Photo: UNDP/Karin Scherbrucker

6.1 Barriers



Commercial investors perceive DRE investments as high risk. Financial aggregation instruments can only reduce overall risk to a limited extent, which necessitates additional risk mitigation practices: It is well known that DRE investments carry high systemic and non-systemic risk. The creditworthiness of end-customers, especially energy access customers, can be questionable, DRE companies often lack the necessary infrastructure to run efficient operations, macroeconomic conditions remain challenging and DRE operations tend to be exposed to negative regulatory shifts. While financial aggregation can isolate these risks and in turn reduce risk overall, there is still substantial risk that remains. Risk is amplified further due to the limited track record of aggregation instruments in the DRE sector.



Aside from certain market leaders, the current DRE asset bases in most individual EAC countries are too small to warrant financial aggregation: Aggregation deals should at the very least be \$10 million to account for costs. This is the lower end of the spectrum – where costs are cut using securitization structures that are not fully off-balance sheet. A high proportion of concessional capital in the capital stack can also enable deal sizes on the lower end of the spectrum as these investors' minimum required ticket sizes tend to be smaller. However, if fully off-balance sheet structures are to be used and a larger proportion of commercial investors are to invest, deal sizes should preferably be higher – from \$50 to \$100 million and upward. The small asset base and future pipeline in the majority of individual EAC countries are underpinned by a series of related supply-side barriers, as Figure 20 below shows. **Aggregation across countries would however leverage an asset base large enough to warrant financial aggregation, as chapter 5 shows.**



High cost of setting up and running securitization structures: Our research into past securitization transactions indicates that the transaction costs of setting up these deals vary widely, from approximately \$250,000 to \$2 million. In order to cover these costs, running costs and to account for investment returns, securitization deals should be \$10 million at the very least, but ideally significantly larger. While there might be sufficient assets to aggregate across countries to meet these deal sizes, it is the general perception of the market that single countries alone do not have enough assets on the ground or in the near-term pipeline to meet them. Aggregating across countries is also likely to increase costs as it would require specific expertise to navigate country-specific legislation.

“At times, projects have to be aggregated across multiple developers to create portfolios that meet threshold investment sizes of larger investors.”
– Piyush Mathur, Odyssey Energy Solutions

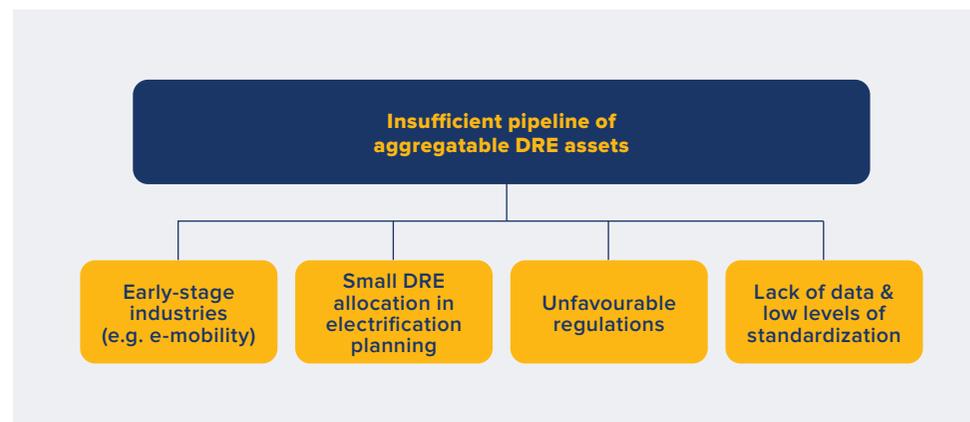


Figure 21: Linkages between supply-side barriers



Lack of data: DRE is perceived as a risky sector from an investment perspective, but there are a number of other industries that are equally risky, yet they are still able to successfully attract the requisite investment levels. One key differentiating factor is data to showcase a track record and better understand and assess risk. The paucity of data in DRE sectors in sub-Saharan Africa is well documented but the challenge remains pervasive on the ground. This can be attributed, in part, to the sector's relative youth. The average DRE company, including the most established market leaders, have only been operating for a few years. As such, many lack the historical customer data needed to make future projections. It is also worth noting that off-the-shelf digital data collection and management systems have only entered the market over the past few years. Many young and growing companies also have to juggle between pursuing sales pipelines and reinvesting in data management infrastructure. Overlooking the latter often results in self-reported and unregulated data, which jeopardizes fundraising efforts.¹⁹⁴

“Full scale securitization needs to be an 8-figure USD transaction just to justify all the costs. But this can only work when the sector is mature. It can be a great way of ensuring regular access to capital in a capital-intensive industry, such as this one.”

– Avi Jacobson, Sunfunder

“There is an opportunity to aggregate receivables from a pool of companies to diversify risk and be able to provide off-balance sheet financing to companies that do not have sufficient scale to carry the legal costs associated with this financing structure on their own.”

– Kristoffer Valvik, Norfund



Low levels of standardization: Standardization is a key enabler of aggregation^{xxx}. There needs to be a minimum level of homogeneity between assets if they are to be aggregated together into portfolios. However, achieving this homogeneity is a challenging endeavour as the DRE industry consists of a diverse set of products and services, from standalone off-grid solar systems to C&I solar energy-as-a-service packages. Most DRE technologies are vastly different from each other in their technical make up, deployment approaches and business models. Consequently, aggregation of assets across DRE sectors is very challenging. Conversely, aggregation within single DRE sectors is more achievable in theory as there is comparatively less variability between assets. In practice, however, even within a given sector, there tends to be substantial variation between companies.

The lack of cross-company standardization within the same DRE industry is a critical challenge that needs to be addressed if aggregation of assets across companies is to be achieved. While some companies are mature enough to aggregate their own assets into viable portfolios, most will only be able to participate in aggregation facilities if their portfolios are aggregated together with portfolios of other originators.

The lack of standardization within a given sector also makes it difficult for investors to assess opportunities or benchmark prospective investments.

^{xxx} The definition of standardization includes both “doing things the same way” as well as standards in terms of quality. While enforcement of quality standards is important, the argument presented here refers to standardized operations.



Underdeveloped markets for asset-backed securitization: As this report has noted, only a small number of East African countries have asset-backed securitization legislation in place. Arrangers, originators and investors are unlikely to structure securitization transactions in jurisdictions that do not provide clear guidance on permitted and prohibited practices. Furthermore, some laws that are in place tend to deter securitization through unfavourable requirements. This typically takes place in tax laws, where high stamp duties, withholding tax rates and VAT rates make securitization deals financially unviable.



East African government bonds, with their relatively high returns and low risk, are crowding out private bonds and securities: Government bonds in the EAC offer returns of 10-15%. It becomes difficult for private entities to offer bonds and securities that can compete with that level or return on investment and low risk level.



Low repayment rates causing low quality receivables streams. High default rates tend to be a result of entering into contracts with customers that are not creditworthy. This especially happens when companies do not have the knowledge or means to accurately assess the creditworthiness of customers or when companies knowingly take on too much risk.¹⁹⁵ Pandemic-induced payment shocks also play a role. Default rates, according to data from interviews with DRE companies vary widely from 10% to 25% of all customers. ESMAP data for the OGS sector suggests that the global write-off ratio of OGS customers in 2021 amounted to 32%.¹⁹⁶

“ OGS companies sometimes expand their portfolios very quickly and then they don't spend that much effort on studying customers. They are more interested in achieving their specific sales targets. As a consequence, there are a lot of receivables at risk. The portfolio might then be at risk and the default rates increase. ”

– Marsida Rada, EnDev Uganda



High exchange rate volatility creates high levels of foreign exchange risk. The high volatility of the South Sudanese pound, Congolese Franc and the Ugandan shilling against the USD makes hard currency lending in these countries challenging, both for existing debt instruments as well as future aggregation facilities. It increases the cost of foreign exchange hedging, which adds to the ultimate cost of setting up an aggregation facility.

“ Currency volatility is a barrier. Hedging is expensive and it makes smaller deals unbankable. Hedging costs can be around 20% of the deal (dependent on deal size. The smaller the deal, the more the percentage cost). This was in Kenya. In Nigeria we've seen about 18.2%. So the average is around there. ”

– Anonymous DRE investor



6.2 Opportunities

Aggregation facilities can bridge the gap between DRE companies and investors: This research has identified a large demand for suitable debt facilities from DRE companies, as well as a large demand among institutional investors (banks, pension funds, insurance funds) for assets to which they can deploy debt funding, especially ESG-compliant assets.

The processing times between applying for debt and accessing that debt is notoriously long in the DRE sector. Aggregation facilities, when setup and operational, can offer quicker access to capital in the future: DRE companies report waiting times between three months and more than a year. First-mover aggregation facilities that have already been deployed in the DRE space have not yet shortened these timeframes. The time it took for existing aggregation facilities to be fully set up and operational varied widely, from one to two years.¹⁹⁷ Stakeholders however mentioned that the target is to reduce this to at least six months through increased standardized processes and as learnings accrue over time.¹⁹⁸

Off-the-shelf digital solutions geared to the DRE sector are readily available and can support the data backbone that financial aggregation needs: Beyond that, they can also support DRE market growth at large by increasing scalability and reducing cost and risk. They can be categorized into four categories:¹⁹⁹



Digital planning tools consist of least cost electrification planning tools, site selection software and site design software. They use geospatial data to gather intelligence on unelectrified areas. Least cost electrification planning tools analyse the national level to inform national electrification plans, while site selection platforms assess predefined areas of interest for selecting a prioritized list of suitable sites for project deployment. Site design tools zoom in on a specific site to plan project design and layout;



Digital platforms include project aggregation platforms that are designed to house data from project portfolios and are consequently directly beneficial to financial aggregation. There are also platforms that facilitate aggregation on the investor side, commonly known as crowdfunding platforms;



Digital operations enable remote monitoring and control. This reduces cost of operations as they provide operators with the ability to remotely diagnose, troubleshoot and solve operational problems. Many of these platforms also enable remote data collection, which is indispensable for creating a data trail of customer performance;



Digital payments streamline transactions between DRE operators and customers. They leverage mobile connectivity, mobile devices, mobile money, PAYGO software and are critical for scaled operations of PAYGO business models.

Debt is expensive in the DRE sector. Aggregation facilities can offer cheaper access to capital: DRE companies in East Africa report sourcing local currency debt at rates of 15-25% on average and hard currency at 6-15% (concessional debt at the lower end and commercial debt at the higher end). These rates are seen to be too high by most DRE companies interviewed. Aggregation facilities can offer lower financing rates to DRE companies. Hard currency rates are estimated at approximately 8% if there is extensive involvement from concessional funders. Pure commercial rates would be 11-12% at the minimum.²⁰⁰

Aggregation structures involving in-country asset companies linked with offshore holding companies can benefit from international tax treaties: EAC countries' DTAs, especially those with tax-efficient economies (see table 2) mean that double taxation will be avoided. This, in turn, improves the financial case for setting up aggregation facilities that use securitization structures.

Multi-jurisdictional aggregation, while inherently complex and only to be achieved in the distant future, will be facilitated by an already-existing close intra-regional EAC collaboration: Multi-jurisdictional aggregation offers the benefits of cross-country diversification and access to an asset base larger than what a single country can offer. Implementing financial instruments across countries is, however, inherently complex. Yet, organizations such as the East Africa Securities Regulatory Authority and the East Africa Securities Exchange Association have a mandate to attain harmonization across the securities markets of EAC member states. The Capital Markets Authorities of the different countries also collaborate to achieve harmonization and cross-pollinate best practices. Under the East African common market protocol, East African investors are considered domestic investors by individual country regulations – rather than as foreign investors.

There is prior experience with different DRE financial aggregation modalities in the EAC: As Box 3 has shown, d.light and SFC have closed sophisticated off-balance sheet securitization deals in Kenya. Furthermore, in mid-2023, two new receivable securitization structures were announced involving market leaders in the off-grid solar sector in East Africa as the sole recipients. The first one, a \$130 million securitization transaction to finance the pooled expected future payments from Sun King customers in Kenya, was arranged by Citi and involves participations from development finance institutions and commercial lenders.²⁰¹ The second involves Solar Frontier Capital and expands d.light's securitization financing facilities presented in Box 3²⁰² beyond Kenya, into Tanzania, and brings the total value of local currency structures financed by African Frontier Capital LLC (AFC) to \$490 million.²⁰³

There is also experience with on-balance sheet receivables financing in Uganda, with the likes of the United Nations Capital Development Fund (UNCDF) supporting transaction arrangers to close local currency-denominated receivables financing with local Ugandan companies. Looking to project aggregation, Winch Energy, in partnership with NEoT Offgrid Africa aggregated 25 of its mini-grids in Uganda into a portfolio to raise limited recourse debt.²⁰⁴

These experiences create a foundational knowledge base of how to approach future DRE financial aggregation transactions in the EAC.

6.3 Aggregation readiness conclusion in EAC countries

As the above-mentioned challenges suggest, aside from certain market leaders, the DRE sector in most EAC countries is currently not ripe for the deployment of financially viable off-balance sheet DRE aggregation facilities. Table 5 categorizes EAC countries in terms of their current attractiveness for aggregation facilities based on prevailing domestic conditions, with level 1 being most attractive and level 4 being least attractive. Note that these should be interpreted in parallel to DRE sector-specific conditions outlined in chapter 4.



Table 5:
EAC country categorization according to current financial aggregation attractiveness

LEVEL 1	Kenya	<ul style="list-style-type: none"> • Largest DRE market in the EAC • Mobile cellular subscriptions exceed sub-Saharan African average, streamlining transactions with DRE customers • Growing use of PAYGO business models in OGS • Decreased reliance on ODA for energy sector funding potentially indicating an increase in other forms of capital • Relatively good collective experience with corporate bonds, including green bonds • Presence of capital market support facilities (ESMID, J-CAP & ALCB) • ABS laws & favourable securitization tax framework in place • Shelf companies available for purchase • Several DTAs in place
LEVEL 2	Uganda, Rwanda	<ul style="list-style-type: none"> • Presence of capital market support facilities (ESMID in both and ALCB in Uganda) • Institutionalized low-carbon pathway (Rwanda) • ABS laws in place • Favourable securitization tax framework in place (Rwanda) • DTAs in place with tax-efficient economies • High levels of PAYGO business models (yet with a relatively weak outlook) • Moderate experience with corporate bonds • Volatile Ugandan shilling creating moderate FOREX exposure risk • Unfavourable securitization tax framework (Uganda)
LEVEL 3	Tanzania	<ul style="list-style-type: none"> • Presence of ABS & bond support facilities (e.g. ESMID) • Mobile cellular subscriptions only slightly below sub-Saharan African average, which streamlines transactions with DRE customers • Moderate experience with corporate bonds • DRE regulations in place, but uncertainty remains due to influential rule changes over the past few years, especially in the mini-grid sector • No ABS laws
LEVEL 4	DRC, Burundi, South Sudan	<ul style="list-style-type: none"> • Volatile political conditions • Volatile currencies creating high FOREX exposure risk (DRC and South Sudan only) • No experience with ABS or corporate bonds • Unclear business setup rules • No ABS laws • Small DRE markets • Underdeveloped DRE regulatory environment

7

Recommendations



Photo: UNDP/Karin Scherbrucker

The barriers to DRE financial aggregation outlined in the market assessment section of this report will need to be tackled if the potential addressable market is to be unlocked one day. This section provides specific barrier-removal activities to systematically address barriers holding back the financial aggregation market in East Africa, enable broader replication and achieve market scale-up.

It provides a menu of possible market development activities as well as the resources, partnerships and time needed to implement them – recognising that many barriers identified in this report will require substantial time and the involvement of a multitude of stakeholders to be addressed. Each market development activity discussed in this section is designed to partially or completely address specific barriers over different time frames.

The focus is on areas that are most relevant to financial aggregation in the DRE sector in East Africa. As such, it excludes wider market barriers that affect the DRE sector's development more broadly. These wider barriers might also have some relevance to DRE financial aggregation but are less critical compared to barriers addressed in this report. At the same time, it should be noted that the activities proposed here could also help address barriers to the broader sector's development. Table 6 provides an overview of key market development activities and the financial aggregation barriers that they are designed to address.

The sections below provide a detailed account of the respective market development activities. Each activity is discussed in detail, including steps involved in the activity, stakeholders that could ideally be involved, high level timelines and more. Some activities, especially those with shorter timelines, form part of the CAP's own market development work. The action plan however also includes longer term activities that serve as a roadmap to inform the design of future interventions to help develop the financial aggregation market in East Africa.

MARKET DEVELOPMENT ACTIVITY		BARRIER TARGETED
7.1	Open source and standardize term sheets	High cost of setting up and operating off-balance sheet structures
7.2	Explore approaches to reduce legal fees	
7.3	Streamline structuring of transactions that involve domestic DRE assets and offshore holding facilities	
7.4	Explore cost-effective hedging strategies and local currency lending	High exchange rate volatility
7.5	Open source details of successful DRE financial aggregation transactions and standardize recommended approaches	Commercial investors attach high risk perceptions to DRE investments. Risk is amplified further due to the limited track record of aggregation instruments in the DRE sector
7.6	Engage concessional funders to crowd in commercial capital	
7.7	Upskill investors on accepting credit-assessed receivables as collateral	
7.8	Appoint backup service providers as a contingency in case of O&M provider insolvency	
7.9	Engage credit rating agencies to rate the credit quality of DRE assets	
7.10	Less mature companies: Raise awareness about good financial reporting, data management and creditworthiness assessment and offer technical assistance to improve in these areas	
7.11	Missing middle companies: Bridge the gap between seed funding and late-stage funding	
7.12	Employ bulk procurement to grow the market	Less mature DRE companies are not investment ready, while "missing middle" companies lack access to scaling capital
7.13	Test approaches to remedy low payment rates	
7.14	Compile a common data reporting framework with input from investors and developers	High customer default rates
7.15	Raise awareness about shared application programming interfaces to standardize mobile money payment flows	
7.16	Raise awareness about standardization of customer contracts	
7.17	Work with public sector institutions to improve regulatory environments for asset-backed securitization	Unfavourable environment for domiciling aggregation facilities

Table 6: Overview of financial aggregation barriers and associated market development activities

7.1 Open source and standardize term sheets

Barrier targeted: High cost of setting up and operating securitization transactions

One strategy to reduce the cost of setting up securitization transactions is to open source best practice term sheets. A handful of securitization and other financial aggregation transactions have already taken place in the DRE sector in the EAC. These however occur in siloes with little knowledge exchange emanating from these experiences.

Given that term sheets typically contain commercially sensitive information there could be value in a non-profit, non-competitive organization to request access to term sheets from arrangers of past transactions and compile an anonymous best practice term sheet for the industry to learn from. This will allow each new arranger of a financial aggregation transaction to avoid starting from scratch and trying to “reinvent the wheel.” It will greatly reduce the cost of setting up transactions given that costly mistakes can be avoided. Standardising a best practice term sheet will also increase the scalability of a financial aggregation facility given that transactions with originators will be faster and more cost effective.

Steps involved in this market development activity:

1. Reach out to arrangers of past transactions, test appetite for participation in the endeavour and discuss conditions for participation;
2. Conduct one-on-one consultations with participating arrangers to discuss the term sheets and lessons learnt that are not evident on paper;
3. Compile best practices into a single, standardized and anonymous term sheet document and send for peer-review by participating arrangers;
4. Publish the term sheet template in the public domain alongside awareness building workshops.

Stakeholders involved:

DRE companies, arrangers and investors of previous successful aggregation transactions (e.g. NeOT, Sunfunder, Norfund, CrossBoundary, Solar Frontier Capital).

Existing initiatives/resources:

- The Open Sourcing Infrastructure Investing initiative by CrossBoundary;^{xxxi}
- Open-sourced PPAs availed by the World Bank as part of the Public-Private Partnership Legal Resource Centre;²⁰⁵
- The Open Solar Contracts initiative by IRENA and the Terrawatt Institute, which published various generic term sheets and agreements for solar projects.²⁰⁶

Timeframe:

Short term commencement, no preparatory actions needed. Duration estimated to be 1 year.

Budget items:

Time-based research, publishing costs

Table 7: Overview of open sourcing and standardising term sheets

xxxi CrossBoundary have expressed intention to publish term sheets that were used in mini-grid project financing deals closed in the past. More details available here: CrossBoundary Energy Access, Open sourcing infrastructure investing for mini-grids, 2020 ([link](#)).

7.2 Explore approaches to reduce legal fees

Barrier targeted: High cost of setting up and operating securitization transactions

Legal fees are renowned to be one of the largest costs of setting up and operating financial aggregation facilities. Costs are especially prohibitive for smaller deals, as these costs are mostly fixed. Legal fees as a percentage of total deal size thus decreases as deal size increases. Nevertheless, there would be value in reducing legal fees for first mover financial aggregation deals that are not yet able to raise large investments.

One strategy could be to explore the feasibility of an initiative that partially or fully funds legal fees. This should be preceded by a detailed understanding of how legal fees are structured, which would require input from a legal services provider – ideally one that has supplied legal counsel to one of the past DRE financial aggregation transactions. Norton Rose Fulbright is an example of a firm that has provided legal counsel to OGS players to set up securitization transactions, enabled by funding from Power Africa.²⁰⁷ Other legal firms that have been involved with DRE securitization transactions in the past include Allen & Overy LLP, Walkers LLP, Hogan Lovells, Field Fischer and Clarkson Wright & Jakes.^{208,209,210} A second strategy could be to reduce costs from the legal provider side by involving an impact-driven legal service provider.

Steps involved in this market development activity:

1. Consult with legal counsel on cost components of arranging aggregation transactions in varying degrees of sophistication (on-balance sheet to off-balance sheet, single originator to multi originator and single jurisdiction to multi jurisdiction);
2. Carry out market research into the existence of impact-driven legal counsel;
3. With knowledge of legal counsel cost components, involve a catalytic funder to explore the possibility of legal cost funding.

Stakeholders involved:

Financial sector development agencies (e.g. FSD Africa^{xxxii}), legal service providers (e.g. Norton Rose Fulbright), catalytic funders (e.g. Power Africa)

Existing initiatives/resources:

- Power Africa's funding support for legal counsel on deal structuring.

Timeframe:

Short term commencement, no preparatory actions needed. Duration estimated to be 1 to 3 years.

Budget items:

Consultation with legal teams, time-based research for market assessment

Table 8: Overview of exploring approaches to reduce legal fees

^{xxxii} FSD Africa has a mandate to deepen financial markets in sub-Saharan Africa and could thus carry knowledge of how to approach legal counsel for sophisticated financial transactions in resource-constrained settings.

7.3 Streamline structuring of transactions that involve domestic DRE assets and offshore holding facilities

Barrier targeted: High cost of setting up and operating off-balance sheet securitization facilities

In Uganda off-balance sheet securitization transactions do not benefit from any tax incentives, while there are no regulations that guide securitization taxation in South-Sudan, Burundi, DRC and Tanzania. This means that local domiciling of financial aggregation facilities in these countries is either financially unattractive or not possible at all. However, offshore transactions are still possible. DRE assets from these markets could be securitized and aggregated into facilities that are domiciled in jurisdictions with tax efficient economies such as Rwanda and Mauritius. Future work would need to focus on determining exactly how this could be structured and executed, borrowing from previous experiences of transferring DRE assets to holding facilities domiciled abroad.

In Rwanda and Kenya, where more investment friendly and tax-efficient conditions prevail, cost-effective domiciling in-country could be a plausible way forward. Indeed, these countries could become preferred destinations for domiciling DRE aggregation facilities instead of established destinations such as Mauritius and Jersey. This is especially the case for facilities that aim to pool DRE assets across EAC member states. Progress made towards streamlining and harmonizing EAC capital markets could mean that domiciling of facilities in Rwanda or Kenya could be more cost-effective than established destinations. A regional aggregation facility domiciled in these countries can benefit from credit enhancement in order to achieve the appropriate credit quality of the assets (see Box 5 for more details on credit enhancement approaches used by financial aggregation facilities).

Steps involved in this market development activity:

1. Identify preferred jurisdictions to domicile aggregation facilities, keeping in mind that the EAC country in question should ideally have a DTA in place with the targeted jurisdiction;
2. Obtain quotes from the necessary service providers to determine the cost structure;
3. Appoint legal counsel to assist with navigating through cross-country regulatory requirements.

Stakeholders involved:

Transaction arrangers, legal counsel, DRE companies with experience in transferring DRE assets abroad.

Existing initiatives/resources:

- There are various transaction advisory services on offer in the market from organizations including but not limited to Power Africa, GET.invest and the Private Infrastructure Development Group.^{xxxiii} These services invariably include advice on offshore structuring if a transaction requires it.

Timeframe:

Short term commencement, no preparatory actions needed. Duration estimated at 1 year.

Budget items:

Legal fees, time-based research costs, accounting costs

Table 9: Overview of streamlining offshore structuring of transactions

^{xxxiii} See for example the Finance Catalyst programme implemented by GET.invest: GET.invest, Finance Catalyst, 2023 ([link](#))

7.4 Explore cost-effective hedging strategies and local currency lending

Barrier targeted: High exchange rate volatility

Exposure to high exchange rate volatility is likely to be a key challenge for DRE financial aggregation facilities that raise investment in hard currency as cash flows are typically denominated in local currency. This risk is pronounced in South-Sudan, the DRC and Uganda due to the high volatility that the currencies of these countries experience against the US Dollar. Costs of hedging against this volatility increase with currencies that have elevated volatility and when hedges against fluctuations far into the future are made. Both of these conditions mean that hedging is expensive. Future work can explore possible avenues of reducing hedging costs with input from hedging providers and development partners.



Photo: UNDP/Karin Schermbrucker

Steps involved in this market development activity:

1. Consult with hedging providers to determine the cost structure of hedging facilities and the extent to which each cost component increases as volatility and hedging time period increases;
2. Consult with hedging providers on opportunities for cost reduction;
3. Consult with catalytic funders to explore opportunities for funding hedging costs.

Stakeholders involved:

FOREX hedging providers (e.g. TCX Fund and MFX Solutions), DFIs

Existing initiatives/resources:

- The Africa Local Currency Bond Fund, sponsored by KfW and BMZ and managed by Lion's Head Asset Management, acts as an anchor investor for local currency bond issuances. The fund also offers technical assistance to share knowledge around local currency issuances;²¹¹
- The Off-Grid Energy Access Fund, funded by various DFIs and managed by Lion's Head Asset Management, offers local currency financing solutions to off-grid companies;²¹²
- The IFC has considerable experience in local currency investments and foreign currency hedging through initiatives such as the Local Currency Facility;²¹³
- GuarantCo offers local currency credit solutions.²¹⁴

Timeframe:

Short term commencement, no preparatory actions needed. Duration estimated at 1 year. Successfully implementing strategies will however require more time.

Budget items:

Time-based research costs

Table 10: Overview of exploring cost-effective hedging strategies and local currency lending

7.5 Open source details of successful DRE financial aggregation transactions and standardize recommended approaches

Barrier targeted: Commercial investors attach high risk perceptions to DRE investments. Risk is amplified further due to the limited track record of aggregation instruments in the DRE sector.

The benefits of term sheet open sourcing and standardization for reducing transaction costs have already been discussed. Beyond term sheets, open sourcing as many details and lessons from past successful transactions as possible will lead to a widening of the knowledge base for the sector and in turn demystify how financial aggregation transactions are structured and closed. Greater familiarity with DRE financial aggregation among investors can, in turn, help reduce investors' risk perceptions and ultimately attract investments. Naturally, a key challenge lies in the extent to which arrangers, originators and investors of past aggregation transactions would be willing to share information. This information is largely commercially sensitive, so approaches to address concerns should be explored. These could include:

- Anonymising names of organizations and mixing findings across multiple transaction experiences to reduce possible linkages to specific organizations;
- Omitting details as required by originators, arrangers and investors of past transactions;
- Attracting originators, arrangers and investors of past transactions to this endeavour by offering arrangers opportunities to arrange future aggregation transactions and offering originators and investors first options in future aggregation transactions.

Steps involved in this market development activity:

1. Approach originators, arrangers and investors of successful past financial aggregation transactions to test appetite and identify conditions and concerns;
2. Implement approaches to address concerns as necessary (from the aforementioned list or beyond);
3. Publish outputs in white paper format.

Stakeholders involved:

Originators, arrangers and investors of previous successful aggregation transactions (e.g. NeOT, Sunfunder, Norfund, CrossBoundary, Solar Frontier Capital).

Existing initiatives/resources:

- The Open Sourcing Infrastructure Investing initiative by CrossBoundary;
- The CAP Financial Innovation Challenge invited proposals in 2022 for financial aggregation models that innovate and improve on existing approaches – UNDP will develop knowledge products to share key details and lessons learnt from these innovations.²¹⁵

Timeframe:

Short term commencement, no preparatory actions needed. Duration estimated at 1 year.

Budget items:

Time-based remuneration for researching previous transactions and writing up findings in white paper format.

Table 11: Overview of open sourcing details of successful DRE financial aggregation transactions

7.6 Engage concessional funders to crowd in commercial capital

Barrier targeted: Commercial investors attach high risk perceptions to DRE investments. Risk is amplified further due to the limited track record of aggregation instruments in the DRE sector.

Most commercial investors interviewed as part of this research have expressed interest to invest in financial aggregation facilities provided that appropriate risk mitigation measures are put in place. To this effect, the recommendation is to engage concessional funders to take up guarantee and junior debt positions in the capital stack. Guarantees are important as they effectively underwrite the assets in the portfolio. Should the senior lender's return expectations not be met or the investment lost entirely, a guarantee will compensate the lender for their losses. A junior debt position would be suitable for a concessional funder that expects some return instead of donating funds but is still playing a catalytic role by taking losses before the senior lender. In so doing, the concessional funder taking up the junior debt position can crowd in senior lenders and leverage private, commercial capital.

Care should be taken to ensure that concessional funds do in fact crowd in commercial capital. Poorly designed concessional facilities can lead to market distortion if funds are allocated to lower risk DRE assets, in which case they effectively compete with commercial capital. Concessional funds should exclusively be applied to lower risk for commercial capital.

Steps involved in this market development activity:

1. Convene a group of concessional funders to discuss conditions for participation in guarantee and junior debt positions of financial aggregation facilities;
2. Consult with senior lenders to exactly determine the preferred structure of risk mitigation measures in the capital stack;
3. Offer technical assistance to local banks who might not be fully skilled in assessing DRE investments;
4. Raise funds from interested concessional and commercial investors when the financial aggregation facility is set up and ready for fundraising.

Stakeholders involved:

Concessional funders, commercial investors, DRE companies

Existing initiatives/resources:

- The \$16 million limited recourse loan received by Winch Energy for development of mini-grid projects in Uganda and Sierra Leone offers a good example of concessional and commercial fund blending in a financial aggregation transaction. Commercial funders included NEoT Offgrid Africa and Sunfunder, while FCDO and BMZ disbursed grant funding;
- Another example is a receivables securitization loan facility closed between NeOT Offgrid Africa and Zola Electric in Cote d'Ivoire, which has been guaranteed by the African Development Bank to crowd in investment from local banks;²¹⁶
- Multiple examples of standard transactions involving capital blending exist, and lessons from these experiences are also relevant. Often guarantee facilities from organizations such as GuarantCo are in place. For example, in Uganda, the \$50 million investment into the Bugala Island mini-grid was made by Nedbank, GuarantCo, the Uganda Development Corporation, Emerging Africa Infrastructure Fund and the Industrial Development Corporation of South Africa;
- The European Fund for Sustainable Development Plus offers guarantees and EU grants blended with bank loans. It is a global programme that runs from 2021 and 2027 with a total of €53.5 billion;²¹⁷
- The Swedish International Development Agency offers guarantees to encourage commercial lending. By the end of 2021, approximately \$975 million has been disbursed globally. The programme has made contributions to DRE investments including the COVID19 Off-Grid Relief Fund, TRINE and Lendahand crowdfunding deals and more.²¹⁸

Timeframe:

Medium term commencement, following confirmation of ideal transaction structure/best practice approaches.

Budget items:

Time-based research costs

Table 12: Overview of engaging concessional funders to crowd-in commercial capital

7.7 Upskill investors to accept credit-assessed receivables as collateral

Barrier targeted: Commercial investors attach high risk perceptions to DRE investments. Risk is amplified further due to the limited track record of aggregation instruments in the DRE sector.

While knowledge of previous successful aggregation transactions is useful to increase investor confidence, work is also needed to train investors on some of the practicalities of financial aggregation facilities. More specifically, investors would need to be comfortable with accepting receivables as collateral. Research however indicates that this is a challenge for investors.²¹⁹ Most established investors in the DRE sector have a preference for the conventional types of collateral; land and buildings, equipment and stock. At the very best, some are willing to accept receivables as one component of collateral together with the more conventional types, but not receivables exclusively. Strategies for increasing investor confidence in receivables could include:

- Adding measures to the transaction to limit potential downside from receivables as collateral:
 - Ensure that an O&M agreement is in place with the originator (to ensure ongoing servicing of the assets);
 - Appoint a backup service provider to service the assets in case of originator insolvency;
 - Adding risk mitigation measures as discussed in section 7.6 above;
 - Making use of credit enhancement techniques as described in Box 5 below.
- Improving the quality of the receivables in order to increase its collateral value:
 - Implement methodologies to accurately estimate the creditworthiness of DRE end-customers, so as to increase investors' confidence that end-customers will continue paying for the service and that receivables will perform as expected. Lessons on how to best standardize customer credit scoring can be derived from the FICO scoring model in the US.²²⁰ This standardized credit scoring model is used by more than 90% of US-based lending institutions and forms the backbone of mortgages and other types of asset financing in the country. The methodologies of local service providers of creditworthiness assessments in East Africa such as Nithio and Gnugrid will also be useful, as well as those used by microfinance institutions.

Steps involved in this market development activity:

1. Convene a group of DRE investors interested in financial aggregation;
2. Arrange training days/webinars on DRE financial aggregation with a focus on receivables as collateral;
3. Garner input from investors on the difficulties inherent in accepting only receivables as collateral;
4. Embark on brainstorming exercises in an attempt to address investors' concerns (such as mentioning strategies listed above);
5. Road test real-world scenarios – showcase receivables data from operational DRE companies.

Stakeholders involved:

DRE investors (especially new ones with limited experience),^{xxxiv} financial sector development agencies (e.g. FSD Africa, UNCDF).^{xxxv}

Existing initiatives/resources:

- The Renewables Academy (RENAC) offers training programmes directed at local financial institutions to scale up lending to DRE companies. Training programmes have been conducted in Uganda, Burundi, Senegal, Benin and Nigeria.²²¹

Timeframe:

Medium term commencement, following confirmation of ideal transaction structure/best practice approaches.

Budget items:

Venue costs for in-person workshop(s)

Table 13: Overview of upskilling investors to accept receivables as collateral

^{xxxiv} Local commercial banks can especially benefit from such inputs. Interviews have shown that especially Centenary Bank and Equity Bank are open to exploring new approaches. There is also an appetite for smaller ticket sizes among these banks.
^{xxxv} FSD Africa have in the past made efforts to sensitize investors and issuers on the opportunities provided by securitization. UNCDF has held capacity building events with local banks on receivables as DRE collateral.

Box 5:

Credit enhancement techniques to increase receivables quality and limit downside risk

Credit enhancement is a valuable tool that arrangers of aggregation transactions can use to mitigate against downside risk. **Various techniques exist:**

- **Tranching** involves the categorization and securitization of receivables based on quality. As a result, only the receivables of the best performing customers are selected. This is especially relevant if commercial capital is involved, as this capital is more risk averse than concessional capital;
- **Over-collateralization** and **factoring** go hand in hand. **Factoring** means that only a portion of the total value of receivables are paid by the facility. Yet while less than 100% of the total value of the receivables is paid for, the facility has the right of ownership for more than 100% of the value of the receivables, referred to as over-collateralization. The facility can dip into this excess value if certain unfavourable events occur, for example:
 - If a system crash occurs on the DRE asset and the facility loses visibility on critical digital data to assess performance of the asset, such as payment data;
 - If customer payments fall behind schedule. In this case, the facility can swap out the problematic account receivable with another one that has been included in the over-collateralized group;
- Appliance financing and business support can be offered to DRE customers to grow their energy consumption, which ultimately reduces customer default rates.^{xxxvi}

Standard guarantees and first loss facilities are also useful risk mitigation instruments given that they shield investors against complete or partial capital loss in a bad debt scenario. They are, however, not designed to enhance the credit quality of the underlying receivables.

^{xxxvi} See for example: *EnerGrow, About us, 2023* ([link](#))

7.8 Appoint backup service providers as a contingency in case of O&M provider insolvency

Barrier targeted: Commercial investors attach high risk perceptions to DRE investments. Risk is amplified further due to the limited track record of aggregation instruments in the DRE sector.

A backup servicer is an entity that is appointed to take over the operations (“servicing duties”) of an originator in the event of insolvency or any other reason the originator cannot perform its duties. The backup servicer acts as an insurance policy for investors in an asset-backed security. The servicer is mandated to ensure that customer services and payments are uninterrupted, thus insulating investors from risk associated with possible bankruptcy of the originator.

A large proportion of investors interviewed have expressed the need for backup servicing as a condition for investing in off-balance sheet aggregation facilities. Given the limited track record of financial aggregation transactions in the DRE space, there is a lack of established backup service providers in the market.²²² Some investors noted having to act as both an investor and backup servicer which goes beyond the traditional scope of an investor and has the effect of concentrating risk. In the future, a backup servicer can be arranged by the originator or arranger of the transaction.

“In order to have a bankruptcy remote structure with no recourse to the originator you need to have a backup servicing solution. We found that some of the earlier off balance sheet approaches did not adequately address this issue. More recently, we’ve seen structures that have taken backup servicing more seriously and started to implement some solutions, albeit imperfect. But you won’t have a perfect solution from the start, and there has to be a journey and learning curve. We are willing to work with companies as long as they take it seriously and are willing to work with us towards solutions.”

– Geoff Manley, BII

Steps involved in this market development activity:

1. Consult with mature, reputable DRE companies to determine conditions for backup servicing;
2. Develop standardized backup servicing contract templates;
3. Present potential investors with a proposed backup servicing structure and the track record of appointed backup servicers.

Stakeholders involved:

Leading DRE companies (as backup servicers), potential investors

Existing initiatives/resources:

- No initiatives exist, but a leading multinational OGS company consulted as part of this project expressed interest in offering backup services to off-balance sheet facilities. Several investors, such as BII mentioned above, have also considered how backup servicing could be arranged.

Timeframe:

Medium- to longer-term term commencement, following confirmation of ideal transaction structure/best practice approaches and when off-balance transactions become more likely.

Budget items:

Legal fees for setup of backup servicing contracts

Table 14: Overview of backup servicing

7.9 Engage credit rating agencies to rate the credit quality of DRE assets

Barrier targeted: Commercial investors attach high risk perceptions to DRE investments. Risk is amplified further due to the limited track record of aggregation instruments in the DRE sector.

An asset credit rating agency is an independent third party employed to assess the underlying risk of financial assets. Moody's, Standard and Poor's (S&P) and Fitch Ratings are trusted market leaders. Alongside these high-profile organizations, are a multitude of trusted, locally based rating agencies. The work of these agencies reduces the level of due diligence required by investors and provides legitimacy to an asset. Having credit rating agencies actively participating in the DRE sector will go a long way in strengthening the legitimacy of DRE receivables as a bankable asset. It will, in particular, help attract risk averse investors such as pension funds and insurance companies, as these can only invest in assets that are credit-rated.

There is potential for development agencies to engage with and support credit rating agencies as a measure to activate the financial aggregation market in Africa. Smaller organizations such as Nithio and Gnugrid offer services related to creditworthiness assessment of DRE customers. These players already have an understanding of the DRE market, especially DRE customer behaviour, and could thus be good candidates for developing methodologies for credit rating receivables and cash flow assets.

“With standardized credit risk assessments you understand more fully what the risk of repayment from different customers in a borrower’s portfolio is. This enables accurate pricing of debt collateralized by receivables. Different pools of capital with different return expectations and impact mandates can then be deployed to fund receivables which match their mandate. DFI funding can be used to fund risky receivables, philanthropic capital to fund parts of the portfolio which are unlikely to repay and commercial capital to fund parts of the portfolio which can produce a commercial return. Nithio works on facilitating this blending of capital driven by data to unlock the flow of capital into DRE assets.”

– Chris Woolhouse, Nithio

Steps involved in this market development activity:

1. Determine the qualifying requirements for assets to be credit assessed by Moody's, S&P and Fitch;
2. Assess costs involved for abovementioned rating agencies to rate DRE assets;
3. Consult with established DRE customer creditworthiness assessment providers on the possible transferability of knowledge and skills to credit rating receivables as assets;
4. Consult with institutional investors on information to be included in credit ratings of assets and what the minimum credit rating should be.

Stakeholders involved:

Credit rating agencies, DRE creditworthiness assessment service providers, institutional investors.

Existing initiatives/resources:

- TransUnion's Menyasha initiative provides information about the credit status of individuals and businesses in Rwanda;²²³
- Gnugrid is a locally based company in Uganda that collects credit data on individuals and provides credit reports to lenders;²²⁴
- Consultative Group to Assist the Poor (CGAP) published a guide on credit risk management approaches for asset finance companies in 2021.²²⁵

Timeframe:

Only to be commenced in the long term when there is a sufficient DRE asset pool and the market is ready for institutional investment.

Budget items:

Time-based research costs

Table 15: Overview of rating the credit quality of DRE assets

7.10 Less mature companies: Raise awareness about good financial reporting, data management and creditworthiness assessment and offer technical assistance to improve in these areas

Barrier targeted: Less mature DRE companies are not investment ready while “missing middle” companies lack access to scaling capital.

Less mature companies require assistance to increase their investability. The status quo for the majority of small DRE companies is that they do not meet the due diligence requirements of most investors, development funders included. Financial reporting, data management and customer creditworthiness assessment have been cited by a wide range of stakeholders as the main areas where companies lack knowledge and skills. These shortcomings affect general investability as well as prospects for participation in financial aggregation facilities. Good data management, for example, shows that company management is in the position to make informed business decisions. At the same time, it enables a company to participate in future data pooling initiatives and, in turn, raise capital through financial aggregation facilities.

Training on how to improve in these areas would be a valuable next step. Key would also be to identify and demonstrate the link between such improvements and an increase in investability and deal flow. This could be done in a series of bootcamps and workshops or through ongoing company-specific technical assistance. Technical assistance could either take the form of external support with regular check-ins or embedded assistance, where a technical assistance provider is embedded within the DRE company for a prolonged period of time as a quasi-staff member.

“We can support companies on improving the aspects where they are currently lacking (e.g., business development, credit risk analysis) so that they can grow to get to a point where they are at a suitable maturity level to qualify for aggregation transactions.”

– Marsida Rada, EnDev Uganda

Steps involved in this market development activity:

1. Appoint a technical assistance expert in the field of SME financial reporting and data management;
2. Alternatively, coordinate with existing technical assistance initiatives (see examples below) to incorporate investment readiness content for financial aggregation into their offers;
3. Convene DRE companies in a bootcamp format to upskill in the areas of financial reporting and data management;
4. Follow workshops and bootcamps up with continued technical assistance, either through external check-ins or internal, embedded assistance as described above.^{xxxvii}

Stakeholders involved:

DRE companies, technical assistance providers, technical assistance funders, industry associations.

Existing initiatives/resources:

- Power Africa’s open-sourced financial modelling tools for PAYGO energy access companies (in partnership with Persistent Energy);²²⁶
- Power Africa’s business development resources for OGS companies including distribution best practices, microfinancing approaches and more;²²⁷
- The Green Mini-Grid Helpdesk, implemented by Energy 4 Impact and Inensus on behalf of the African Development Bank offers practical information on mini-grid business operations;²²⁸
- Odyssey Energy Solutions offers an end-to-end platform for development of DRE projects;²²⁹
- Solar Power Europe, in partnership with GET.invest published best practice guidelines for engineering, procurement and construction of solar projects.²³⁰

Timeframe:

Short term commencement, no preparatory actions needed.

Budget items:

Technical assistance budget, workshop convening costs, time-based remuneration for preparation of materials.

Table 16: Overview of raising awareness about areas for improvement among DRE companies

^{xxxvii} Continued support is important because one or two workshops are unlikely to achieve tangible impact alone.

7.11 Missing middle companies: Bridge the gap between seed funding and late-stage funding

Barrier targeted: Less mature DRE companies are not investment ready while “missing middle” companies lack access to scaling capital.

Small, less mature companies still have a long growth path ahead before reaching a stage where they are mature enough to qualify for financial aggregation instruments. A second category of companies, missing middle companies, are defined as those that have already graduated from early-stage, seed-funding stages to having a strong track record but are not fully mature yet. These companies are in need of capital to take their operations to the next level, which is to reach large scale operations.

Options for missing middle financing would include working capital facilities, convertible loans and on-balance sheet receivables-based financing. The latter is an entry-level version of debt-based financial aggregation as it is based on the principle of securitization of customer receivables but avoids the complex aspects associated with off-balance sheet transactions. An additional strategy to simplify the closing of these transactions is to focus on financing of fixed receivables – whereby customers pay a fixed monthly fee instead of variable PAYGO payments. The former enables more clarity on future cash flows, which greatly reduces the complexity involved in estimating the value of future receivables.

Steps involved in this market development activity:

1. Explore, with input from missing middle companies, appropriate funding options e.g. convertible loans, on-balance sheet receivables financing, mezzanine finance, longer tenor debt, etc.
2. Identify and involve appropriate providers of these financing instruments;
3. Identify and involve a guarantee provider if deemed a necessary precondition for involvement from above-mentioned financiers;
4. Link missing middle companies with financiers by curating deals to suit both investor and investee;
5. Package these deals as building blocks towards eventual financial aggregation. Create awareness of this strategic direction among investors and investees to create added impetus for closing of deals.

Stakeholders involved:

DRE companies, return-seeking patient investors, guarantee providers, in-vestment matchmakers (e.g. GETinvest)²³¹

Existing initiatives/ resources:

- The BUILD Fund is an impact fund managed by Bamboo Capital Partners and UNCDF that seeks to disburse missing middle finance to small- and medium-sized enterprises in least developed countries;²³²
- EEP Africa, managed by the Nordic Development Fund, offers early stage and catalytic grant finance to innovative clean energy companies across Southern- and East Africa;²³³
- The Beyond the Grid Fund for Africa, managed by NEFCO, offers results-based financing to off-grid companies in Uganda, Burkina Faso, Liberia, Zambia and Mozambique.²³⁴ To date, the fund has had four rounds of funding;
- The Renewable Energy Performance Platform (REPP), managed by Camco, offers development phase capital, gap financing and long-term loans to small-scale projects below 25 MW;²³⁵
- The AfDB Leveraging Energy Access Finance Framework is a \$800 million programme that offers concessional capital, credit enhancement instruments and technical assistance to facilitate local currency DRE investments in Ghana, Guinea, Ethiopia, Kenya, Nigeria and Tunisia.²³⁶ The programme is looking to expand to more countries.

Timeframe:

Short term commencement, no preparatory actions needed.

Budget items:

Time-based research costs, investment matchmaking services.

Table 17: Overview of bridging the gap between seed funding and late-stage funding

7.12 Explore bulk procurement to grow the market

Barrier targeted: Less mature DRE companies are not investment ready while “missing middle” companies lack access to scaling capital

Less mature and missing middle companies may not yet be ready for financial aggregation, but they can benefit from a different type of aggregation – bulk procurement. Aggregating equipment orders across companies enables large orders, which reduces unit costs. The challenge that bulk procurement faces, however, is two-fold. Firstly, standardization of equipment is a necessary precondition for bulk procurement but developers do not necessarily use the same equipment. Second is timing. To place a large order, demand for a given equipment or product from multiple companies must be aligned. This only happens occasionally, as mini-grid developers are not necessarily at the same stage of site development. For this to happen, mini-grid sites would need to be allocated through lots, concessions or tenders with preselected sites through a central entity. Similarly, captive power developers interested in aggregating their equipment orders would each need to have contracts or purchase orders signed with one or more clients and each site should be more or less in the same stage of the development cycle. The same applies to companies in the OGS and e-mobility sectors – there should be alignment when different companies need stock or inputs.

Steps involved in this market development activity:

1. Consult with DRE companies on which hardware can be standardized;
2. Explore opportunities with central procurement agencies to allocate lots and/or concessions of sites;
3. Identify any other approaches to harmonize timing when developers need equipment.

Stakeholders involved:

DRE companies, equipment manufacturers (e.g. Victron, SMA, Steamaco, Sparkmeter, etc.).

Existing initiatives/resources:

- The Demand Aggregation for Renewable Technology programme, implemented by the Global Energy Alliance for People and Planet, in partnership with All On and Odyssey Energy Solutions, aims to aggregate demand, standardize equipment and ultimately enable bulk procurement of renewable energy components among DRE companies.²³⁷ The programme is currently being piloted in Nigeria and is supported by a \$10 million funding facility;²³⁸
- The Mini-Grid Innovation Lab, implemented by CrossBoundary, launched a study on the impact of bulk procurement on mini-grid procurement costs in 2020.²³⁹

Timeframe:

Short term commencement. Successfully implementing bulk procurement across companies is likely to only occur in the medium term.

Budget items:

Time based research costs

Table 18: Overview of exploring bulk procurement

7.13 Test approaches to remedy low repayment rates

Barrier targeted: High customer default rates

Low repayment rates are one of the key barriers of not only DRE financial aggregation, but also industry growth at large. Addressing this barrier is thus of utmost importance. This starts with determining all possible reasons for default. Possible ideas for facilitating more on-time payment could include:

- Only enter into customer contracts with those that are less likely to default, by accurately assessing creditworthiness beforehand;^{xxxviii}
- Institute a small financial penalty for running out of credit;
- Institute a reward for paying before credit runs out, e.g. free electricity for a short period of time during the day;
- Account for seasonality in payment plans (e.g. if useful for the customer, allow one payment for the year's worth of electricity);
- Engage an agri partner e.g. Sunculture, Futurepump or One Acre Fund to obtain insights into smallholder farmers' money flows (given that many mini-grid and off-grid customers are smallholder farmers);
- Institute payment reminders.

^{xxxviii} A key existing initiative in Uganda is EnDev's work on linking credit track records of customers to credit reference bureaus. More details available at: EnDev, *Improving sustainability in Uganda's solar market – Linking OGS energy companies to a credit reference system, 2020* ([link](#))

Steps involved in this market development activity:

1. Circulate a note or brief paper to relevant stakeholders on the status quo of DRE customer defaults and its effects on industry growth and portfolio quality;
2. Convene DRE companies (especially those working with mini-grids & off-grid systems) in a workshop format to test out possible remedies such as those outlined above;
3. Explore the possibility of technical assistance to implement remedies and to generally improve data management systems for better customer insights.

Stakeholders involved:

DRE companies (especially mini-grids & off-grid), industry associations.

Existing initiatives/resources:

- Power Africa's guide on off-grid PAYGO credit risk management;²⁴⁰
- Persistent Energy's PAYGO Business Analytics Toolkit that include, amongst others, metrics and calculations for determining the value of receivables;²⁴¹
- CGAP published a guide on credit risk management approaches for asset finance companies in 2021;²⁴²
- EnerGrow offers appliance financing and training to grow energy consumption and, in turn, profitability of small- and medium-sized enterprises.²⁴³ This ultimately reduces default rates among productive use customers;
- 60 Decibels offers open-sourced data on off-grid energy performance benchmarks including repayment rates;²⁴⁴
- The Access to Energy Institute is a research and development organization that is focused on in-field experimentation and could thus be interested in running repayment experiments.²⁴⁵

Timeframe:

Short term commencement

Budget items:

Research and writing costs, workshop convening costs, technical assistance budget

Table 19: Overview of testing approaches to remedy low repayment rates

7.14 Compile a common data reporting framework with input from investors and DRE companies

Barrier targeted: Lack of data and low levels of standardization

Standardization of data reporting between companies within their respective DRE subsectors is essential for achieving aggregation of assets across companies. This is needed to ensure comparability between assets, which will in turn ease due diligence at the portfolio level. As it stands however, there is substantial variability between companies in terms of how data is reported. While there is a general consensus of what to report, the metrics that are used for reporting, especially for financial reporting, often differ. Furthermore, there is variability in terms of the granularity and frequency with which companies report. Some companies use in-house software while others make use of one or more of the various digital operating data platforms on the market (e.g. AMMP, Odyssey, Solaris Offgrid, Sparkmeter, SteamaCo and New Sun Road).

A commonly adopted standardized data reporting framework is a key enabler for aggregating assets across companies as it facilitates comparability in how each asset performs. If a common data framework is adopted by companies, the need for translating cross-company data into a standardized format will be substantially reduced. At the sector level, a common data reporting framework also serves as an advocacy tool because it enables the communication of overall performance and impact.

Creating awareness about these data reporting frameworks platforms is a key market development activity in building towards a future where DRE assets can easily be aggregated across companies. This should be followed by determining barriers to broad adoption across the sector. This research might point to a possible need for improving the utility of data reporting frameworks with input from DRE companies, investors and data hosting. If it is indeed found that there is a need to improve the utility of existing data reporting frameworks and associated reporting platforms for the needs of financial aggregation, the following topics would need to be discussed:

- What data potential investors in the aggregation facility would want to see when conducting due diligence on the portfolio;
- What data DRE companies can currently report considering hardware and software limitations;
- What data DRE companies will realistically be able to report considering commercial sensitivity as well as cost and time limitations;
- What data hosting platforms are designed to ingest and present.

Steps involved in this market development activity:

1. Arrange virtual consultations and/or webinars to create awareness of the importance of data standardization, its relevance for aggregation and the existing frameworks;
2. Determine barriers to adoption of existing frameworks during consultations;
3. Garner input from different angles of the spectrum by stakeholders listed below and if necessary, refine an existing framework so that it becomes a mutually agreed standardized data reporting framework. In sectors where there are no existing frameworks, for example electric mobility, compile a new framework for broad adoption;
4. Assist companies, where necessary, to commence with data collection and cloud hosting to create an evidence base for receivables financing. Explore the utility of the database in identifying consumption patterns so as to estimate the value of receivables;
5. Explore the possibility of a reporting framework with standardized metrics across DRE sectors.

Stakeholders involved:

DRE companies, data standardization experts, data hosting platforms (e.g. Odyssey, AMMP, New Sun Road, PayGops etc), investors, data reporting framework developers.

Existing initiatives/resources:

- The PAYGO Performance, Reporting and Measurement Framework (PAYGO PERFORM) developed by CGAP, GOGLA and Lighting Global, in consultation with 600 investors, PAYGO executives, and energy and finance experts, which outlines financial and operational key performance indicators (KPIs) for the PAYGO OGS industry. The initiative started in 2022 and will collect, analyse and share semi-annual data on abovementioned KPIs from participating companies;²⁴⁶
- GOGLA's Standardized Impact Metrics for the OGS Sector;²⁴⁷
- The mini-grid quality assurance framework developed by NREL and adapted by TFE;^{248,249}
- Solaris Offgrid's PayGops Disruptive Receivables Finance Project is a receivables-based financing facility that uses standardized flows of asset and payment information through the company's last-mile operation management software PayGops.²⁵⁰

Timeframe:

Medium term commencement, by which time smaller companies are anticipated to have basic capacity in place.

Budget items:

Webinar facilitation, time-based research and liaison, data hosting, hardware retrofitting where necessary.

Table 20: Overview of creating a common data reporting framework

7.15 Raise awareness about shared application programming interfaces to standardize mobile money payment flows

Barrier targeted: Lack of data and low levels of standardization

Digital transactions between end customers and the asset operator is a necessary requirement for financial aggregation, especially off-balance sheet securitization. When securitized receivables are transferred to an SPV, the actual cash flows must flow directly from the end customer to the SPV. For this to happen, the SPV must link with the originator’s mobile money operator (or other payment platform) through an application programming interface (API). DRE operators use different mobile money operators so there is currently no common API that a financial aggregation facility can link up with to facilitate streamlined payment flows from end customers to the SPV. There could be value in encouraging operators to make use of mobile money aggregators and then link up with the aggregator’s API.

This market development activity is not of high importance in the short term given that off-balance sheet multi-originator securitization will only be achievable in the long-term future when the DRE sector and local capital markets are more mature. However, initial scoping research would bode well for guiding future work.

Steps involved in this market development activity:	<ol style="list-style-type: none"> 1. Perform a scoping assessment of the current status of digital transaction formats used by DRE companies (relationships with mobile money providers and/or aggregators, API designs); 2. Determine the precursors for redirecting payment flows from DRE companies to SPVs.
Stakeholders involved:	DRE companies, mobile money providers, mobile money aggregators, software experts (e.g. Solaris Offgrid/ PayGops)
Existing initiatives/resources:	<ul style="list-style-type: none"> • OpenPAYGO Metrics is an initiative by PaygOps that offers a standard API for PAYGO devices to transmit various data metrics to a server. The API is free, open-source and interoperable with all types of PAYGO devices and management platforms;²⁵¹ • Stitch offers a standard API integration to streamline the processing of online payments.²⁵²
Timeframe:	Medium term commencement
Budget items:	Time-based remuneration for research and convening of workshops and/or webinars

Table 21: Overview of raising awareness about shared APIs

7.16 Raise awareness about standardization of customer contracts

Barrier targeted: Lack of data and low levels of standardization

Each DRE operator naturally has diverse arrangements in place with their respective customers, all of which are reflected in customer contracts. While not all sections of customer contracts can practically be standardized, there is a subset of sections that should ideally be standardized, chief of which is considerations that relate to the frequency and structure (e.g. flat subscription fee or per kWh) of payments. This is important because standardized contracts can enable an apple-to-apple comparison of receivables. Secondly, contracts that do not bind customers to on-time payment will lead to low repayment rates and negatively affect the likelihood of receivables flowing to SPVs on time. Interviews conducted during this research have shown that DRE companies generally agree that certain sections of customer contracts should be standardized and that it would be possible.

“There is a lot of variance across companies in terms of customer contracts and credit scoring. A lot of companies don't do credit scoring at all. On customer contracts, you're not able to fully standardize this across countries because of different laws.”

– Siten Mandalia, Solaris Offgrid

Steps involved in this market development activity:

1. In a workshop format, communicate the value of contract standardization;
2. Determine the conditions and practicalities of which sections can be standardized and how this can be done (considering variability between assets and between developers/operators);
3. Draw up a standardized customer contract template and garner post-workshop input from participating developers.

Stakeholders involved:

DRE companies

Existing initiatives/resources:

- NREL offers a set of published customer agreement considerations for mini-grids in sub-Saharan Africa;²⁵³
- GOGLA's Consumer Protection Code advocates for consumer protection standards in the OGS sector. Consumer protection clauses should ideally be standardized to ensure that all customers enjoy the same protection in terms of considerations such as data privacy.²⁵⁴

Timeframe:

Medium term commencement

Budget items:

Research, workshop costs

Table 22: Overview of raising awareness about standardization of customer contracts

7.17 Work with public sector institutions to improve regulatory environments for asset-backed securitization

Barrier targeted: Unfavourable environment for domiciling aggregation facilities

Kenya, Rwanda and Uganda are the only EAC countries that have legislation on asset-backed securitization in place. These laws however remain largely untested in practice because little to no private placement of asset-backed securities have been conducted to date. Involving the capital market authorities (CMAs) and the Ministries of Finance along with transaction originators and arrangers in closing a model transaction will go a long way in road testing the regulations and inform policymakers whether the law needs any updates. A model securitization transaction will likely require regulatory sandbox treatment. Regulatory sandboxes are frameworks put in place by a regulator to allow industry practitioners to road test financial innovations under supervision of the regulator. Lessons from these road tests often inform subsequent regulations.

Conversely, the focus in more underdeveloped capital markets (South Sudan, DRC, Burundi and Tanzania) should be to draft laws on asset-backed securitization as there currently are none.

Steps involved in this market development activity:

1. Involve financial sector regulatory sandbox experts if necessary, e.g. CGAP;
2. Determine the availability of local and/or international arrangers to structure a model transaction;
3. Select an appropriate originator (ideally in the DRE sector, but not a requirement).

Stakeholders involved:

CMAs, Ministries of Finance, originators (DRE companies) and arrangers, securitization experts in developing markets (e.g. FSD Africa & the Milken Institute)

Existing initiatives/resources:

- As part of its capital markets development programme, FSD Africa provides technical and financial support to originators, arrangers and investors to close demonstration transactions.²⁵⁵

Timeframe:

Commencement in the long term. The DRE market first needs to grow to aggregation-readiness before a locally domiciled transaction can be closed.

Budget items:

Time-based costs, development of regulatory sandbox and transaction costs related to origination and structuring of the model transaction.

Table 23: Overview of improving regulatory environments for asset-backed securitization

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Photo: Adobe Stock / Lightfield Studios

Appendix A: Environmental and social risk assessment

The UNDP's social and environmental standards²⁵⁶ will guide the design and implementation of UNDP market development activities to grow the market towards financial aggregation readiness, any supported financial aggregation transactions and any participating DRE projects, products and companies. This is to ensure mitigation against environmental and social risks.

1. **Ensure biodiversity conservation and sustainable natural resource management:**

Due to the small scale of DRE projects, risks related to natural resource depletion are not foreseen. However, any hydro-based project participating in a financial aggregation facility or transaction would need to be assessed for any hydrological changes such as damming of rivers.

2. **Mitigate against climate change and disaster risks:** While possible financial aggregation facilities and transactions considered in the context of this market assessment and action plan will target low-carbon assets, care still needs to be taken to assess the level of carbon emissions in assets that generate electricity from fossil fuels, such as solar-diesel hybrid mini-grids. More DRE projects, irrespective of generation technology, would also lead to increased carbon emissions through the transport of supplies and the development of any supporting infrastructure.

3. **Ensure community health, safety and security:** Community buy-in is essential both at project level and within the wider renewable energy industry. At the project level, the following risk is foreseen:

- a. Construction of projects funded through a financial aggregation facility or transaction leading to an influx of construction personnel in the local community.

4. **Preserve cultural heritage:** This applies to:

- a. Projects located close to cultural sites (risk will vary depending on site location);
- b. Projects involving excavations or demolitions (risk will vary depending on site plan);
- c. DRE companies, or the financial aggregation facility itself proposing to use tangible or intangible forms of cultural heritage (participating companies to be screened, with no risk foreseen pertaining to facility design).

5. **Avoid displacement and resettlement:** No displacement or resettlement of communities are envisaged as a consequence of the implementation of financial aggregation facilities.

6. **Incorporate the needs of indigenous peoples:** To ensure land of participating projects do not encroach on indigenous lands. This requires consultation with community leaders.

7. **Ensure dignified labour and working conditions:** This will require an assessment of working conditions in companies prior to funding disbursement.

8. **Prevent pollution and ensure resource efficiency:**

- a. Project construction or distribution of solar products can cause pollution in the local environment. Companies and projects funded through financial aggregation facilities would need to ensure that sites are cleaned when construction is completed and that all hazardous materials are removed;
- b. OGS companies must ensure that quality-verified (e.g., GOGLA or Verasol) systems are being used so as to reduce the likelihood of premature obsolescence. Systems must also adhere to in-country quality standards;
- c. A financial aggregation facility would need to incorporate recycling and other "after life" considerations in programme design.

Appendix B: Data privacy risk assessment

National data protection and privacy acts should be perused to assess data privacy risks involved with DRE financial aggregation facilities in each individual EAC country, for example the Data Protection and Privacy Act of 2019 in Uganda and Law Nr. 058/2021 of 13/10/2021 relating to the protection of personal data and privacy in Rwanda. The African Union Convention on Cyber Security and Personal Data Protection can also serve as a guideline.

These laws and conventions typically outline guidelines for personal data collection and processing, such as the following best practices:

- Personal data may only be collected or processed subject to consent from the data subject;
- Data subjects have the right to withdraw their consent for processing of their data;
- Personal data should be protected;
- Data should be complete, up-to-date and accurate;
- Data may not be stored for periods longer than it is required for.

Entities collecting, processing and controlling data must usually register with the relevant authorities. Information about registered data collections, processors and controllers are maintained in the authorities' data protection registers. Each entity that processes or controls personal data are typically also required to appoint a data protection officer.

DRE operations depend heavily on collection, processing and storing of digital data about customers. This includes:

- Data on energy consumption and payments, typically from smart meters and mobile money payments;
- This is often accompanied by demographic data about each customer, and the demographic data is linked to the customer's consumption and payment behaviour. This would include age, gender, nature of business (in the case of a productive user), etc;
- Names and contact details of data subjects;
- Location of data subjects.

Data is also very important for financial aggregation facilities, due to the importance of granular energy consumption and payment data in estimating the value of receivables and assessing the creditworthiness of customers. In addition to the data points listed above, financial aggregation facilities will likely also make use of credit profiles of DRE customers in order to assess creditworthiness. This would include payment performance related to other accounts such as mobile cellular subscriptions. **Financial aggregation facilities can reduce data privacy risks by employing the following strategies:**

- Closely following the act and regulations specified above;
- Redacting private data from data types that will be stored, to further increase the privacy of data subjects. This includes names, ID numbers, contact details and sensitive account details.

Appendix C: Methodology for estimating DRE financial aggregation market size

Mini-grids

Short term time frame (ambitious & conservative scenario):

Inputs (data sources and assumptions in footnotes):

• Sites currently operating: ^{xxxix}	469
• Estimated connections per village: ²⁵⁷	100
• ARPU per month: ²⁵⁸	\$4.65 per connection

Calculation:

1. Total estimated current connections:	469 sites x 100 connections = 46900 connections
2. Total aggregatable revenue per annum:	46900 connections x \$4.65 x 12 months = \$2,617,020

Medium term time frame (ambitious scenario):

Inputs (data sources and assumptions in footnotes):

• Estimated connections by 2025: ^{xli}	1,642,635 connections
• ARPU per month: ^{xlii}	\$6.05 per connection
• Estimated connections per village:	100
• Estimated number of projects per portfolio:	25
• Estimated years that a mini-grid will operate:	20

Calculation for annual aggregatable revenue:

1. Total aggregatable revenue per annum:	1,642,635 connections x \$6.05 x 12 months = \$119.2 million
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Calculation for portfolio financing case:

1. Estimated number of operational sites by 2025:	1,642,635 total connections / 100 connections per site = 16426 sites
2. Estimated number of portfolios:	16426 sites / 25 sites per portfolio = 657 portfolios
3. Estimated deal size per portfolio:	25 sites x 100 connections x \$6.05 x 12 months x 20 years = \$3.6 million

Long term time frame (ambitious scenario):

Inputs (data sources and assumptions in footnotes):

• Estimated connections by 2030: ^{xliii}	2,958,774 connections
• ARPU per month: ^{xliiii}	\$9.07 per connection
• Estimated connections per village:	100
• Estimated number of projects per portfolio:	25
• Estimated years that a mini-grid will operate:	20

Calculation for annual aggregatable revenue:

1. Total aggregatable revenue per annum:	2,958,774 connections x \$9.07 x 12 months = \$321.9 million
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Calculation for portfolio financing case:

1. Estimated number of operational sites by 2030:	2,958,774 connections / 100 connections = 29587 sites
2. Number of mini-grids added to reach target:	29587 sites – 16426 sites = 13161 sites
3. Estimated number of portfolios:	13161 sites / 25 sites per portfolio = 526 portfolios
4. Estimated deal size per portfolio:	25 sites x 100 connections x \$9.07 x 12 months x 20 years = \$5.4 million

Medium term time frame (conservative scenario):

Inputs (data sources and assumptions in footnotes):

• Estimated operational mini-grids by 2025: ^{xliiv}	675
• ARPU per month:	\$6.05 per connection
• Estimated connections per village:	100
• Estimated number of projects per portfolio:	25

Calculation for annual aggregatable revenue:

1. Estimated operational connections by 2025:	675 sites x 100 connections = 67536 connections
2. Total aggregatable revenue per annum:	67536 connections x \$6.05 x 12 months = \$4.9 million

Calculation for portfolio financing case:

1. Estimated number of portfolios:	675 sites / 25 sites per portfolio = 27 portfolios
2. Deal size remains the same as ambitious scenario.	

Long term time frame (conservative scenario):

Inputs (data sources and assumptions in footnotes):

• Estimated operational mini-grids by 2030: ^{xliiv}	1681
• ARPU per month: ^{xliiii}	\$9.07 per connection
• Estimated connections per village:	100
• Estimated number of projects per portfolio:	25

Calculation for annual aggregatable revenue:

1. Estimated operational connections by 2030:	1681 sites x 100 connections = 168051 connections
2. Total aggregatable revenue per annum:	168051 connections x \$9.07 x 12 months = \$18.3 million

Calculation for portfolio financing case:

1. Number of new mini-grids added after 2025:	1681 sites – 675 sites = 1005 sites
2. Estimated number of portfolios:	1005 sites / 25 sites per portfolio = 40 portfolios
3. Deal size remains the same as ambitious scenario.	

^{xxxix} See endnotes 130 to 134 for sources. South Sudan is omitted due to data unavailability.

^{xi} Uganda data based on: Ugandan Ministry of Energy and Mineral Development, Electricity Connections Policy 2018-2027, ([link](#)). Rwanda data based on: Rwanda Energy Group, National Electrification Plan Revision, 2021 ([link](#)). Kenya data based on: Government of Kenya, Kenya National Electrification Strategy, 2018 ([link](#)). DRC data based on: IFC, Scaling mini-grid programme to increase clean electricity access in the DRC, 2022 ([link](#)). Burundi and Tanzania data based on CAGR applied to current operational portfolio of sites.

^{xli} 30% growth from current ARPU as an estimate of medium term ARPU growth based on AMDA data

^{xliii} Uganda data based on: Uganda Off-Grid Market Accelerator, Off-Grid Energy in Uganda, 2021 ([link](#)). Rwanda data based on: Rwanda Energy Group, National Electrification Plan Revision, 2021 ([link](#)). Kenya data based on: Government of Kenya, Kenya National Electrification Strategy, 2018 ([link](#)). DRC data based on: World Bank, Increasing access to electricity in the DRC, 2020 ([link](#)). Burundi data based on: World Bank, Project information document: Solar Energy in Local Communities, 2020 ([link](#)). Tanzania data based on CAGR applied to current operational portfolio of sites.

^{xliiii} 50% growth from current ARPU as an estimate of long term ARPU growth based on AMDA data

^{xliiv} Calculated by applying anticipated African mini-grid CAGR (20%) to number of operational sites in 2022 (469).

^{xliiv} Year-on-year growth up to 2030 follows the same rate (20%).

^{xliiv} 30% growth from current ARPU as an estimate of medium term ARPU growth based on AMDA data.

Off-grid solar

Short term time frame (ambitious & conservative scenario):

Inputs (data sources and assumptions in footnotes):

- Estimated number of PAYGO units sold in 2022:^{xlvii} 1,640,225
- Estimated current average PAYGO revenue per unit per year:^{xlviii} \$142

Calculation:

- Estimated total value of PAYGO market in 2022: 1,640,225 units x \$142 = \$232.9 million

Medium term time frame (ambitious scenario):

Inputs (data sources and assumptions in footnotes):

- Estimated PAYGO connections by 2025:^{li} 2,017,502
- Estimated mid-term average PAYGO revenue per unit per year:^{li} \$185

Calculation:

- Estimated total value of PAYGO market in 2025: 2,017,502 connections x \$185 = \$372.4 million

Long term time frame (ambitious scenario):

Inputs (data sources and assumptions in footnotes):

- Estimated PAYGO connections by 2030:^{lii} 2,848,819
- Estimated long-term average PAYGO revenue per unit per year:^{liii} \$258

Calculation:

- Estimated total value of PAYGO market in 2030: 2,848,819 connections x \$258 = \$736.2 million

Medium term time frame (conservative scenario):

Inputs (data sources and assumptions in footnotes):

- Estimated PAYGO connections by 2025:^{liii} 1740620
- Estimated mid-term average PAYGO revenue per unit per year:^{liii} \$185

Calculation:

- Estimated total value of PAYGO market in 2025: 1740620 connections x \$185 = \$321.3 million

Long term time frame (conservative scenario):

Inputs (data sources and assumptions in footnotes):

- Estimated PAYGO connections by 2030:^{liii} 2,039,413
- Estimated long-term average PAYGO revenue per unit per year:^{liii} \$258

Calculation:

- Estimated total value of PAYGO market in 2030: 2,039,413 connections x \$258 = \$527 million



Photo: Adobe Stock/U. J. Alexander

^{xlvii} Assumes that 55% of total sales in East Africa are sold on PAYGO.

^{xlviii} This metric represents the average revenue that a single PAYGO OGS unit generates in a year. The average is based on 2018 and 2019 GOGLA data. Annual PAYGO revenue per unit for each year was calculated by dividing total value of the PAYGO market in that year by the total number of units sold on PAYGO in the same year.

^{xlix} Assumes that 55% of total sales in East Africa are sold on PAYGO. 7.14% growth rate applies from 2022 to 2025.

^l Factors in a 30% escalation from the baseline value to account for growing consumer purchasing power.

^{li} Assumes that 55% of total sales in East Africa are sold on PAYGO. 7.14% growth rate applies from 2025 to 2030.

^{lii} Factors in a 40% escalation from the baseline value to account for growing consumer purchasing power.

^{liii} Assumes that 55% of total sales in East Africa are sold on PAYGO. 2% growth rate applies from 2022 to 2025.

^{liii} Assumes that 55% of total sales in East Africa are sold on PAYGO. 2% growth rate applies from 2025 to 2030.

^{liii} Factors in a 40% escalation from the baseline value to account for growing consumer purchasing power.

Captive power (C&I solar only)

Short term time frame (ambitious & conservative scenario):

Inputs (data sources and assumptions in footnotes):

• Baseline installed capacity: ²⁵⁹	100.5 MW
• Share of installed capacity on rent to own/PPA model: ^{lvi}	50%
• General PV performance ratio:	78%
• Estimated rainy days per year:	128
• Average sun hours per day (estimated):	9
• Estimated PPA tariff:	\$0.15/kWh

Calculation:

1. Sun hours per year:	9 x (365 days - 128 days) = 2133 hours
2. Total installed capacity on rent to own/PPAs:	(100.5 MW x 50%) x 1000 = 50,265 kW
3. Annual kWhs (assuming everything is consumed):	50,265 kW x 78% x 2133 hrs = 83627891 kWh
4. Total aggregatable revenue per annum:	83627891 kWh x \$0.15/kWh = \$12.5 million

Medium term time frame (ambitious scenario):

Inputs (data sources and assumptions in footnotes):

• Estimated installed capacity by 2025: ^{lvii}	257.2 MW
• Share of installed capacity on ESCO models by 2025: ^{lviii}	60%
• Estimated PV performance ratio by 2025: ^{lix}	85%
• Sun hours per year:	2133 hours (calculated above)
• Estimated number of projects per portfolio:	15
• Estimated years that a C&I project will operate:	20
• Average installed capacity per project:	100 kW

Calculation for annual aggregatable revenue:

1. Total installed capacity on rent to own/PPAs by 2025:	(257.2 MW x 60%) x 1000 = 154294 kW
2. Annual kWhs (assuming everything is consumed):	154294 kW x 85% x 2133 hrs = 279743398 kWh
3. Total aggregatable revenue per annum:	279743398 kWh x \$0.15/kWh = \$42 million

Calculation for portfolio financing case:

1. Estimated number of operational C&I sites:	154294 kW / 100 kW = 1543 sites
2. Estimated energy generated per year per project:	100 kW x 85% x 2133 hrs = 181305 kWh
3. Estimated number of portfolios:	1543 projects / 15 projects per portfolio = 103 portfolios
4. Estimated deal size per portfolio:	181305 kWh x 15 projects x \$0.15 x 20 yrs = \$8.2 million

Long term time frame (ambitious scenario):

Inputs (data sources and assumptions in footnotes):

• Total installed capacity by 2030: ^{lx}	2691.3 MW
• Share of installed capacity on ESCO models by 2030: ^{lxi}	70%
• Estimated PV performance ratio by 2030: ^{lxii}	90%
• Sun hours per year:	2133 hours (calculated above)
• Estimated number of projects per portfolio:	15
• Estimated years that a C&I project will operate:	20
• Average installed capacity per project:	150 kW

Calculation for annual aggregatable revenue:

1. Total installed capacity on ESCO models by 2030:	(2691.3 MW x 70%) x 1000 = 1883886 kW
2. Annual kWhs (assuming everything is consumed):	1883886 kW x 90% x 2133 hrs = 3616496508 kWh
3. Total aggregatable revenue per annum:	3616496508 kWh x \$0.15/kWh = \$542.5 million

Calculation for portfolio financing case:

1. Estimated number of new ESCO C&I sites:	(1883886 kW / 150 kW) – 1543 sites = 11016 sites
2. Estimated energy generated per year per project:	150 kW x 90% x 2133 hrs = 287955 kWh
3. Estimated number of portfolios:	11016 projects / 15 projects per portfolio = 734 portfolios
4. Estimated deal size per portfolio:	287955 kWh x 15 projects x \$0.15 x 20 yrs = \$13 million

Medium term time frame (conservative scenario):

Inputs (data sources and assumptions in footnotes):

• Estimated installed capacity by 2025: ^{lviii}	169.9 MW
• Share of installed capacity on ESCO models by 2025: ^{lix}	60%
• Estimated PV performance ratio by 2025: ^{lxv}	85%
• Sun hours per year:	2133 hours (calculated above)
• Estimated number of projects per portfolio:	15
• Estimated years that a C&I project will operate:	20
• Average installed capacity per project:	100 kW

Calculation for annual aggregatable revenue:

1. Total installed capacity on rent to own/PPAs by 2025:	(169.9 MW x 60%) x 1000 = 101937 kW
2. Annual kWhs (assuming everything is consumed):	101937 kW x 85% x 2133 hrs = 184817639 kWh
3. Total aggregatable revenue per annum:	184817639 kWh x \$0.15/kWh = \$27.7 million

Calculation for portfolio financing case:

1. Estimated number of operational ESCO C&I sites:	101937 kW / 100 kW = 1019 sites
2. Estimated energy generated per year per project:	100 kW x 85% x 2133 hrs = 181305 kWh
3. Estimated number of portfolios:	1019 projects / 15 projects per portfolio = 68 portfolios
4. Estimated deal size per portfolio:	181305 kWh x 15 projects x \$0.15 x 20 yrs = \$8.2 million

^{lvi} Estimated average based on limited data from the region – the share of ESCO models in total sales is only known in Uganda and Kenya.

^{lvii} Based on 2020-2022 historic CAGR of 59.94%.

^{lviii} Assuming growth as the rent to own/PPA market matures over time

^{lix} Considering improvements in solar PV technology

^{lx} Based on 2020-2022 historic CAGR of 59.94%.

^{lxi} Assuming growth as the rent to own/PPA market matures over time

^{lxii} Considering improvements in solar PV technology

^{lxiii} Based on reduced CAGR of 30%.

^{lxiv} Assuming growth as the rent to own/PPA market matures over time

^{lxv} Considering improvements in solar PV technology



Long term time frame (conservative scenario):

Inputs (data sources and assumptions in footnotes):

• Total installed capacity by 2030: ^{ixvi}	630.8 MW
• Share of installed capacity on ESCO models by 2030: ^{ixvii}	70%
• Estimated PV performance ratio by 2030: ^{ixviii}	90%
• Sun hours per year:	2133 hours (calculated above)
• Estimated number of projects per portfolio:	15
• Estimated years that a C&I project will operate:	20
• Average installed capacity per project:	150 kW

Calculation for annual aggregatable revenue:

1. Total installed capacity on ESCO models by 2030:	$(630.8 \text{ MW} \times 70\%) \times 1000 = 441567 \text{ kW}$
2. Annual kWhs (assuming everything is consumed):	$441567 \text{ kW} \times 90\% \times 2133 \text{ hrs} = 847677301 \text{ kWh}$
3. Total aggregatable revenue per annum:	$847677301 \text{ kWh} \times \$0.15/\text{kWh} = \$127.2 \text{ million}$

Calculation for portfolio financing case:

1. Estimated number of new ESCO C&I sites:	$(441567 \text{ kW} / 150 \text{ kW}) - 1019 \text{ sites} = 1924 \text{ sites}$
2. Estimated energy generated per year per project:	$150 \text{ kW} \times 90\% \times 2133 \text{ hrs} = 287955 \text{ kWh}$
3. Estimated number of portfolios:	$1924 \text{ projects} / 15 \text{ projects per portfolio} = 128 \text{ portfolios}$
4. Estimated deal size per portfolio:	$287955 \text{ kWh} \times 15 \text{ projects} \times \$0.15 \times 20 \text{ yrs} = \13 million

^{ixvi} Based on reduced CAGR of 30%.

^{ixvii} Assuming growth as the rent to own/PPA market matures over time

^{ixviii} Considering improvements in solar PV technology



Photo: UNDP/Aurélia Rusek

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United Nations Development Programme
One United Nations Plaza
New York, NY 10017
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