United Nations Development Programme

# Financial Aggregation for Distributed Renewable Energy in Rwanda

## Market Assessment and Action Plan

January 2024

# Financial Aggregation for Distributed Renewable Energy in Rwanda

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The UNDP task team responsible for the production of this report was composed of Eduardo Appleyard, Walker Darke and Mateo Salomon.

The TFE team includes André Troost (lead author), Dr. Sam Duby, Kumbirai Makanza, Adrian Lotter, Tamara Rose Chizema and Nts'ebo Sephelane. The Lime Group team includes Irene Wagaki and John Wainaina.

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# Foreword

It is with great pleasure that we present this report on Financial Aggregation for Distributed Renewable Energy (DRE) in Rwanda, part of a report series on Financial Aggregation for DRE developed by UNDP's Climate Aggregation Platform.

Rwanda exemplifies the astounding strides made in the distributed renewable energy sector in recent years: For instance, the installed capacity of commercial and industrial solar (C&I) projects has grown to 5.7 MW by 2023, marking an 18% increase since 2020[1,2]. Off-grid solar sales reached 236,611 units in 2021[3,4], and 84 mini-grids are now operational in the country.[5]

Despite this growth, the market for small-scale, low-carbon, energy assets in Rwanda is still at an early stage for financial aggregation. While innovative financial structures involving some form of aggregation have been considered and could take shape in Rwanda in the near future (e.g., Solar Securitization for Rwanda*), several market barriers remain to be addressed if these are to be widely employed and scaled.

This report comprises a comprehensive analysis that sheds light on the current market landscape and charts the course for cultivating an environment conducive to financial aggregation in Rwanda's DRE sector. It offers insights and quantifies the prospective market opportunity. The report underscores the off-grid solar sector as the most mature sub-sector, exhibiting a relatively high readiness for financial aggregation, followed by mini-grids, captive power, and e-mobility.

While Rwanda's potential for financial aggregation is undeniable, it is important to recognize the limitations stemming from the scale of the current DRE asset base. Off-balance sheet securitization and aggregation transactions entail significant costs that may not be warranted by Rwanda's asset base alone. The report advocates for the exploration of multi-jurisdictional financial aggregation, bundling DRE assets not only within Rwanda but also across East Africa and beyond, to attain the critical mass necessary for cost-effective transactions, and providing an opportunity for regional collaboration. Rwanda's conducive business environment, its supportive tax legislation and the country's ambitions to be a leader in green and sustainable finance provide a good starting point.

Tackling the market barriers to financial aggregation, and financing the DRE sector more broadly, requires coordinated action from a variety of stakeholders in Rwanda and beyond. By harnessing Rwanda's strengths and forging alliances across East Africa, we can rally resources to spur the DRE sector's growth in the region.

We express our sincere appreciation to the authors, researchers, and contributors who have dedicated their expertise and time to produce this 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

** More information on the Solar Securitization for Rwanda initiative can be found here.*

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# Abbreviations

| | |
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| **API** | application programming interface |
| **BRD** | Development Bank of Rwanda |
| **C&I** | commercial and industrial |
| **CAP** | Climate Aggregation Platform |
| **CMA** | Capital Markets Authority |
| **CPIA** | Country Policy and Institutional Assessment |
| **DFI** | development finance institution |
| **DRE** | distributed renewable energy |
| **DTA** | double tax agreement |
| **EAC** | East African Community |
| **EDCL** | Energy Development Corporation Limited |
| **EIA** | environmental impact assessment |
| **EV** | electric vehicle |
| **FDI** | foreign direct investment |
| **FONERWA** | Rwanda Green Fund |
| **GDP** | gross domestic product |
| **GEF** | Global Environment Fund |
| **GOGLA** | Global Off-grid Lighting Association |
| **HGS** | Home Grown Solutions |
| **KIFC** | Kigali International Financial Centre |
| **ktoe** | kilotonne of oil equivalent |
| **kWh** | kilowatt hour |
| **LCOE** | levelized cost of energy |
| **LPG** | liquid petroleum gas |
| **LV** | low voltage |
| **MFI** | microfinance institution |
| **MINECOFIN** | Ministry of Finance and Economic Planning |
| **MtCO2e** | metric tons of carbon dioxide equivalent |
| **MV** | medium voltage |
| **MW** | megawatt |
| **NARUC** | National Association of Regulatory Utility Commissioners |
| **NDC** | nationally determined contribution |
| **NEP** | National Electrification Plan |
| **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 |
| **RPF** | Rwandan Patriotic Front |
| **RRA** | Rwanda Revenue Authority |
| **RURA** | Rwanda Utilities Regulatory Authority |
| **RWF** | Rwandan Franc |
| **SDG** | Sustainable Development Goal |
| **SHS** | solar home system |
| **SPV** | special purpose vehicle |
| **UNCDF** | United Nations Capital Development Fund |
| **UNDP** | United Nations Development Programme |
| **UK** | United Kingdom |
| **US** | United States |
| **VAT** | value added tax |

# Glossary

| | |
|---|---|
| **Application programming interface (API)** | A software intermediary comprised of a set of rules that allows two applications to communicate with each other. |
| **Asset-backed securitization (ABS)** | 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 (DRE)** | 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 (GDP)** | 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 (LCOE)** | 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 multiple 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 (SPV)** | 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 Rwanda 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 grown to 5.7 megawatt (MW) by 2023, marking 18% growth since 2020.[6,7] Annual sales of off-grid solar (OGS) products reached 236,611 units in 2021.[8,9] This is the highest sales level that the country has seen since an all-time high of 271,310 units in 2017. The mini-grid market has grown to a total of 84 mini-grids operating across the country as of 2022;[10]

- Despite this growth, the market for small-scale, low-carbon, energy assets in Rwanda is still nascent when it comes to financial aggregation. While innovative financial structures involving some form of aggregation have been considered and could take shape in Rwanda in the near future (e.g., Solar Securitization for Rwanda[11]), several market barriers must be addressed if these are to be widely employed and scaled;

- Looking to the future, we estimate that the total annual DRE[i] financial aggregation market opportunity in Rwanda will peak at $36 million by 2030, up from $25 million per annum in 2025. This is based on data pertaining to revenue per year derived from pay-as-you-go (PAYGO) sales from all DRE sectors and the estimated size of the future DRE asset base;[ii]

- Our quantified market opportunity assessment shows that the DRE sector with the largest financial aggregation market opportunity in Rwanda is OGS, followed by captive power and mini-grids. Electric mobility also presents a large potential market opportunity but this is based on a qualitative assessment;[iii]

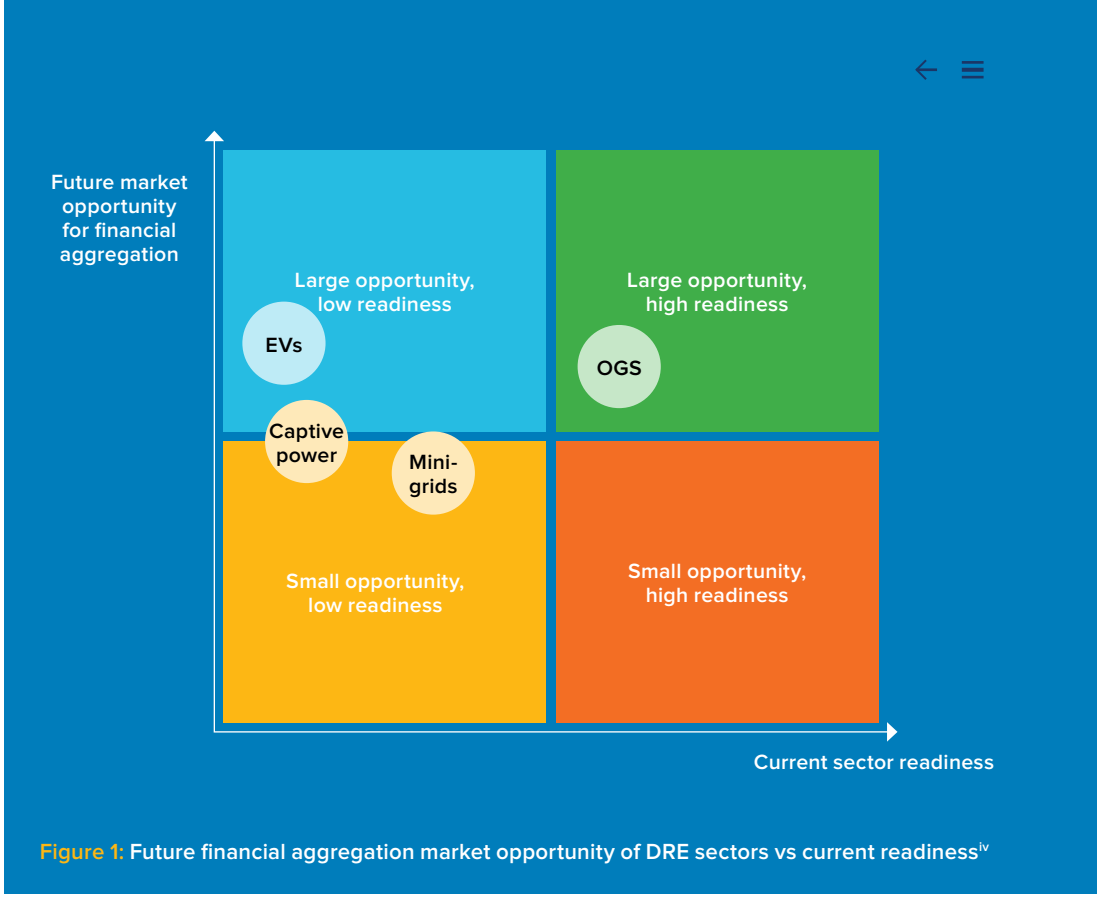



Figure 1: Future financial aggregation market opportunity of DRE sectors vs current readiness[iv]

- The OGS market is the most mature market currently, indicating relatively high readiness for financial aggregation compared to other sub-sectors such as mini-grids and captive power which exhibit low readiness at this stage;

- The estimated total future financial aggregation market size of $36 million is too small to justify the comparatively high costs involved with setting up and operating off-balance sheet securitization and aggregation transactions. Put differently, Rwanda alone is unlikely to have the requisite DRE asset base to warrant the setup and operation of off-balance sheet transactions as these are complex and expensive financial instruments. This is however not a Rwanda-specific issue – it is highly likely that the majority of countries in sub-Saharan Africa do not have DRE asset bases sufficiently large to warrant financial aggregation by themselves;

- If off-balance sheet securitization and aggregation is to be employed, multi-jurisdictional financial aggregation (aggregation of assets within and beyond Rwanda) will likely be required in order to pool together an asset base large enough to warrant the cost of such transactions;

*i DRE technologies considered in this report include mini-grids, solar home systems and pico-solar products, solar productive use systems, captive power and electric mobility.*
*ii All methodologies and assumptions are provided in Appendix C.*
*iii Due to data availability constraints, the financial aggregation market opportunity for electric mobility could not be quantified.*
*iv See Figure 15 for quantified assessments of the future financial aggregation market opportunity of off-grid solar, mini-grids and captive power.*

- 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 its lower set-up cost and relative simplicity;

- Bulk procurement – a different form of aggregation – can be used 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. Asset-backed securitization regulations remain largely untested, the future of DRE in Rwanda's electrification efforts is uncertain and most DRE companies are not yet aggregation ready;

- Despite these challenges, there are also positive signs, in particular, favourable 'ease of doing business' indicators, supportive tax legislation in Rwanda and a willingness of existing DRE investors to participate in aggregation transactions when DRE portfolios become aggregation-ready;

- The investment friendly climate means that multi-jurisdictional DRE financial aggregation facilities could potentially be domiciled in Rwanda while pooling DRE assets from Rwanda and across the EAC. National initiatives such as the Kigali International Financial Centre (KIFC) which aims to position Kigali as a regional finance hub and a preferred financial centre, or the recently launched investment facility 'Ireme Invest', a one stop centre for green and sustainable investment,[12] highlight the country's ambitions to be a leader in this space;

- Developing the market towards aggregation-readiness will require globally relevant work. This includes open sourcing and standardising term sheets, engaging concessional funders to crowd-in commercial capital, upskilling investors to accept receivables as collateral, compiling a common data reporting framework and more. It will also require working directly with industry in Rwanda. This includes creating awareness among less mature DRE companies about financial reporting best practice, data management and customer creditworthiness assessment, communicating necessary DRE regulatory improvements, closing a model securitization transaction and more. These are discussed in Chapter 7.

Photo: UNDP Rwanda/Julie Pudlowski

# 1 Introduction



Photo: UNDP Rwanda

**Access to finance continues to elude the energy access sector and other distributed renewable energy (DRE) sectors in Rwanda and many other countries in the region.** 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 seeks to assess the market readiness and potential for financial aggregation of the DRE sector in Rwanda. It provides an in-depth analysis of the key precursors[v] to financial aggregation and the barriers that will need to be tackled if the potential addressable market is to be unlocked. Finally, it presents an action plan setting out two pathways with specific barrier-removal activities 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 Rwanda and beyond.

The report has been 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. This document is part of a report series including a similar assessment for Uganda and for East Africa at large.

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. The chapter is structured according to the PESTLE framework, with an analysis of **P**olitical, **E**conomic, **S**ocial (demographic), **T**echnological, **L**egal and **E**nvironmental factors that are relevant for DRE financial aggregation. Chapter 3 provides a brief overview of the current status of the energy sector in Rwanda, while Chapter 4 focuses in more depth on the status of different DRE sub-sectors.

An appraisal of the market's level of readiness in relation to each of these national- and sector-level factors is presented at the beginning of each section in Chapters 2 and 4. This appraisal merely provides a basic indication of current market readiness and should therefore be viewed in conjunction with the detailed discussion of the section that it pertains to. It is based on a financial aggregation market assessment framework developed as part of the CAP project. This framework also served as a guide for all research conducted during the project and therefore this report also follows the same structure – from national-level PESTLE factors down to sector-specific considerations such as sector maturity and size. More details of the market assessment framework and its indicators are presented under appendix G.

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 Rwanda, while Chapter 7 concludes with an action plan of activities to address these barriers.

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.

*v The report provides insights into a variety of sub-topics to assess the potential of DRE financial aggregation in Rwanda. 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.*

## The following DRE industries are considered in the report:[vi]

**Off-grid solar (solar home systems and standalone solar productive uses):** Solar home systems 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. These are also referred to as solar lanterns. 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 DC 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 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.

*vi 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.*

Photo: UNDP/Sophie Guibert

## 1.1 DRE financial aggregation

Small-scale energy assets can be aggregated into portfolios to achieve scale and attract larger investment ticket sizes[13] in a process defined as DRE 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 solar home systems, 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.

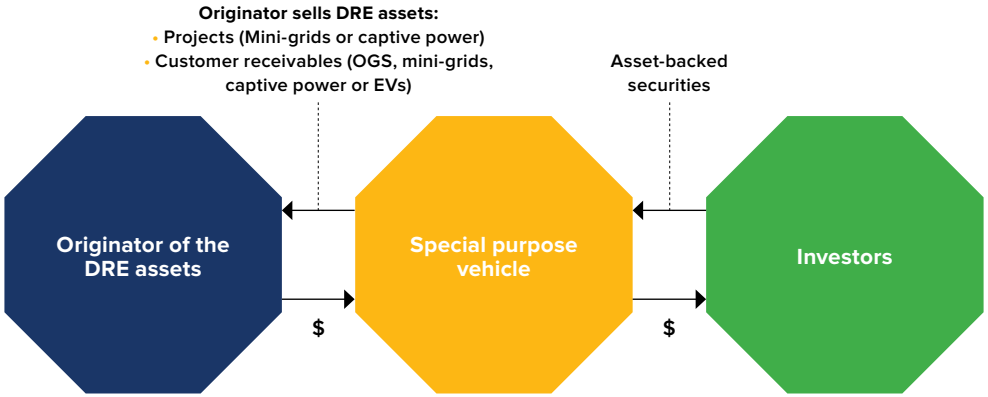
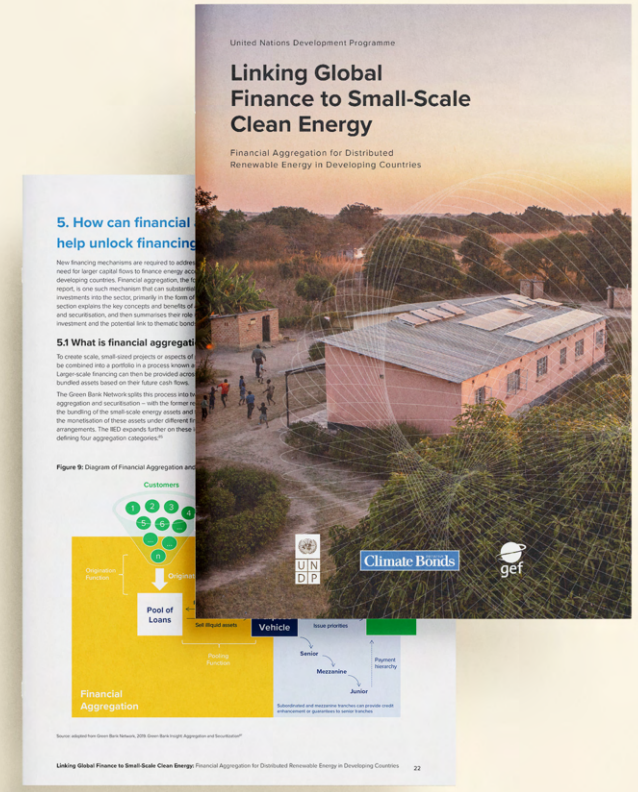



Figure 2: **Basic off-balance sheet securitization structure**



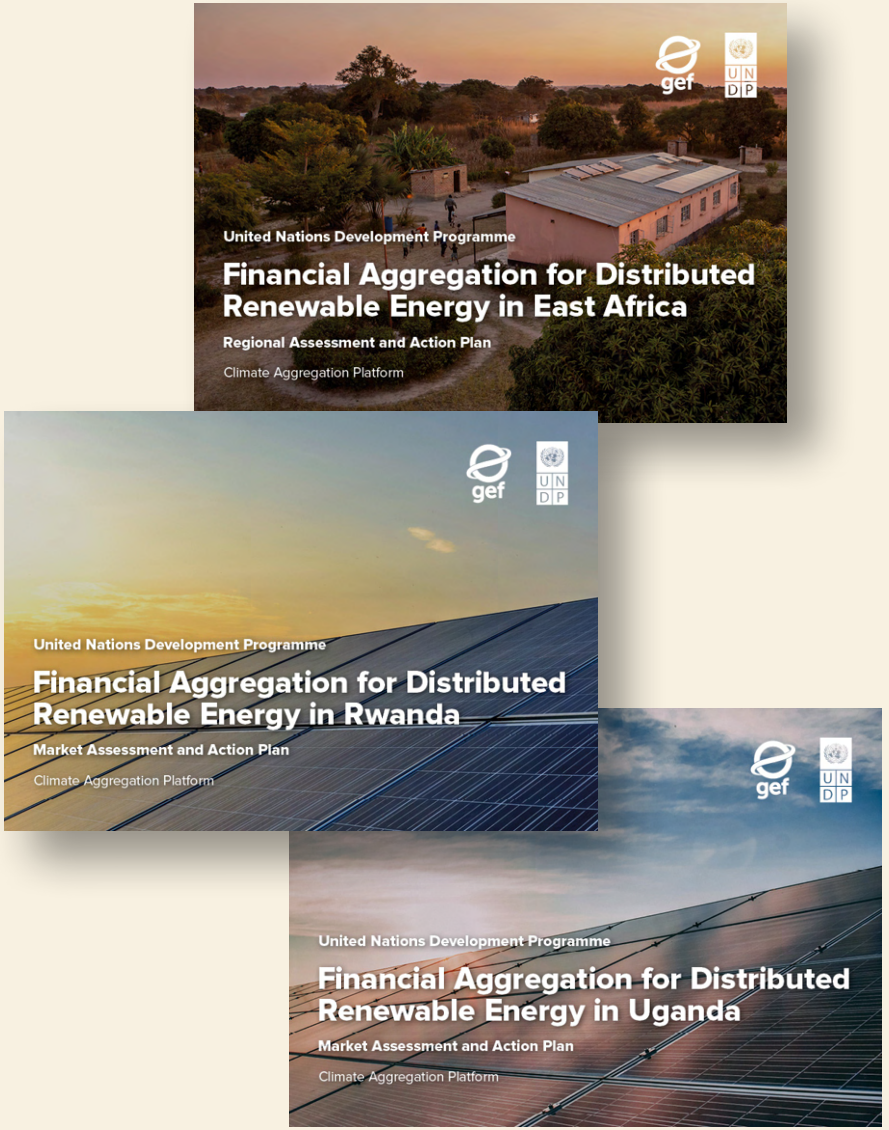

To learn more about financial aggregation please see **UNDP's** and the **Climate Bonds Initiative** report on "Linking Global Finance to Small-Scale Clean Energy".

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, with no successful examples in Rwanda. 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.[vii] 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.

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.[14] 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. Deals can be smaller as transaction costs are significantly lower than off-balance sheet transactions. 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.

> *"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**




**For the status of DRE financial aggregation in Uganda and in East Africa more broadly, see a parallel assessment for Uganda here and East Africa here.**

*vii See for example: African Frontier Capital, D.light and SFC announce industry-leading USD 238 million multi-currency receivable financing facility, 2022 (link)*

# 2

# Country overview

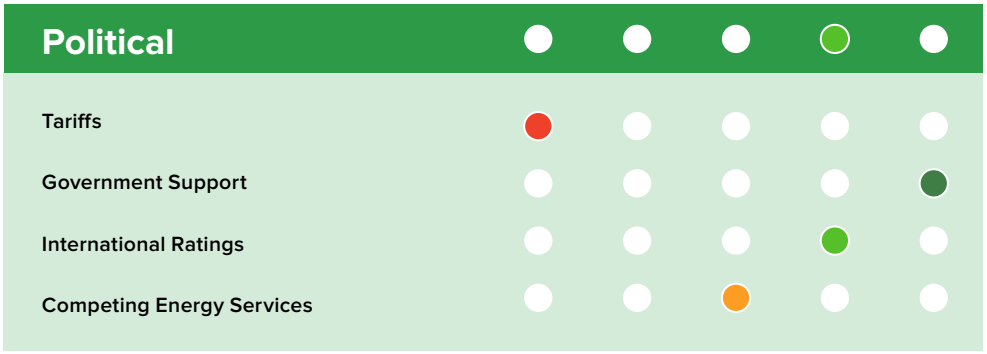


Photo: UNDP Rwanda/Constantin Uwase

## 2.1 Political outlook and 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.**

### Rwanda's political score on the CAP market assessment framework:[viii]



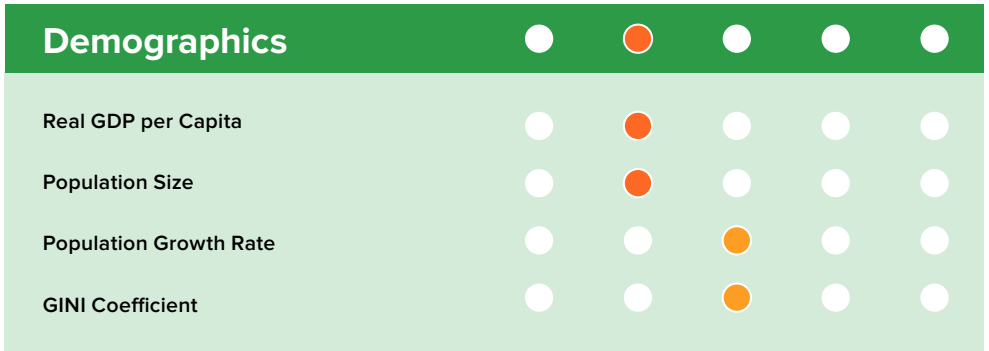

Rwanda has enjoyed relative stability in the nearly three decades following the turmoil of the genocide against the Tutsi in 1994. The country functions under a top-down governance system led by the Rwandan Patriotic Front (RPF). The RPF implements a clear-cut approach in its governance with both citizens and government officials. It stands firmly against corruption and implements accountability by binding government officials to a detailed personal performance contract (*imihigo*) which is used as an effective mechanism to manage officials' performance and the delivery of socioeconomic transformation.[15] The country's Home-Grown Solutions (HGS) programme is a collection of locally developed solutions by Rwandans that are implemented to build the nation, promote national culture and fast track local development. One of its primary HGS, the annual National Dialogue Council known as "Umushyikirano," brings civilians, government officials and parliamentarians together to discuss the country's issues at local and national levels, while also observing the country's development progress, and strategising for the future.[16]

Rwanda has a relatively good public sector transparency, accountability and corruption rating score of 3.5 out of 6 (1 being low and 6 being high) on the Country Policy and Institutional Assessment (CPIA) scale.[17] The RPF's inclusive culture transcends beyond its own borders, with the government fostering an open environment for refugees and actively pursuing peaceful resolutions to regional conflicts.

## 2.2 Demographic considerations

**Countries that fare relatively well on demographic grounds tend to be poised for faster DRE market growth and increased likelihood of DRE financial aggregation. Rwanda has low (although rapidly improving) socio-economic conditions. This adversely affects the ability to pay for certain DRE goods and services in the short term. It is, however, expected to improve in the medium to long term.**

### Rwanda's demographic score on the CAP market assessment framework:




*viii Full details of the financial aggregation market assessment framework employed in this study are provided in appendices G and H.*

Rwanda's population of 13.4 million is small compared to neighbouring Kenya, Tanzania and Uganda, with populations of 53 million, 63.5 million and 45.8 million respectively.[18] Despite a decreased poverty rate from 60% in 2000 to 38% in 2017, and an improved life expectancy from 29 in the mid-1990s to 69 in 2019, Rwanda still had a relatively low gross domestic product (GDP) per capita of $834 in 2021 compared to the average of $1645 across Africa, which places the country 166th out of 175 in the world.[19] GDP per capita achieved 7.4% growth in 2021, recovering from a 5.9% contraction in 2020.[20]

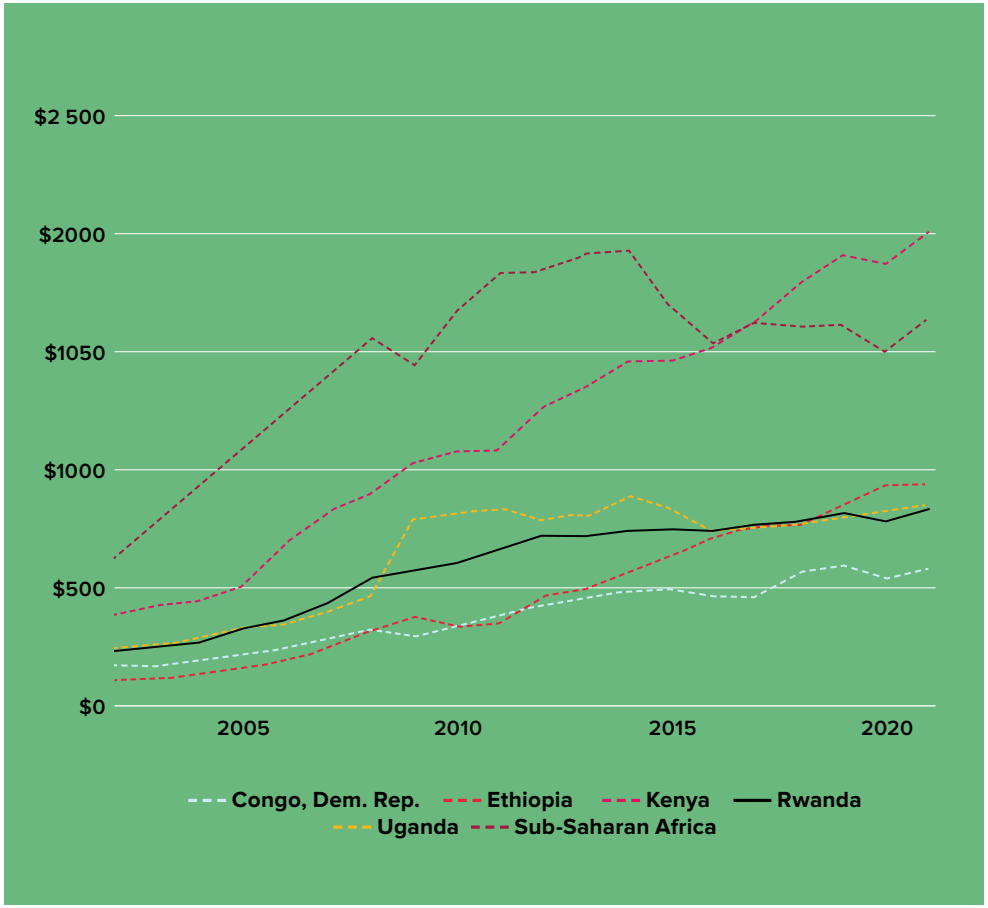
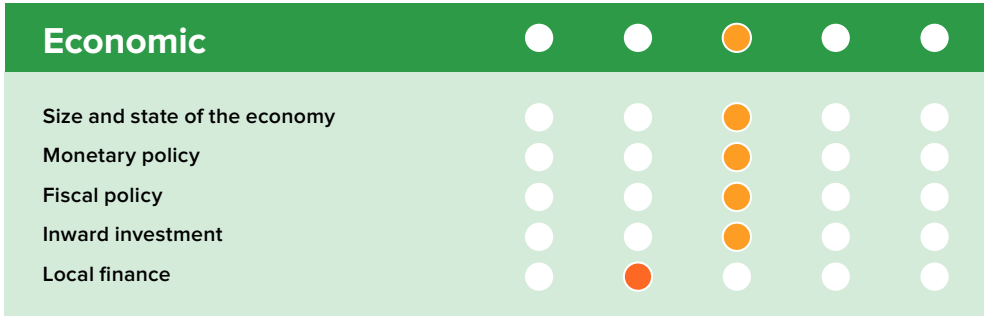



Figure 3: **Rwanda GDP per capita compared to East African neighbours and regional average[21]**

## 2.3 Economic status and outlook

**Above-average GDP growth contributes indirectly to the growth of DRE markets, as it indicates an increase in consumer spending power, among other considerations.**

### Rwanda's economic score on the CAP market assessment framework:




Rwanda has experienced a notable economic turn-around in the last decade. This growth has been driven in part by the business environment created by the government. Rwanda is considered as one of the top four countries in Africa for investment attractiveness.[22] This is due to the continuous and various efforts made towards improving its operating environment. The country registered an average GDP growth rate of around 8% per year in the last decade.[23]

The Rwandan economy briefly contracted by 3.4% in 2020 as a result of the COVID-19 pandemic, however, the economy appears to have swiftly recovered with GDP growth of 10% in 2021 and 6.9% in 2022.[24] This recovery can be attributed in part to the sustained fiscal stimulus by the government, relative easing of COVID-19 restrictions and partial recovery in global demand. To counter the impacts of the pandemic, the government set up its own publicly financed Economic Recovery Fund to complement the following external funds raised:[25]

- $14.25 million loan from the World Bank through the COVID-19 Emergency Response Project to assist with health preparedness;[26]
- $100 million loan from the Asian Infrastructure Investment Bank primarily to support the SME sector;[27]
- IMF Special Drawing Rights allocation of $219 million (1.9% of GDP and 12.8% of its international gross reserves) and the issuance of a $620 million Eurobond.[28]

The impact of the war in Ukraine is likely to dampen Rwanda's recovery due to rising oil prices, supply chain disruptions and a heavy reliance on Russian wheat and fertiliser (64% of its wheat coming from Russia).[29] This is having an adverse effect on the economy. In response to the ongoing crisis the country instituted a plan in 2022 to spend an additional $50 million in fiscal stimulus and to seek alternative sources of wheat and other disrupted supplies.[30]

> *"Governments and households continue to face immense pressure from the once-in-a-generation cost-of-living crisis, including skyrocketing and volatile energy prices, due to the war in Ukraine."*
> **– UN Global Crisis Response Group**

## 2.3.1 Monetary policy

**DRE revenues are typically generated in local currency while investments in DRE assets are typically made in hard currencies. It follows that financial aggregation favours stable currencies, as this minimizes foreign exchange risk.**

The stability of the Rwandan Franc (RWF) versus the US Dollar and relatively stable and competitive repo rates have created a conducive environment for investment. This is favourable for financial aggregation in Rwanda and for instruments with exposure to foreign currency volatility. Rwanda maintains no foreign exchange controls. Large foreign exchange inflows, particularly from the tourism sector, have supported the relative stability of the RWF. The standard deviation in monthly fluctuations of the RWF against the US Dollar between January 2017 and June 2022 is only 0.005, making it the third most stable currency in the East African Community (EAC).[31] While fluctuations have not been severe, the long-term change over this period shows a gradual weakening of the RWF. The currency weakened by 25% against the US Dollar over the same period (see Figure 4).

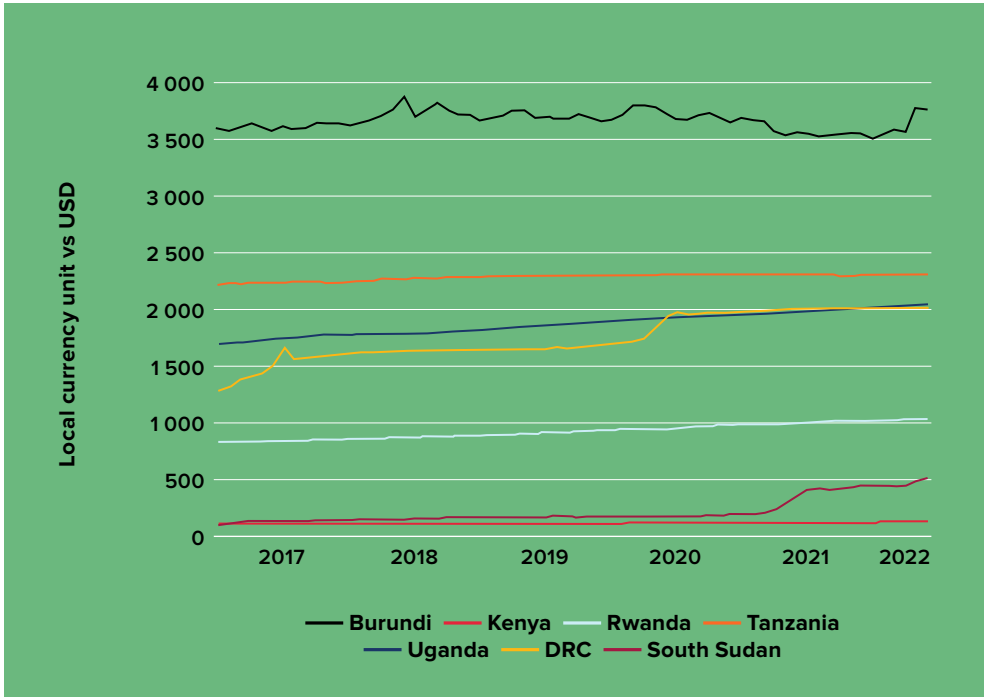



Figure 4: **Exchange rate volatility of RWF vs USD, compared to East African currencies[32]**

Rwanda's monetary policies have been effective at keeping the inflation rate low prior to the pandemic. Between 2016 and 2020 inflation averaged below 4.0% and below the Central Bank's policy target of 5%.[33] In 2020, inflation reached 7.7%[34] and since then increased significantly, reaching 21.7% by November 2022.[35] In response, the National Bank of Rwanda has been gradually increasing the repo rate since the pandemic, reaching 7% in February 2023, up from 4.5% in May 2020.[36]

**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 could 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 could reduce the likelihood of local financial institutions investing in financial aggregation facilities as a result of higher return expectations.**

## 2.3.2 Fiscal policy

**High fiscal deficits could limit a government's ability to support the 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.**

Fiscal policy discipline and consistency, favourable tax incentives and an efficient tax authority have created a conducive operating environment for financial aggregation and investment more broadly in Rwanda. The Rwandan government followed a fiscal consolidation stance between 2015 and 2019 and shifted to an expansionary policy in 2020 in response to the impact of the pandemic. **During the consolidation period Rwanda aimed to:**

- Increase domestic revenue collection;
- Wean its economy of aid;
- Steer expenditure towards priority infrastructure projects, and;
- Avoid domestic financing to avoid the crowding out financing for the private sector.

As a result of this strategy, tax revenue increased from 13.3% of GDP in 2015 to 15.1% of GDP in 2020 and government expenditure increased from 13.9% of GDP in 2015 to 16.4% of GDP in 2020.[37,38] The 2021 Country Fiduciary Risk Assessment found strong fiscal discipline, an orderly budget preparation process, and sound financial controls within the Government's Integrated Financial Management Information System. The country's fiscal deficit stood at 6% of GDP in 2022 – an improvement from 7.1% of GDP in 2021.[39,40]

During the fiscal expansionary period post 2020, the debt-to-GDP ratio is estimated to have grown from 50% in 2019 (already up from 19.4% in 2010) to 68% of GDP in 2022.[41,42] Public debt is deemed to be still sustainable with a moderate risk of external debt distress according to Fitch. This is aided by the majority of Rwanda's debt being relatively cheap – 88% of its external debt is concessional.[43] This means that despite moderate risk of debt distress, any government infrastructure investment plans should not be severely affected by issues related to the government's fiscal deficit.

### Taxation

Rwanda has a residence-based tax system in which residents are subject to tax on their global income and non-residents are subject to tax only on income sourced in the country. Rwanda has double taxation agreements (DTAs) in place with Belgium, Jersey, Mauritius, Singapore, South Africa and Turkey.[44] **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.**

**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 taxes in Rwanda with a particular focus on policies relevant to the DRE sector. Taxation of renewable energy in Rwanda is relatively favourable – most technologies are exempt from value added tax (VAT) and import duties and a reduced withholding tax rate applies. Financial instruments also enjoy favourable tax arrangements, provided that certain registrations are in place. These are elaborated on in section 2.5.2.

The national tax authority, the Rwanda Revenue Authority (RRA) in 2012 launched an e-filing and e-payment system which has greatly reduced taxpayer compliance burdens. The RRA reports that it now takes three days to get a taxpayer compliance certificate versus the 10 days that was previously customary before the system was instituted.

Under the Rwanda Investment Code, the country has several investment tax incentives for its priority sectors which include energy generation, transmission and distribution, and electric mobility, namely;

- Reduced corporate income tax rates applying for a period of five years to newly listed companies;
- Income tax concessions available to an international company which has its headquarters or regional office in Rwanda;
- A seven-year tax holiday and reduced corporate income tax rate of 15% available to registered investors in priority sectors;
- A five-year tax holiday available to microfinance institutions and specialized industrial and innovation parks developers; and
- Customs duties exemption for a registered investor investing in products used in export processing zones.[45]

| TAX | RATE | NOTES |
|---|---|---|
| **Corporate tax** | • Standard rate: 30%<br>• Reduced rate: 15% (Renewable energy companies and other priority sectors). | • In line with sub-Saharan Africa average of 28% |
| **Withholding tax** | • Standard rate: 15% (interest, dividends and royalties)<br>• Reduced rate: 5% (Government securities and dividends paid by listed companies to EAC resident beneficiaries) | • In line with sub-Saharan Africa average of 15% |
| **Valued added tax** | • Standard rate: 18%<br>• All solar products, including panels or assembled into products like solar home systems and batteries are exempt in Rwanda. | • Slightly higher than sub-Saharan Africa average of 15%.<br>• VAT returns are due after each calendar month and any payable VAT is due 15 days after the end of that month.<br>• Taxpayers with an annual turnover of less than RWF 200 million can opt to file VAT returns and make payments on a quarterly basis. |
| **Import duties** | • Standard import duty depends on type of goods<br>• Most solar products are exempt (pico-solar products are charged at 10%)<br>• Batteries are charged at a 25% duty | |

**Table 1: Rwanda tax summary[46,47]**

## 2.3.3 Inward investment

Rwanda is well embedded into the international community. It is a member of the African Continental Free Trade Area Agreement, African Union, Common Market for Eastern and Southern Africa, the World Trade Organization, the EAC, the Economic Community of the Great Lakes and the Economic Community of Central African States. The country has bilateral investment treaties with the Belgium-Luxembourg Economic Union, Germany, the Republic of Korea and the United States. Treaties have also been signed with other countries but these are yet to enter into force.

**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.**

Rwanda registered total investments worth $3.7 billion in 2021, up from $1.3 billion in 2020.[48] The construction, manufacturing (including agro-processing) and real estate sectors accounted for 72% of total investments.

### Foreign direct investment

Foreign direct investment (FDI) grew steadily from 0.3% of GDP in 2005 to a peak of 3.8% of GDP in 2018.[49] FDI fell to 1% of GDP in 2020 but increased to 1.9% of GDP in 2021.[50] The decline is a similar trend observed in many other emerging market economies.

### Official development assistance

Following a spike in net official development assistance (ODA) in the 1990s in response to the genocide, Rwanda has maintained a relatively high reliance on international aid.

In 2020, ODA amounted to 16.3% of gross national income.[51] ODA funders to Rwanda are presented in Figure 6. Figure 7 below presents total ODA flows to Rwanda's energy sector. The significant decline in 2020 is likely a result of interruptions to normal funding cycles caused by the COVID-19 pandemic.

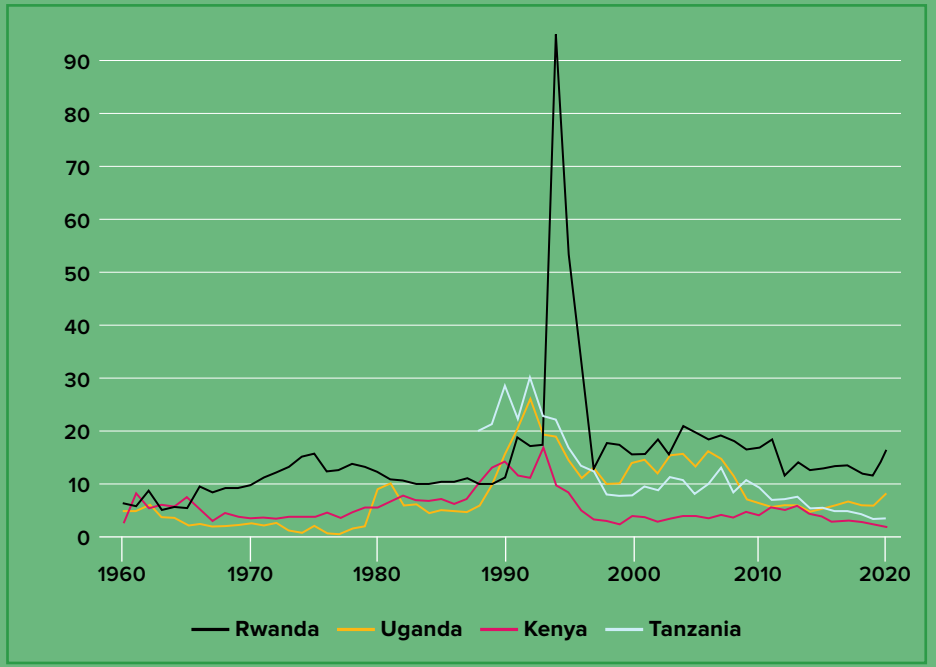



Figure 5: ODA received (% of GNI)[52]

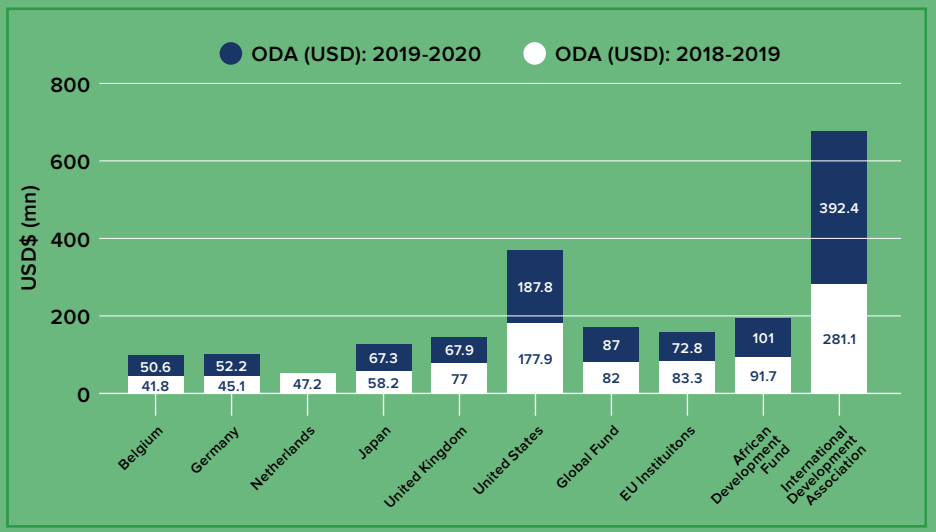



Figure 6: Top ten donors disbursing ODA funds in Rwanda 2018-2020[53]

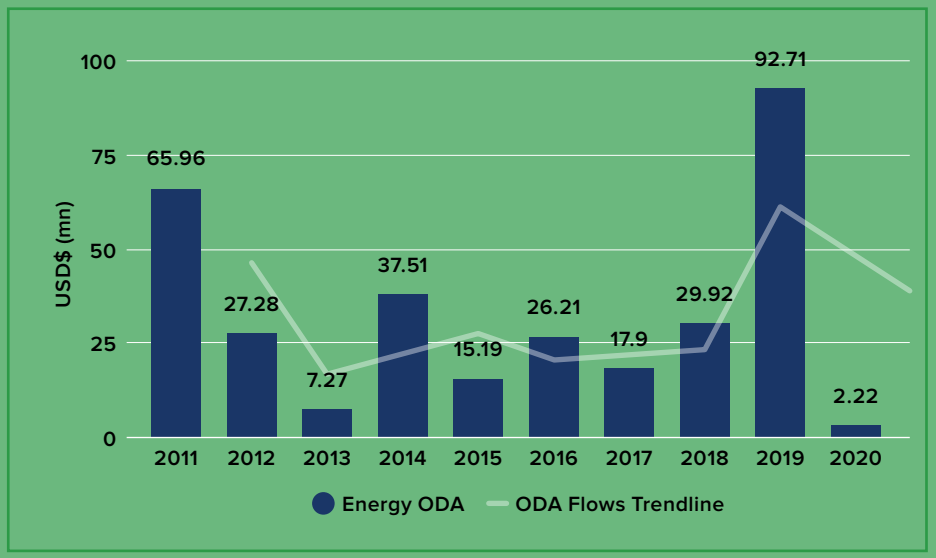



Figure 7: **Total ODA funding into the Rwandan energy sector (2011-2020)[54]**

## 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. On the other hand, the concentration of the total financial sector asset base in banking, as is the case in Rwanda, indicates that alternative financial sectors such as private equity, bonds and securities are still underdeveloped. This constrains the potential of DRE financial aggregation.**

Consistent with the size of its economy, Rwanda's financial sector is relatively small, worth RWF 8.9 trillion (approximately $8.2 billion) in 2022.[55] This suggests a small available domestic capital pool for financing aggregation facilities. In comparison, the financial sector asset base in Kenya was $70.4 billion as of July 2022.[56] The financial sector in Rwanda comprises 603 institutions regulated by the National Bank of Rwanda.[57] Compared to Rwanda, Uganda has 471 financial institutions regulated by the Bank of Uganda,[58] the Central Bank of Kenya regulates 2,289 financial institutions,[59] and the Bank of Tanzania 59.[60] Regionally, each partner country in the EAC regulates its own financial sector with some commercial banks functioning as regional commercial banks.[61] The volume of domestic capital is rising relative to GDP annually, suggesting the potential of increasing domestic capital participation in future financial aggregation deals.[62]

**The most pervasive structural challenges experienced by the financial sector include:**

- Low levels of income which adversely affect the level of domestic savings. Low savings are compounded by a low savings culture;
- Low access to financial services, in particular in rural areas;
- Low level of skills in the financial services sector.

### Banking

Despite accounting for only 16 of the 603 registered financial institutions, local banks held 67% of the total financial sector asset base by the end of June 2020 (see Figure 8).

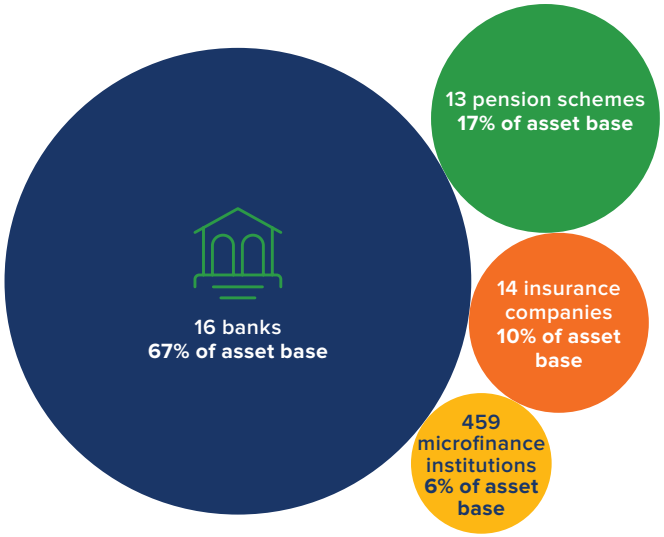



Figure 8: **Proportion of financial sector assets held by financial institution type[63]**

From 2021 to 2022 the value of assets grew across the banking, microfinance and insurance sectors. Banking sector assets grew by 18.8%, microfinance by 23% and insurance by 17%.[64] The banking sector is not only the largest by assets under management, but also a systemically important sector based on its interconnectedness with other sub-sectors. As of June 2020, 19% of pension schemes, 42% of insurance and 35% microfinance assets in Rwanda were held in banks (see Table 2).[65] The asset mix of the local financial market is largely composed of bank loans, as Table 2 indicates. Despite the dominance of the banking sector in terms of assets under management, more can be done to grow the retail section of banking – only 36% of Rwanda's adult population has access to banking services.[66]

## Private equity

Rwanda's private equity market is one the smallest in East Africa. As is the case in many other African markets, it is overshadowed by commercial banks. The sector is also under-researched, with limited data available on the status of deal volumes. Between 2017 and 2018, only 0.4% of private equity investments in East Africa were made in Rwanda.[67] In 2021, total deal volumes in the mergers and acquisitions sub-segment decreased from $131 million in 2018 to $5 million.[68] The country has also been omitted from the top ten most attractive African countries for private equity investment between 2022 and 2025 in the latest African Private Equity Industry Survey.[69] The underdeveloped nature of the private equity sector can in part be attributed to the small size of the Rwandan market. In order to expand Rwanda's private equity market, the East Africa Venture Capital Association (EAVCA) and Rwanda Finance Limited (RFL) have partnered together to enable private investment in Africa.[70] The partnership was formed in 2021 and aims to provide a platform for Rwanda to increase its attractiveness and competitiveness as a financial and business hub for private equity and venture capital activities. This will be achieved through the KIFC.

## Bond market

Bond issuances in Rwanda continue to be dominated by the government. A total of 28 domestic government bonds are listed on the Rwanda Stock Exchange (RSE) with a combined value of $300 million. The Rwandan government has also issued two 10-year sovereign Eurobonds. The first was issued in 2013 worth $400 million, and the second was issued in 2021 and is worth $620 million.[71] Proceeds from the new bond will partly be used to retire Rwanda's first Eurobond which is due in May 2023.[72] The country's first RWF-denominated bond was issued by the World Bank in 2020 to the equivalent of $40 million. The bond has been listed simultaneously on the London Stock Exchange and RSE.[73]

| TYPE OF ASSET | ASSET MIX BY FINANCIAL INSTITUTION | | | |
|---|---|---|---|---|
| | Banking | Pension schemes | Insurers | Microfinance |
| Placement in banks | n/a | 19% | 42% | 35% |
| Government securities | 18% | 20% | 19% | 2% |
| Investments in properties | n/a | 18% | 9% | 18% |
| Receivables | n/a | n/a | 11% | n/a |
| Loans | 57% | n/a | n/a | 52% |
| Tangibles | n/a | n/a | n/a | 9% |
| Placements in foreign financial institutions | 5% | n/a | n/a | n/a |
| Cash | n/a | n/a | n/a | 2% |
| Cash and reserves at Central Bank | 7% | n/a | n/a | n/a |
| Dues from financial institutions | 7% | n/a | n/a | n/a |
| Fixed assets | 4% | n/a | n/a | n/a |
| Other assets and securities | 2% | 14% | 7% | n/a |
| Equity investments | n/a | 32% | 12% | n/a |

Table 2: **Financial institution asset mix in Rwanda**[74]

As of December 2021, Rwanda only had one corporate bond listed on the RSE – issued by private energy investment company Energicotel. The capital raised from the first tranche of the bond is designated towards refinancing existing bank debt, investing into operational hydro power plants and to cover issuance costs. The bond is fully subscribed with a committed annual fixed interest rate of 13.5%.[75]

## Green bonds

Rwanda does not yet have any green bond guidelines in place, which is one of the main reasons why no explicit green bonds have been issued in Rwanda, except for the Energicotel corporate bond used to finance hydro projects.

Rwanda announced IREME Invest at COP27, in November 2022, an initiative by the Development Bank of Rwanda (BRD), the Rwanda Green Fund (FONERWA) and RFL. The facility will use several types of financing instruments and could in the future use a green bond as an additional capitalization source. It will use a blended finance approach and will offer grants, equity, loans and credit guarantees to commercially viable green projects. The facility is aiming for an initial capitalization of $110.5 million with investment expected to come from BRD, the European Investment Bank, the French Development Agency, the Government of Sweden, the Foreign, Commonwealth and Development Office of the UK Government, the Global Climate Partnership Fund and the Danish International Development Agency.[76]

## Asset-backed securitization

Securitization remains largely nascent in Rwanda. This is despite a law on asset-backed securitization that permits the use of these financial instruments (see section 2.5.2). No issuances have taken place, including both public and private placements. As of February 2022, only 22 companies were registered to conduct securities business. Of these 22, only three are registered to offer custodian/trustee services and only six are registered as fund managers/arrangers.[77] The RSE is also relatively small and young having only been launched in 2011. As of July 2022, there were ten listed companies with a market capitalization of $3.6 billion. A solar securitization instrument was developed by BRD in 2019, which is designed to pool solar loans from multiple companies intro tradable asset-backed securities (See Box 4 in section 4.3.2).

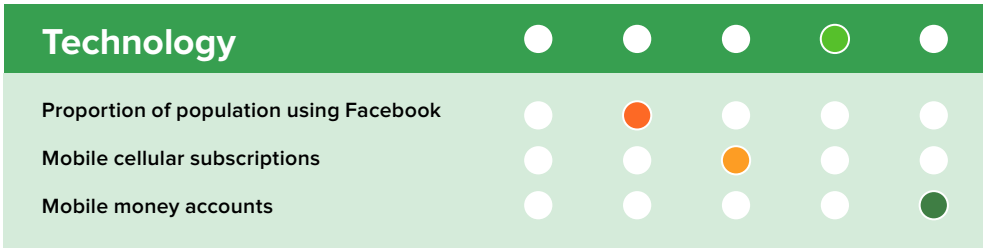
Photo: Adobe Stock/Thongsuk

## 2.4 Technological considerations

### 2.4.1 The mobile economy

**Mobile cellular subscriptions and mobile money accounts are the foundations of 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.**

**Rwanda's technological score on the CAP market assessment framework:**




Rwanda is home to the Kigali Innovation City, a growing tech hub developed by Africa50 in conjunction with the Rwanda Development Board (RDB).[78] The hub is home to Carnegie Mellon University Africa, large corporations, and technology companies. Its goal is to drive Rwanda's economic growth through digital transformation. The positioning of Rwanda as a tech hub creates an enabling business environment for companies to develop and operate tech-enabled financing and DRE businesses. Additionally, Rwanda is set to host Timbuktoo, the headquarters of the UNDP's new innovation financing hub, aimed at investing a total of $1 billion to support African start-up companies across the continent.[79]

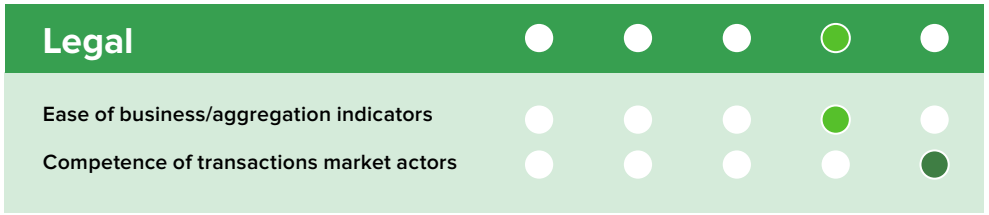
High quality mobile networks are enabling a growing share of Rwanda's population to access a host of bolt-on services such as financial- and energy services. At the start of 2018, Rwanda had the highest 4G coverage in sub-Saharan Africa and achieved 4G mobile coverage for more than 90% of the country.[80] Mobile cellular subscriptions have grown at an annual rate of approximately 31%, equating to 81 subscriptions for every 100 people in 2021.[81] This is slightly lower than the sub-Saharan African average of 93 subscriptions per 100 people. At the start of 2022, there were 3.5 million internet users in Rwanda, a 3.7% increase between 2021 and 2022.[82]

Mobile money fills a large gap in access to financial services for the Rwandan population, particularly for the rural population. In 2021, there were 1,904 registered mobile money accounts per 1,000 adults, which is more than double the global average of 924 accounts.[83] The value of the country's mobile money market is however relatively small, having reached a total transaction value of $96.6 million in 2021.[84] By contrast, in the same year, the total value of transactions in Uganda amounted to $36.7 billion,[85] and $118.5 billion in Kenya.[86] 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.[ix]

## 2.5 Legal considerations

**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.**

**Rwanda's legal score on the CAP market assessment framework:**




Rwanda has a joint legal system based on French/Belgian civil and customary law, and a gradual introduction of the Anglo-Saxon common law system.[87] There is generally no requirement for local shareholding, with the exception of specified industries such as mining.

*ix 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.*

## 2.5.1 Ease of doing business

Overall, Rwanda has one of the most attractive business climates on the continent, considered to be the fourth best African investment destination in 2021.[88] All investors or multinational companies wishing to open business in Rwanda need to adhere to the following processes regarding applications for licences and registrations:

- Foreign companies looking to operate a business in Rwanda are governed by the Investment Law which does not necessitate that investors register their investment with the RDB, nor to obtain an investment registration certificate. Registration is however required to benefit from incentives available to priority sectors;
- Industry-specific licences may also be required;
- The RDB operates a one-stop shop for business registration and investors can apply for company incorporation and obtain a tax identification number with the RDB;
- A private company must have at least one director who is a resident of Rwanda, but does not need to be a Rwandan citizen;
- Permanent establishments of foreign companies are subject to corporate income tax at a rate of 30%. All taxpayers must register with the RRA;
- Every company must register for a trading licence.

## 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 the structuring and closing of transactions. Securitization transactions, especially off-balance sheet ones, are unlikely to take place in markets where governments do not provide clear regulatory guidance.**

Rwanda maintains a strong rule of law and investment friendly legislation which are beneficial for DRE investments and domiciling financial aggregation instruments. Securitization in Rwanda is regulated under Regulation Nr. 16 on Asset Backed Securities of the Capital Markets Authority of Rwanda. The market for asset-backed securities in Rwanda is still nascent and as such these regulations have not yet been extensively tested. The regulations are specifically targeted at public issuances of asset-backed securities with no specific mention of private placements. SPVs can be created as limited liability companies or trusts. Originators are allowed to own up to 10% of the value of assets held by the SPV.

| TRANSACTION | TAX IMPLICATION |
|---|---|
| **Transfer of assets from originators to SPVs** | No pass-through treatment. Capital gains tax is applied on the originator if profits are realized in a true sale transaction.[x] |
| | No stamp duty applicable |
| **Interest payments from SPVs to investors** | 0% withholding tax (for holders of KIFC investment certificates). Non-holders are liable for the standard 15%. |
| **SPV corporate tax** | 3% preferential tax rate (for holders of KIFC investment certificates). |

Table 3: **Asset-backed securitization tax treatment in Rwanda**[91]

### Securitization tax legislation in Rwanda

**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.**

Securitization transactions by law do not benefit from any notable tax incentives in Rwanda. Holders of KIFC investment certificates do however benefit from a wide range of investment incentives. These are noted in table 3, which outlines tax treatment of securitization transactions in Rwanda.

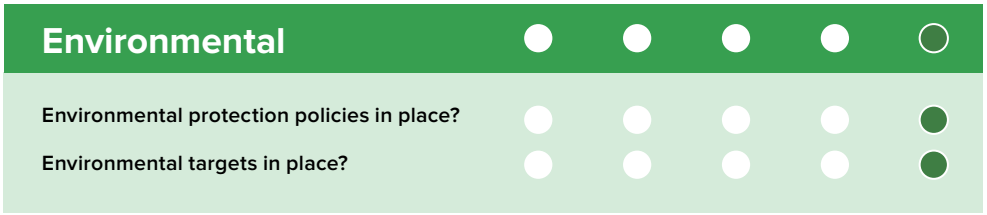
KIFC membership annual fees are $2,500 and processing of applications takes approximately two to three days. To benefit from KIFC tax incentives, a creator of an SPV in Rwanda must be an existing locally registered company with at least two resident directors.[89] The SPV must hold the assets for at least two years and the value of assets issued from within Rwanda should be at least $1 million.[90]

*x Profits are typically not generated on transfers from originators to SPVs. SPVs are thus unlikely to be liable for capital gains tax in reality.*

## 2.6 Environmental considerations

**An overall progressive stance towards climate change mitigation in a country bodes well for the development of low-carbon industries as it is likely that support initiatives for such technologies will be in place. It follows that countries that have supportive environments for low-carbon technologies in place are preferred destinations for DRE financial aggregation facilities.**

### Rwanda's environmental score on the CAP market assessment framework:




Rwanda's carbon emissions are comparatively low, amounting to 0.64 tonnes of CO2e per capita compared to, for example, 9.53 tonnes per capita in Belgium or 17.74 in the United States.[92] The government's focus on low-carbon development makes the country a favourable location for low-carbon assets. At present, Rwanda's emissions are largely driven by the agriculture and energy sectors, with future growth expected from services (especially tourism) and transportation.[93] Rwanda is considered to be vulnerable to climate change, ranking 124 out of 182 in the 2020 ND-GAIN Index.[94]

### 2.6.1 National climate targets

In May 2020, Rwanda became the first African country to submit an updated Nationally Determined Contribution (NDC). Rwanda's mitigation contribution is comprised of two components:

i. **Unconditional contribution:** A reduction of 16% relative to the business-as-usual in the year 2030;
ii. **Conditional contribution:** An additional reduction of 22% relative to the business-as-usual achieved based on the provision of international support and funding.

The mitigation and resilience interventions outlined in the NDC are estimated to cost $11 billion, 60% of which would need to come from international sources.[95] This would require a significant scale up in climate change related funding, as the country has only received a total of $1.2 billion in development finance targeting climate change from 2002 to 2019.[96] International climate finance from funders such as the Green Climate Fund and the Global Environment Facility will likely be a key source of funding and financial aggregation could serve as a vehicle through which this funding is secured. This would require quantifying, reporting and monetising positive environmental impacts of low-carbon energy, for example carbon emissions avoided. Renewable energy certificates such as those developed by the D-REC Initiative and others could also be key in channelling climate finance to Rwanda.[97]

### 2.6.2 Environmental protection policies and targets

Following the Rwanda Green Growth and Climate Resilience Strategy of 2011, the country has sought to realign public finance towards a low-carbon development pathway. This is exemplified through the creation of FONERWA and Ireme Invest. In parallel, the government is considering carbon taxes as a solution to reduce emissions in the transport, energy and housing sectors. This will complement fiscal incentives to replace the country's fleet of ageing cars with electric vehicles (EVs) as well as tax exemptions for renewable energy technologies. Large scale power projects (e.g. medium- and high-voltage power lines and hydro dams) are legally required to conduct environmental impact assessments as required by the Ministerial Order Nr. 001/2019.[98] With respect to the local carbon market, Rwanda is a member of the Vulnerable 20 (V20) Group, which is committed to introducing domestic carbon pricing by 2025.

Despite notable progress being made, the government still has key policies that are misaligned with the goals of the Paris Agreement. These include:

- Continued investments and reliance on peat and methane sources for electricity generation;
- Oil and gas exploration in Lake Kivu;
- Fossil fuel subsidies of approximately $40 million per year (to protect the energy and transportation sectors from fluctuations in international crude oil prices).[99]

# 3 Energy sector snapshot

Photo: UNDP Rwanda

The energy sector has been a key focus area for the Rwandan government over the past decade. The country has a total installed capacity of 276 MW as of June 2022,[100] signifying a near-tripling of capacity in the span of twelve years from 100 MW in 2010.[101] Its National Energy Policy of 2015 is pro-renewable energy, explicitly seeking to "increase the share of renewable energy by exploiting indigenous resources."

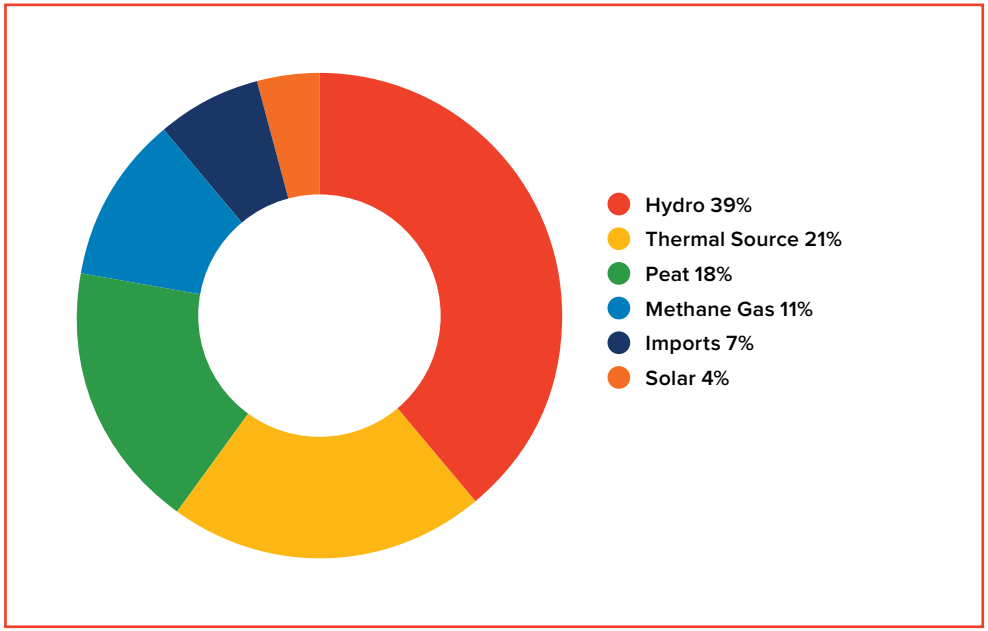



Figure 9: **Rwanda's energy mix in 2022**[102]

By the end of 2022, 77% of the Rwandan population was estimated to be electrified, 26% through off-grid technologies.[103] This represents impressive progress over the last decade – only 17.8% of the population was electrified in 2012.[104] Female-headed households are estimated to have lower access rates for both grid and off-grid electricity: 21.1% of female-headed households have access to electricity, compared with 31.2% of male-headed households.[105]

The government of Rwanda is aiming for universal energy access by 2024, with latest planning indicating 10% off-grid coverage and 90% grid extension coverage. In the National Electrification Plan (NEP) updated in 2021, there was a revision upwards of the number of communities set to be electrified through grid extension relative to off-grid solar and mini-grids. The percentage split by technology is summarized in Figure 10. Of the grid extension portion, 1016 (6.9%) villages which are yet to secure funding will be temporarily connected through standalone solar home systems.[106]

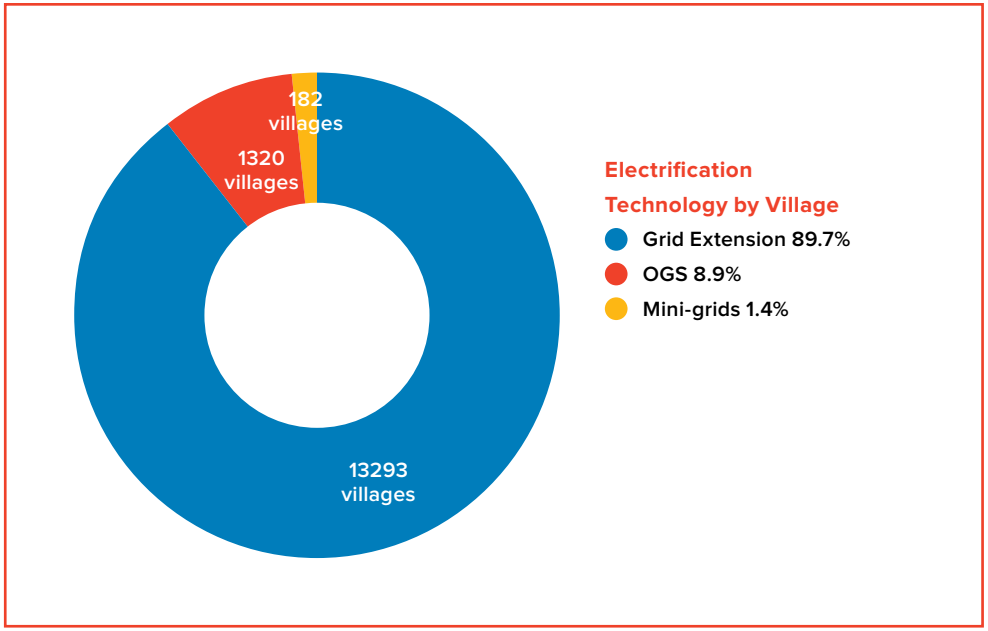



Figure 10: **2021 revision of the NEP**[107]

*xi Details of the existing legal framework of the Rwandan energy sector can be accessed at: Rwanda Utilities Regulatory Authority, Energy, 2022 (link)*

*xii This is a reduction in the allocation to off-grid and mini-grid technologies from 30% of all connections in the 2018 NEP. Stakeholders note that there is room for a larger allocation if the off-grid sector meets its targets without delay. Another reason for possible expansion of the off-grid portion is the potential difficulty in securing funding for 90% grid-based electrification.*

# 4 Status of DRE sectors



Photo: UNDP Rwanda

**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 in terms of PAYGO operations, data management, fundraising experience, and financial reporting.**

## 4.1 Key takeaways across DRE sectors

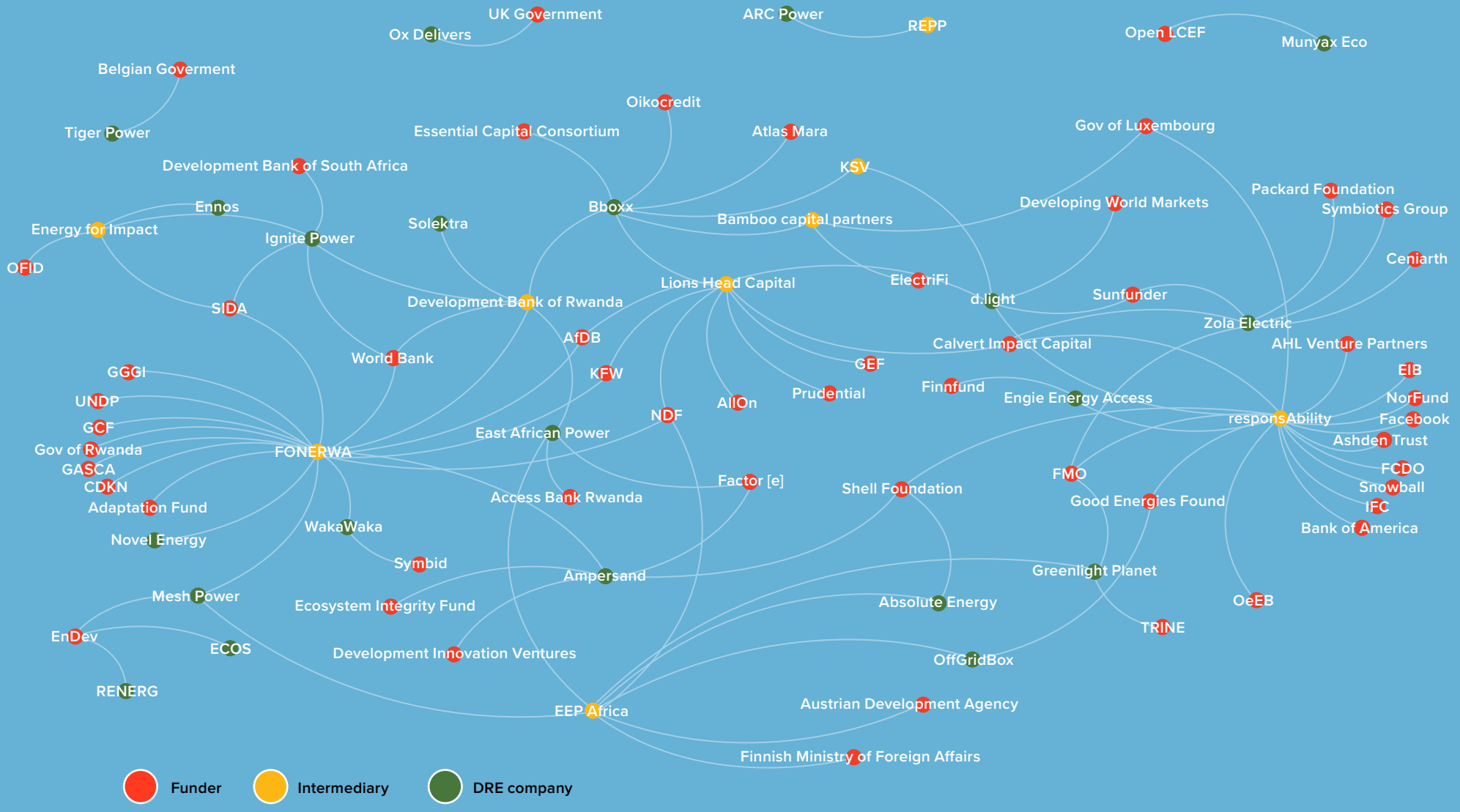
**Investment into the small-scale DRE sector in Rwanda is highly concentrated in a few large, established multinational OGS companies.** This is true in terms of both the number and size of transactions. This is likely due to these companies' proven track records and their ability to raise follow-on 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. Figure 11 below presents the main funding flows to DRE companies in Rwanda. The map shows that a handful of companies – Bboxx, Zola Electric, Ignite Power, Ampersand and Greenlight Planet – have been able to raise funds from a variety of funders and are thus adept at fundraising. The map also indicates that the majority of funders remain concessional. Participation from local banks in the DRE landscape has been limited. I&M Bank and KCB Bank have both lent directly to multinational OGS companies and also participated in on-lending arrangements as part of window 2 of the BRD Rwanda Renewable Energy Fund.[108] No funding has been disbursed by commercial banks to companies operating in other DRE sectors.

> *"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**

Photo: UNDP Rwanda

Figure 11:

## Funding flows to DRE companies in Rwanda[109]



**There are no examples of financial aggregation in the DRE sector in Rwanda** despite the government's efforts to create an enabling environment for the development and domicile of asset-backed securities.

**No DRE company outside the OGS sector identified in this research has managed to close a transaction with a value of more than $3 million, with the notable exception of EV start-ups Ampersand and OX Delivers.** This is a far cry from the much larger typical transaction values of multinational OGS companies that reach values of more than $30 million, as Figure 12 shows.[xiii]

**Barring a handful of OGS multinationals, deal sizes that DRE companies can absorb are too small to be appealing for the average DRE investor.** Minimum deal sizes vary between DRE sub-sectors, but averages reported by investors range from $1 million to $10 million depending on the type of capital deployed and the investment thesis of the investor.[110] Investors tend to be more comfortable with levels around $25 million, while real interest is generated at ticket levels exceeding $50 million. Pipelines that meet ticket sizes above $50 million are hard to come by. The seemingly high minimum ticket sizes are, 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. Similarly, larger transaction values reduce the relative cost of due diligence and other transaction costs.

Figure 13 presents average DRE deal sizes according to investment type. Blended deals (any combination of debt, equity and/or grants) make up the largest deals, compared to any of these investment types alone. The most common type of blended deal identified in Rwanda is a combination of debt and grants. This points to the prevalent use of grants to improve the viability of DRE transactions.

**Rwandan bank loans denominated in RWF to DRE companies tend to be quoted at annual interest rates of 17-20% (USD denominated loans at 6-10%) with a 24-month loan term and high collateral requirements.[111,112]** High interest rates and short loan terms are generally incompatible with the needs of many DRE business models. This has forced many businesses to raise capital abroad and take on exchange rate risk. This is especially true for the more mature solar home system (SHS) companies, who are able to access foreign capital markets more easily than their domestic counterparts.

*xiii OGS companies that also operate in the captive power market tend to attain larger deal sizes than those that only operate in the OGS market.*

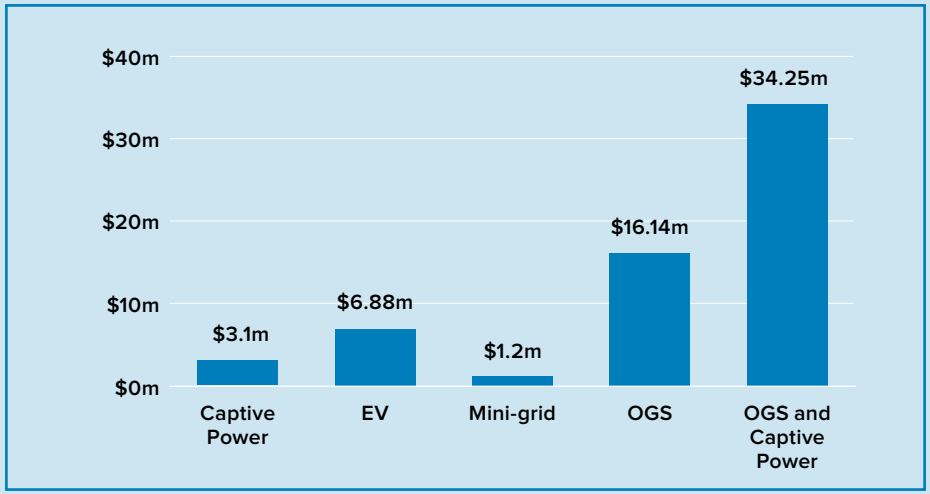



Figure 12: **Average deal size in Rwanda per sub-sector type[113,xiv]**

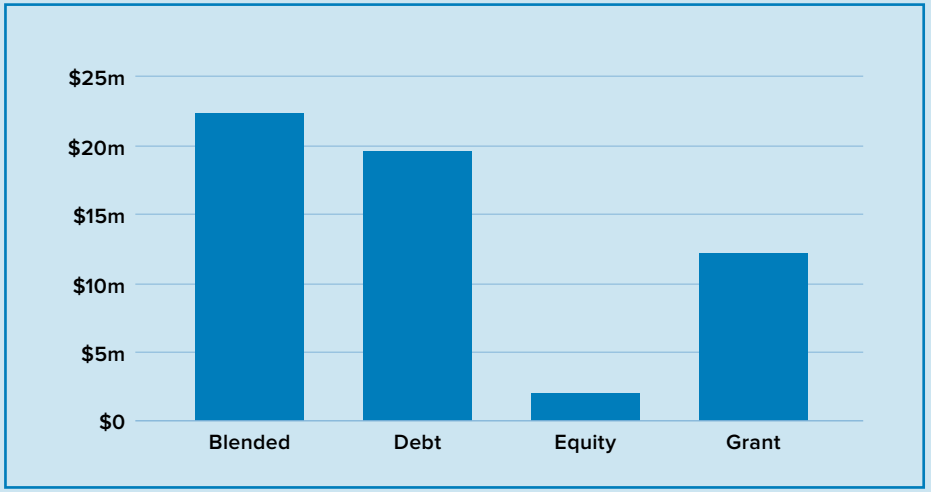



Figure 13: **Average deal size as per capital type[xv]**

*xiv Data is more representative of deals involving multinationals, due to the paucity of data on local companies*
*xv Blended is defined here as any combination of debt, equity and/or grants*

Box 1:
## DRE support programmes in Rwanda

There is a great deal of domestic public sector finance earmarked for the DRE sector. Rwanda is home to **FONERWA**, Africa's first Green Fund established in 2012. Alongside FONERWA, as part of **BRD's** latest strategic plan (2018–2024), BRD supports the energy sector through the following:

- $40 million guarantee scheme instituted in partnership with the Swedish International Development Cooperation Agency (SIDA) to de-risk investments into the sector;

- $49 million **Renewable Energy Fund (REF)** to:
  - Provide direct loans to OGS and mini-grid companies;
  - Provide lending to commercial banks to on-lend to OGS and mini-grid companies;
  - Provide lines of credit to selected private financial institutions, who in turn provide rural households with affordable loans to purchase off-grid systems.

- $110.5 million **Ireme Invest** facility in partnership with FONERWA with the goal of availing green finance for the private sector. The facility will raise a blend of public and private finance and will employ a range of grants, credit guarantees and debt. It will have two windows:[114]
  - Project preparatory facility housed under FONERWA which will offer grants and equity investments to early-stage companies;
  - Credit facility housed under BRD, which will offer debt and guarantees.

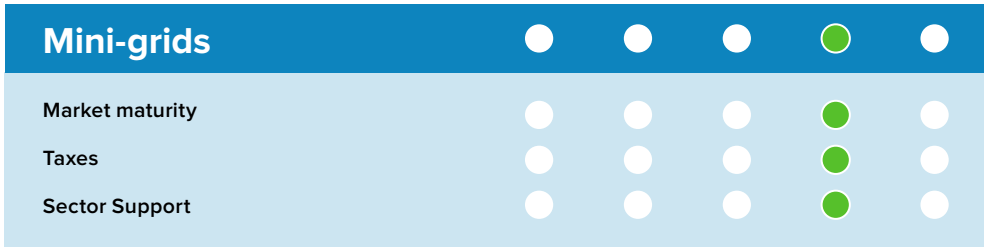
The country also boasts the **Rwanda Universal Energy Access Program**, a $670 million multi-donor energy sector investment facility to support the country's on-grid and off-grid energy access goals outlined in the National Strategy for Transformation (2017-2024).[115] The programme aims to:

- Increase grid access;
- Improve operational efficiency and reliability of the grid;
- Support private investment in access to off-grid electricity and in the promotion of sustainable cooking methods;
- Increase institutional capacity.[116]





# 4.2 Mini-grids




## 4.2.1 Overview

By November 2021, about 6,500 households were connected to mini-grids in Rwanda.[117] 14 companies operating in the mini-grid sub-sector were identified in Rwanda through this assessment. Most of these companies currently operate only a single site in the country and some are still planning to develop their first sites. Exceptions are MeshPower and ARC Power, who collectively operate the majority of sites in the country. Developers in Rwanda typically employ relatively proven PAYGO business models with standardized tariff setting methodologies.[118] The sector is governed by the 2019 Rwanda Utilities Regulatory Authority (RURA) Guidelines on Minimum Technical Requirements for Mini-Grids and RURA Regulations Governing the Simplified Electricity Licensing Framework for Rural Electrification.[119,120] RURA, in 2020, also published a draft tariff methodology for isolated mini-grids and the Ministry of Infrastructure has Ministerial Guidelines on Mini-grid Development in place.[121,122]

The government, in its updated NDC, plans for 68 MWp of solar mini-grids to be installed by 2030, requiring investments of approximately $206 million.[123] Stakeholders interviewed however indicate that mini-grids will likely play a much smaller role in Rwanda's electrification efforts than what is indicated in this target. The country is small, with a high population density, which means that most villages that would have been electrified through mini-grids will likely be electrified by the grid. The mini-grid market is therefore only left with a limited number of viable sites far away from the grid. A total of 111 mini-grids are in the pipeline[124] and the 2021 NEP plans for a total of 182 villages to be electrified with mini-grids by 2024.[125] With an estimated 84 projects already under operation,[126] capacity for only 98 additional projects remains. The average installed capacity of the existing 84 projects is estimated to be fairly small, given that the total installed capacity of mini-grids in Rwanda amounted to only 463 kW in 2021.[127] The relatively small pipeline presents a challenge for scaling the mini-grid sector and subsequently for financial aggregation.

### 4.2.2 Investment trends and financing needs

Mini-grids in Rwanda have been struggling to attract capital, in particular commercial debt. This is likely a consequence of the limited role that mini-grids will play in Rwanda's electrification efforts over the medium and long term as well as concerns over the commercial viability of mini-grids within the country. For example, one of the five funding windows of the Rwanda Renewable Energy Fund, funded by the World Bank and managed by BRD, is intended to provide debt to mini-grid developers but none of the committed funds have been disbursed by 2023, due to concerns about the ability of companies to repay their debt.[128]

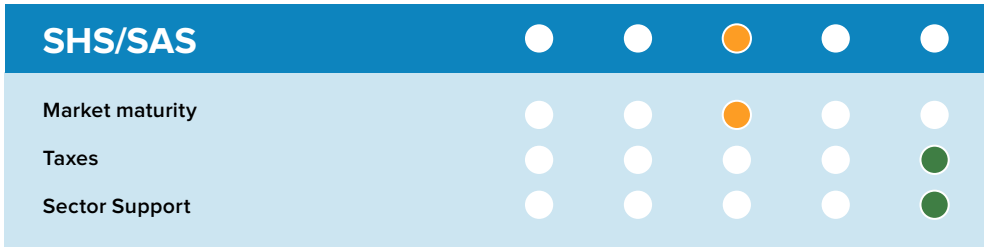
There are no noted examples of local capital investments into the mini-grid sector in Rwanda, nor are there any examples of financial aggregation. Because of the prevailing funding conditions in Rwanda, grants and concessionary capital have been key funding sources for mini-grid developers. To cover funding shortfalls, developers continue to source grant funding covering approximately 40-70% of upfront capital expenditure.[129] This is likely to continue in the near to medium term.

Box 2:

**ARC Power funding success in a difficult market**

ARC Power secured two convertible loans in 2019 and 2020 totalling £900,000 from the Renewable Energy Performance Platform (REPP) managed by Camco Clean Energy – a notable exception to the lack of mini-grid funding in Rwanda. The funding was matched by private Swedish impact investors.[130] REPP's financial support enabled ARC Power to complete four generation systems supplying power to six distribution systems. By the end of 2022, these mini-grids supplied electricity to 14 villages. Following the two convertible loans, REPP took an equity stake in ARC Power through a partial equity conversion.[131]

## 4.3 SHS and standalone solar productive use




### 4.3.1 Overview

21 companies operating in the SHS and standalone solar productive use sub-sector were identified in Rwanda through this assessment. By the end of 2021, about 500,000 households across the country had access to electricity through SHSs.[132] According to Global Off-Grid Lighting Association (GOGLA) data, sales were surprisingly unaffected by the COVID pandemic. Sales have been increasing throughout the pandemic, from 153,000 in 2020 to 236,600 in 2021. Total sales in 2020 also increased compared to 2019 and 2018 numbers as Figure 14 shows. However, the market share of PAYGO, a key enabler of financial aggregation, has been decreasing in relative terms since 2018 in favour of direct sales. In 2020, PAYGO sales accounted for only 32% of total sales, down from 68% of total sales in 2019, and 75% of total sales in 2018.[xvi] It is hypothesized that the share of PAYGO is in reality lower than these figures, as the majority of non-affiliated sales are likely outright purchases. The introduction of end-user subsidies under window 5 of the Renewable Energy Fund is likely to have played a role in the decline of PAYGO sales. The subsidy reduces the upfront price of products sold outright, which increases the attractiveness of this payment model among consumers. See Box 3 for more details about the Renewable Energy Fund.

*xvi GOGLA did not report data on PAYGO sales for 2021 and 2022.*

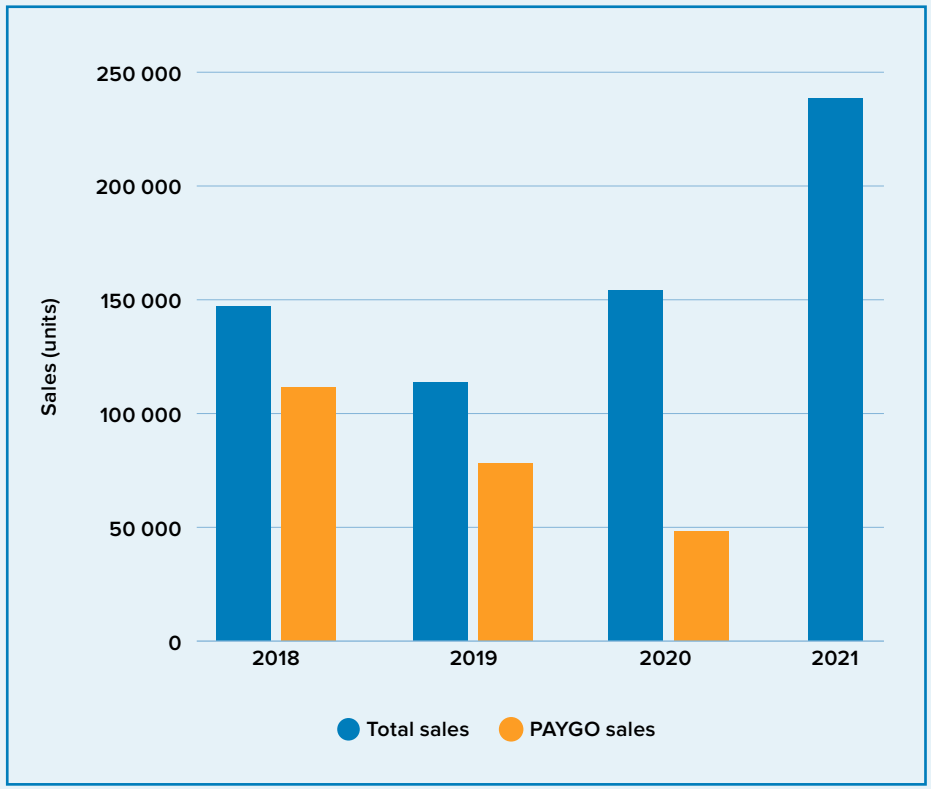



Figure 14: **GOGLA-affiliated PAYGO sales relative to total sales**[133,134,135,136,137,138,139,140]

As is the case in other countries, OGS systems enjoy relatively light regulation compared to other DRE sub-sectors. OGS systems in Rwanda are governed by the MININFRA Ministerial Guidelines on Minimum Standards Requirements for Solar Home Systems of 2022.[141] As per the revised NEP, the SHS sector is projected to account for 8.9% of the yet-to-be electrified population (1,320 villages). In addition, SHS will be used to temporarily power 6.9% of villages earmarked for grid extension but are yet to secure funding under the NEP (1,016 villages).[142] The relatively small market allocated to SHS presents a challenge for scaling the sub-sector and subsequently for financial aggregation in the country.

> *"What happens after 2024 when universal access is reached nobody knows. There could be a second round where people with tier 1 systems are upgraded to tier 2 through a subsidy but that remains to be seen."*
> **– Arthur Houston, Ignite Power**

## 4.3.2 Investment trends and financing needs

Investment into the OGS sector has a good track record compared to other DRE technologies. Public, private and developmental funders all have made significant investments into the sector. OGS multinationals with a presence in Rwanda had an average transaction value of more than $20 million. Whilst it is not clear how much of the capital raised is allocated to Rwanda, as capital is often raised at a holding company level, it is clear that these multinationals have the pipeline and capacity to absorb relatively large sums of capital which is valuable when considering financial aggregation.

Whilst some of the capital is concessional, OGS multinationals differ from other DRE sectors in their ability to raise debt internationally at scale. 20 transactions of more than $2 million have been identified. These transactions are typically led by DFIs (with concessional debt) alongside commercial sources of debt. There have however been some limited cases of local capital transactions through BRD and leading commercial banks KCB Bank Rwanda (formerly Banque Populaire du Rwanda) and I&M Bank. These transactions are often conducted with support from de-risking initiatives of development organizations.[xvii] Despite the limited number of transactions, there does seem to be a willingness and ability among local financial institutions to participate.

*xvii GET.invest and the GIZ Financial Systems Development Cluster is collaborating with Rwandan financiers to increase investment into decentralized renewable energy projects through local currency financing. The project started in June 2021 with a roundtable organized in collaboration with the Rwanda Bankers' Association, attended by over 40 participants from 17 banks.*

Box 3:

## The Rwanda Renewable Energy Fund: A key support mechanism for the OGS sector

The OGS sector received concessional support through Window 4 of the Renewable Energy Fund Project administered by BRD which provided a direct low interest loan facility to locally registered OGS companies.[xvii] This window provides direct financing to qualifying locally registered OGS companies supporting Tier 1 or higher solar systems or locally registered companies serving poor households under the Government's programs.[143]

Window 2 of the programme, now open, lends to commercial banks, who in turn on-lend to companies. Window 5 of the programme is a $30 million results-based financing facility, which facilitates the sale of Tier 1 and above solar home systems and the provision of after sale services to qualifying households.[144] The partial grant is being provided to companies to lower the upfront cost of the system for end-users.[145]

> *"Rwanda has ambitious targets for off-grid electrification, which would not be achievable without tackling affordability. To address this issue, the Government of Rwanda launched a $30 million results-based financing subsidy programme as the 5th Window of the REF. This programme will support private sector to accelerate sales of SHS and substantially increase access to electricity for off-grid households."*
> **– Lawrence Lin, Power Africa Off-grid Project**

*xviii Investees in Rwanda include Ignite, Bboxx and Solektra.*

Research indicates that SHS businesses that have diversified their businesses beyond SHS to include productive uses of energy, consumer products, and captive power, are able to raise more capital on average. This suggests investor preference for diversified income streams and off-takers. The productive use sector in Rwanda is nascent but growing, with solar irrigation particularly receiving increased attention among service providers, government and donors. Companies such as Ignite Power and Bboxx have expanded into offering solar irrigation systems, while others such as Futurepump and Offgridbox specialize in this market. Ignite Power has also expanded its market further to include PAYGO mobile phones. Solar irrigation subsidies have been disbursed by the Rwanda Agricultural Board Small Scale Irrigation Technology programme and the Energy 4 Impact Solar Irrigation in Rwanda Fund. Other productive uses are less developed than solar irrigation.

Diversification into parallel markets brings scale and a diverse set of customer types, some of which exhibit higher ability to pay for energy services. This trend may prove advantageous when creating robust, diversified asset-backed securities.

Box 4:

## Solar securitization concept developed by BRD

The Solar Securitization Instrument was developed by BRD in 2019 and is designed to pool SHS loans from multiple solar companies into tradable asset-backed securities to provide companies with access to more capital. This increases the company's ability to leverage and allows for faster expansion of the solar market. The proposed initial offering has a total targeted value of $9 million and is designed to be completely off-balance sheet. BRD, with assistance from Access to Finance Rwanda, designed the legal structure, created an SPV and designed underwriting and credit rating mechanisms.[146] The capital stack consists of senior debt and subordinated debt. Targeted investors include DFIs, commercial investors and retail investors. No issuances of asset-backed securities have been made with this instrument, although BRD did finance the receivables of two solar companies as part of a separate programme.[147]

## 4.4 Captive power

| Captive Power | | | | | |
|---|---|---|---|---|---|
| Market maturity | ○ | ○ | ● | ○ | ○ |
| Taxes | ○ | ○ | ○ | ● | ○ |
| Sector Support | ○ | ○ | ● | ○ | ○ |

### 4.4.1 Overview

23 captive power companies were identified in Rwanda through this assessment. As of January 2023, the total installed capacity of solar installations for C&I facilities stood at 5.7 MW.[148] Despite the relatively large number of players in this sub-sector, little is known about projects built to date and all stakeholders surveyed indicated that the sector has not received the attention it deserves. Reasons include:

- The government is hesitant to open up significant generation capacity for the private sector;[149]
- C&I demand for energy is still comparatively low with the residential sector accounting for 80% of final energy demand, transport 9% and industry representing only 9%;[150]
- National grid reliability has improved over the past five years, which reduces the pressure on C&I facilities to secure energy supply with their own systems;[151]
- Grid feed-in limitations for captive power users.

As a result of Rwanda's relatively reliable grid supply, the country's captive power market is driven primarily by businesses seeking to reduce electricity costs. Rwandan electricity tariffs are among the highest in the region (see Figure 15). Tariffs for non-industrial customers (i.e. commercial and residential customers) are on average $0.18/kWh compared to the regional average of $0.14/kWh as indicated by Figure 15. Many customers in Rwanda however pay much more than the average tariff – residential and commercial customers alike pay up to $0.24/kWh. Industrial customers have a lower energy charge but are liable for a maximum demand charge of $4.50/kVA on average, and a customer service charge of $9.70 per month.[152]

Grid-connected captive power systems in Rwanda, when designed with an optimal balance between grid electricity and embedded generation, can significantly reduce the cost of electricity for end-users. Grid-connected solar and storage systems in Rwanda have an estimated levelized cost of electricity of $0.06/kWh to $0.14/kWh.[153,154] This compares favourably with the high grid tariffs in Rwanda outlined above and in Figure 15.

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 of these business models are used in Rwanda is unclear. The share of PAYGO and PPA business models in Uganda is reported to be 62% and 35% in Kenya.[155,156] The share of PAYGO and PPA business models in Rwanda could be similar to these figures.

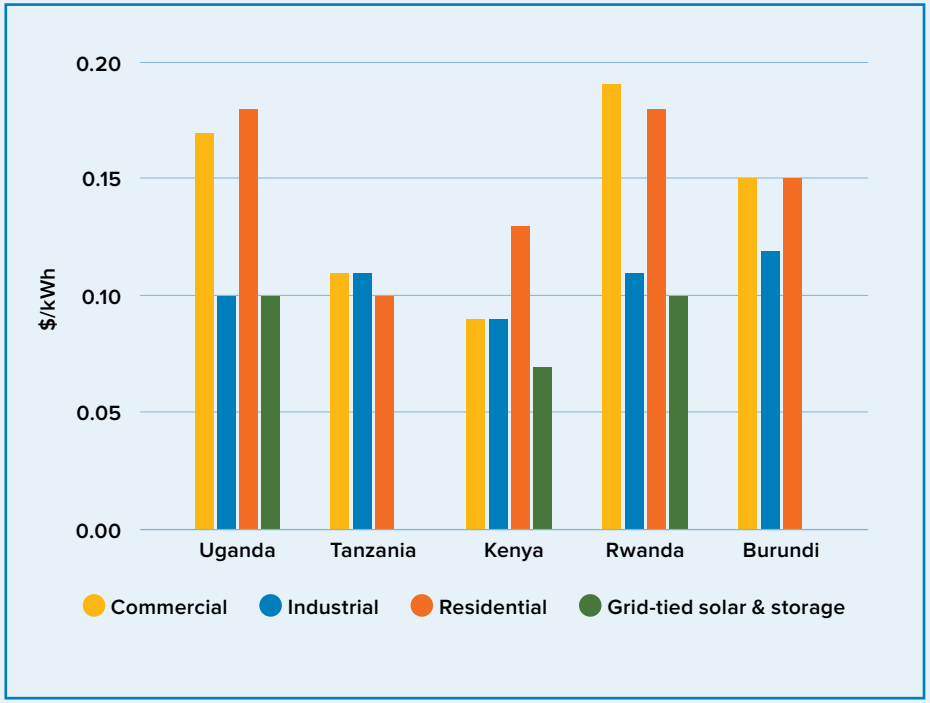



**Figure 15: Rwandan grid tariffs compared to tariffs in the region and captive power LCOE in Rwanda**[157,158,159,160,161]

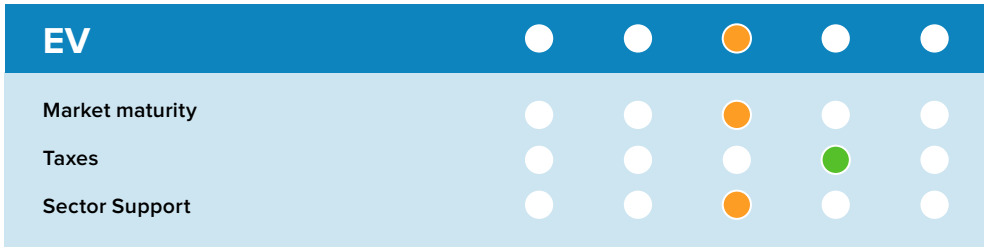
There are no regulations specifically targeting captive power systems through arrangements such as net metering. However, various general regulatory documents indirectly apply to captive power systems, including the RURA Electricity Licensing Regulations of 2013, the RURA Electricity Safety Regulations of 2013 and RURA Regulations Governing Electricity Quality of Service.[162,163,164]

### 4.4.2 Investment trends and financing needs

The average value of identified transactions in the captive power sector is notably smaller than that of the OGS sector. This is because the average deal size that captive power companies can currently absorb is relatively small. Companies in Kenya, for example, typically do not have working capital needs exceeding $1 million,[165] and it is highly likely that the same applies to Rwandan companies. Investors generally avoid funding small capital needs as due diligence costs tend to be fixed, irrespective of potential returns involved, and are therefore high relative to the total deal size. 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 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.

As Figure 12 shows, deals involving companies that have diversified operations across the captive power and OGS sectors tend to be larger than those targeted at companies who only operate in captive power. Examples of diversified companies include Ignite Power, Zola Electric and Munyax Eco. This points to a need to diversify product offerings in order to grow and be competitive in the Rwandan market. Consistent with trends in other sub-sectors, investments also tend to flow more towards multinationals. Munyax Eco stands out as one locally owned captive power business that has managed to raise equity in a transaction led by Open LCEF.

## 4.5 Electric vehicles




### 4.5.1 Overview

The EV sector in Rwanda and across Africa at large is going through its financial and business innovation phase – different business models are being trialled across a diverse range of commercial structures. The Rwandan EV industry is still small with only seven operational companies identified. Despite its nascency, the EV sector holds considerable potential. In Rwanda and Africa at large, micro-mobility (consisting of e-scooters, e-motorcycles, e-bicycles and e-tuktuks) is the largest EV segment. There are an estimated 100,000 petrol-powered motorcycle taxis in Rwanda,[166] which signifies a large addressable market for converting petrol engines to electric, as well as replacing them with new electric-powered motorcycles. 60% to 75% of two-wheeler motorcycles in Rwanda are projected to be electric by 2040.[167]

> *"We currently have over 700 bikes on the road and 11 swap stations in Kigali. Our target is to reach over 2,500 bikes in Kigali by 2024."*
> **– Andy Williams, Ampersand**

The Rwandan government is largely supportive of EVs. It is aiming for 20% penetration of electric buses (of all buses) by 2030.[168] It highlights the importance of electric mobility in its 2021 Investment Promotion and Facilitation Law and approved an e-mobility adaptation strategy in 2021 to foster the scale up of electric mobility. The strategy includes a host of incentives, including the following:[169,170]

- A reduced 15% preferential corporate income tax rate for foreign private companies dealing in e-mobility;
- Reduced electricity tariffs for EV charging (approximately $0.09/kWh);
- Rent-free land for the installation of charging stations;
- Exemption of import and excise duties on EVs, spare parts, batteries and charging infrastructure;
- Zero-rating of EVs, spare parts, batteries and charging station equipment.

> *"We started operations in Rwanda specifically because the ease of doing business is very high."*
> **– Colin Tebbett, OX Delivers**

To further support the transition towards EVs, the RRA implemented a new tax methodology that revises the depreciation threshold upwards to 80% for imported cars that are ten years and older (between the date of manufacturing and date of sale). This move is set to increase the cost of used cars and limit the purchase of polluting older models.

Table 4 shows the variety of EV uses and business models employed in Rwanda and across Africa more generally – 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.

| USE \ 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

## 4.5.2 Investment trends and financing needs

Investment in the EV sector is still nascent. A handful of equity and grant investments have been made by venture capital investors and DFIs. The typical ticket size for investments identified in Rwanda is fairly large with an average transaction value of $6 million. This speaks to the capital intensity of the sector and is a positive signal for its future financial aggregation potential. The bulk of the investment into the sector has mainly been attracted by Ampersand and OX Delivers. Ampersand is the only company identified that has managed to secure debt at scale to date. While the initial equity and grant investments are encouraging, it remains to be seen whether debt will become readily available to support the scaling of the industry. Debt will be extremely important for the growth of this capital-intensive sector.

To activate the market for larger electric vehicle models (2/4 door passenger cars), significant investment into charging infrastructure is required. According to Rwanda's updated NDC, the country needs $900 million in charging infrastructure investments. This infrastructure will be an important precursor to wider adoption of these larger models.

Box 5:

### Ampersand: A shining light in the Rwandan EV sector

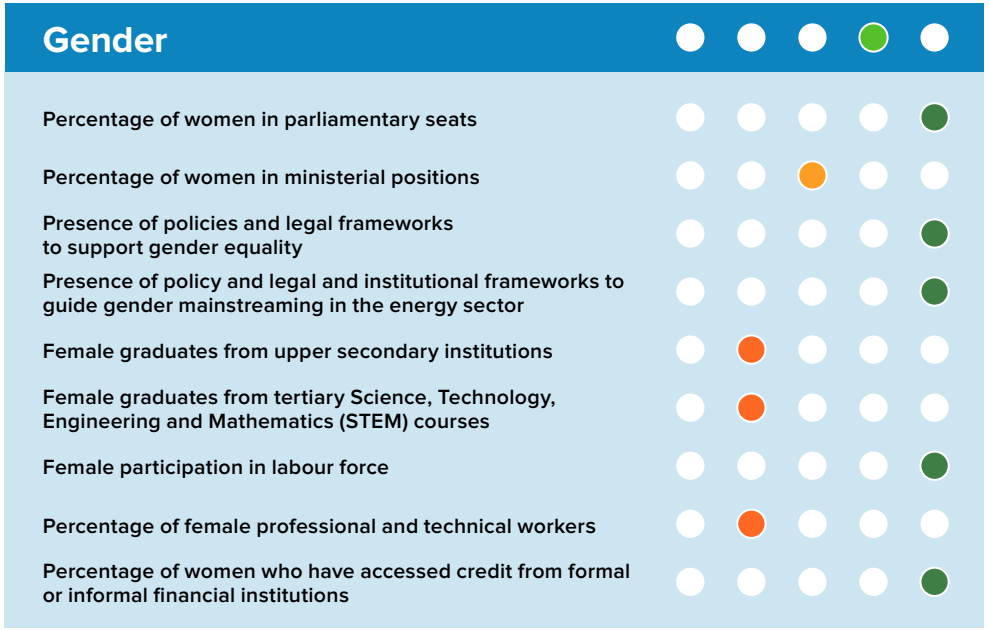
A notable transaction in the EV sector in Rwanda was Ampersand's $9 million debt raise led by USAID's DFC in late 2021. This milestone was achieved after Ampersand successfully raised $3.5 million in equity from the Ecosystem Integrity Fund and $500,000 in a previous equity raise led by Shell Foundation, Development Innovation Ventures, Factor[e] and FONERWA.[171,172]

More recently, Ampersand partnered with Bboxx to raise asset finance using Pulse, Bboxx's proprietary mobile payments data management system.[173]

Ampersand's ability to attract venture capital and debt at scale points to the fact the EV sector is perceived as a profitable, high growth sector. As such, consistent with global trends within the EV sector, EV businesses will likely follow a private sector investment-led growth model (as opposed to the mini-grid sector, which to date has been donor led).

## 4.6 Applying a gender lens to DRE and financial aggregation

### Rwanda's gender score on the CAP market assessment framework:




Rwanda has taken commendable strides in implementing strong legal and policy frameworks to create a more inclusive environment for gender equality. The government has revised the country's constitution to reflect the principle of gender equality and introduced a 30% quota for women in decision-making positions. This was notably reflected in the 2018 parliamentary elections in which 61% of parliamentary seats were filled by women.[174] This is the most in any African country.

The government addresses gender as a cross-cutting issue in the country's national policy strategy documents such as the Rwanda Vision 2020 document, different sector-specific gender strategies and profiles, the Girls' Education policy of 2008, the National Gender Policy of 2010 and the national policy against Gender-Based Violence of 2011. Additionally, there is a legal

mandate for gender-responsive planning and reporting through Gender Budget Statements, gender-sensitive land reform (with joint titling of female and male partners' land), and gender equality in inheritance reforms.[175] Rwanda was ranked 9th in the global top 10 list of the Global Gender Gap Index 2020 report with the top country performance in Sub-Saharan Africa, and amongst the top four countries globally for the political empowerment of women.[176]

Despite progressive policies and legal frameworks, female entrepreneurs still only own 32.5% of all micro, small and medium enterprises. The Rwanda National Institute of Statistics highlights that in 2018, women owned 32.8% of micro enterprises, 29.4% of small enterprises and 15% of medium enterprises.[177] This displays how ownership of larger institutions and industries continue to be dominated by men. Women almost equal men in participating in the labour market, with an 84% participation rate against 83% for men.[178] However, women still have a significantly large income and wage gap of 23.7% and 38.9% respectively.[179] A difference in skills between both men and women and cultural biases are contributing factors to this pay disparity which results in only 39% of women being employed in skilled professions and only 14% holding senior positions.

### 4.6.1 Gender issues in the energy sector

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] REG, the state-owned utility, has over 1,300 employees, of which only 17% are women. One of the major constraints to women accessing equal opportunities within the energy sector is the educational barriers that are still to be addressed. Women in tertiary educational institutions in Rwanda only constitute 9% of science, technology, engineering and mathematics (STEM) programme graduates.[181]

Other notable factors that contribute to limiting participation of women in the energy sector, as well as accessibility to greater employment opportunities, are rigid gender norms and harmful cultural practices. On average, women in Rwanda spend five hours on unpaid childcare work per day compared to an hour and a half for men. Gender-based violence remains a challenge in working environments, with 40% of women experiencing sexual or physical abuse, with majority of those cases going unreported.[182]

### 4.6.2 Addressing gender mainstreaming barriers

In order to address the existing gender gaps, the government, through the National Energy Policy aims to mainstream gender in all national energy planning and implementation, while the national utility, REG, is focusing on increasing female staff representation.[183] Rwanda is also home to Women in Rwanda Energy, which is an initiative funded by the Women's Global Development and Prosperity Initiative. The initiative is one of 14 proposals globally to be awarded funding worth $1.25 million in 2019 to work on increasing female participation in Rwanda's energy sector.[184]

### 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 the DRE sector to encourage 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;
- Perform 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.

5

# Quantifying the market opportunity for financial aggregation



Photo: Adobe Stock/Lightfield Studios

In an effort to estimate the market opportunity for DRE financial aggregation in Rwanda, we present the total estimated financial aggregation investment opportunity in each DRE subsector. We estimate the addressable market per annum in 2022, in the mid-term in 2025 and long-term in 2030 (see Appendix C for methodology followed in calculating each DRE subsector's aggregation market size). Assuming the best-case scenario (full coordination and sufficient standardization between originators, a sufficiently developed capital market and a pipeline that evolves consistent with expectations), the total aggregatable asset base could amount to $25 million per annum by 2025 and $36 million by 2030. Naturally these estimations are based on a number of assumptions[xix] 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.

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 Mini-grids

Our results indicate that the Rwandan mini-grid market only has a total aggregatable revenue base of $363,000 per annum in 2022, which could increase to $1.32 million by 2025 and $2 million by 2030. 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 revised 2024 national electrification target of 182 villages (of on average 100 customers each) electrified through mini-grids will be met, after which customer growth flatlines into the long term. Growth from the mid-term into the long term will exclusively be driven by the expected increase in ARPU over time.

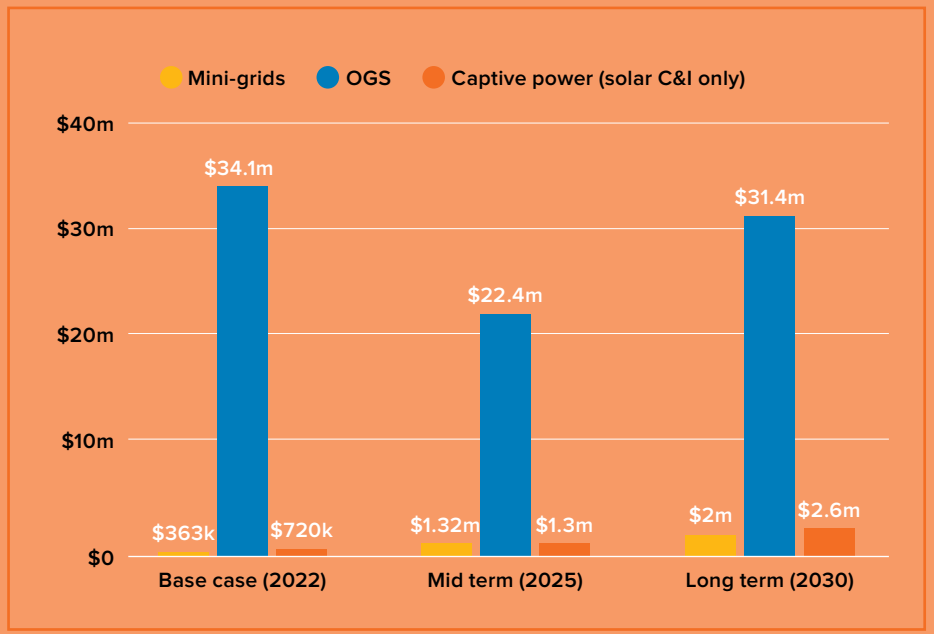



Figure 16: Estimated annual aggregatable revenue per DRE technology in Rwanda[185]

*xix Assumptions provided in Appendix C.*

> *"There is more financial aggregation potential for SHS than for mini-grids – there aren't many sites for mini-grids and changes in government policy are not supportive of mini-grids."*
> **– Anonymous DFI**

182 operational mini-grids by 2025 (assuming one village per mini-grid) would translate to a project aggregation opportunity of approximately 7 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. This is the estimated total size of the mini-grid project aggregation opportunity given that the allocation to mini-grids in the NEP is limited to 182 villages by 2024.

## 5.2 Off-grid solar

The aggregation potential for OGS is orders of magnitude larger than all other DRE markets due to its relative maturity. In 2022, aggregatable revenue per annum is estimated to be $34.1 million based on estimated GOGLA-affiliated PAYGO sales. The medium-term revenue base is projected to decrease to $22.4 million as an increasing share of the population gains electricity access through the national grid. Our projection follows the revised NEP and assumes 1,320 villages (of an average 100 customers each) will be electrified through OGS by 2024 (58% of which will be PAYGO sales).

## 5.3 Captive power

Our projections show a relatively small market opportunity for financial aggregation in the captive power market in Rwanda. The current share of PPA/ESCO business models is estimated to be low, but is likely to increase substantially in the coming years, mirroring developed captive power markets. This positive trend will be boosted by increasing system efficiencies and the improved economics of captive power more broadly. Our calculations indicate a small pool of aggregatable customer receivables with a value of $720,000 per annum in 2022/2023. We estimate this to increase to $1.3 million in the medium term and to $2.6 million in the long term. Projected cash flows are not based on any government-set targets – they are only based on a generally accepted compound annual growth rate for the sector (9.5%).

Translating into practical terms, assuming that the average size per project is 100kW in 2025, projections suggest that by 2025 there would be 45 C&I solar projects operating on an energy-as-a-service model (up from an estimated 28 projects currently operating on this model, assuming 100kW per project). This is equal to 3 portfolios of 15 projects each. Each portfolio would be worth $8.3 million, which is the total aggregated revenue potential of 15 projects stretched over 20 years. If the same rate of growth continues up to 2030, there would be an additional 14 projects operating on energy-as-a-service models (with an increased average capacity of 150kW). This is equal to approximately 1 portfolio containing 15 projects. The portfolio would be worth $13.3 million.[xx]

## 5.4 Electric vehicles

The EV market is the most nascent of all DRE industries studied in this report and therefore has very limited data to base any projections on. Projections are also further complicated by the multitude of business models in use in the sector. Consequently, the projected aggregatable revenue base has not been quantified. It is useful to note, however, that by 2020, there were 264,524 vehicles registered in Rwanda, growing at an annual rate of 12%.[186] As a result, the theoretical addressable market could be substantial – especially given that 60% to 75% of two-wheeler motorcycles in Rwanda are projected to be electric by 2040.[187]

*xx See appendix C for calculations.*

# 6 Looking ahead: Financial aggregation transactions in Rwanda



Photo: UNDP Rwanda

## 6.1 Barriers

DRE financial aggregation in Rwanda faces a number of barriers. Some of these are general barriers that manifest across countries while others are specific to the Rwandan context.

### 6.1.1 General 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.

**The current DRE asset base is 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. Rwanda's current total estimated aggregatable DRE asset base is worth $35.2 million per annum,[xxi] which means that the current asset base is insufficient to warrant financial aggregation at scale. The small asset base and future pipeline is underpinned by a series of related supply-side barriers, as Figure 17 indicates. Each of these barriers as well as other unrelated barriers are discussed in the remainder of this section.

> *"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**

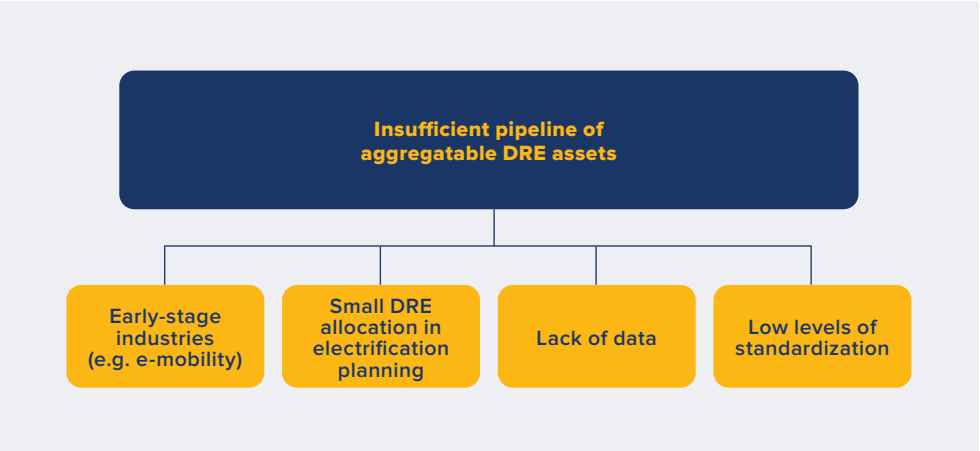



Figure 17: Linkages between supply-side barriers

**High cost of setting up and operating off-balance sheet securitization structures:** Our research into past off-balance sheet 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, operating 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 Rwanda alone does not have enough assets on the ground or in the near-term pipeline to meet this threshold. This is certainly the case for facilities that only aggregate assets from a single originator. Multi-originator aggregation can, however, enable such portfolio sizes in the best-case scenario in select DRE industries.

*xxi Note that this value accounts for all DRE assets that could possibly be aggregated in theory. In reality the aggregable asset base is likely to be smaller due to practical limitations such as coordination between originators of DRE assets. An asset is regarded as aggregatable if there are future payments associated with it. An asset that is sold outright is, for example, not aggregatable, while assets monetized through PPAs, PAYGO or other energy-as-a-service models are regarded as aggregatable.*

> *"We're very much interested in securitising receivables of the longer term contracts so that we can get the money upfront and build more systems. The problem for a company like us is that the transaction costs are huge. A facility that aggregates across companies and across countries would be ideal. We will not be in a place soon where we are able to warrant aggregating only our own receivables."*
> **– Richard Mori, MeshPower**

**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.[188]

**Low levels of standardization :** Standardization is a key enabler of aggregation as it reduces the cost and time required to conduct necessary due diligence research.[xxii] 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 OGS 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 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.

> *"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**

*xxii 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.*

### 6.1.2 Rwanda-specific barriers

**Improvements to be made in supply-side policies and regulations:** Despite Rwanda's sterling work in supporting the DRE sector, there is room for improvement in its policies and regulations. Adjustments to these will lead to more assets deployed, and ultimately a larger asset base for financial aggregation. **More specifically:**

**Mini-grids:** Mini-grids (along with OGS) are significantly deprioritized in the 2021 NEP, chiefly due to REG's impressive grid extension progress over the past few years. This progress has meant that future plans for grid extension have become increasingly ambitious.

**Electric vehicles:** Rwanda's 2021 e-mobility adaptation strategy and e-mobility incentives inscribed in the 2021 Investment Promotion and Facilitation Law signify the government's progressive stance on e-mobility. These positive policy directions and attractive incentives will foster the growth of the sector. However, continued subsidization of fossil fuels (estimated at $40 million per year)[189] reduces the impact of these policies and incentives.

**Captive power:** Rwanda does not have any captive power regulations in place, such as net-metering regulation which would enable grid-connected utility customers to sell surplus self-generated electricity back to the grid. This adversely affects the viability of captive power projects.

**Untested asset-backed securities legislation:** Whilst Rwanda has a favourable tax structure for asset-backed securities,[xxiii] no transactions have been closed. The relatively untested nature of the legislation presents a risk for investors seeking to develop financial aggregation facilities in the country. There is a need for showcase transactions to help boost investor confidence.

**East African government bonds, with their relatively high returns and low risk, are crowding out private bonds and securities:** In Rwanda, government bonds offer returns of 13%; a rate that private entities struggle to compete with. Furthermore, government securities also often carry additional tax incentives, further tilting the balance in favour of government bonds.

## 6.2 Opportunities

### 6.2.1 General opportunities

**Aggregation facilities can bridge the gap between DRE companies and investors.** This research has identified significant demand for suitable debt facilities from DRE companies, as well as strong demand among local and international institutional investors (banks, pension funds, insurance funds) for assets where they can deploy debt funding, especially environmental, social and governance-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.[190] 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.

**The technical capacity to develop financial aggregation structures is in place.** Whilst there have not been any financial aggregation issuances in Rwanda, this research has shown that the skill sets required for developing financial aggregation assets are growing both locally in Rwanda and regionally in East Africa and are relatively established in African financial hubs such as Mauritius.

*xxiii Provided that the originator has KIFC membership*

**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:[191]

**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.

**East African countries like Rwanda have growing levels of mobile penetration and a growing "tech savvy" middle class. Mobile-based retail investment assets targeting the growing middle class offer a possible new investor base in the long term.** The number of retail investing app users grew to over 150 million in 2021 globally.[192] In the same vein, the global digital asset management market size is projected to grow from $4.2 billion in 2022 to $8 billion by 2027.[193] UNCTAD estimates that the value of sustainability-themed investment products in global capital markets amounted to $3.2 trillion in 2020, which represented a more than 80% increase from 2019.[194] Following these trends, there is potential to develop smart, blockchain-based DRE assets

Photo: Adobe Stock/Angkhan

for local and international retail investors. Whilst there are no examples of smart contracts and blockchain in use for financial aggregation in the DRE sector in Africa, there have been instances of financial aggregation assets marketed to retail investors. One such example is M-Akiba, a retail infrastructure bond issued by the Government of Kenya and sold to retail investors through the mobile money wallet M-PESA. Future work would involve a continuation of expanding access to mobile technology and financial services in Rwanda. As sections 2.3.4 and 2.4.1 respectively show, only 36% of Rwanda's population has access to banking services, while mobile money coverage performs well compared to global standards.

## 6.2.2 Rwanda-specific opportunities

**Rwanda is an investment-friendly economy with strong public sector support for domiciling of financial aggregation facilities.** The country maintains a strong rule of law with legislature beneficial for domiciling financial aggregation instruments. The investment friendly climate means that multi-jurisdictional DRE financial aggregation facilities could potentially be domiciled in Rwanda while pooling assets from Rwanda and across the EAC. The RDB and RFL are examples of public support for the finance sector. The RDB has the mandate to foster increased investment within Rwanda. The RDB plays an active role in attracting private FDI through providing market intelligence, connecting investors to local partners and acting as a one-stop centre for the establishment of businesses. KIFC, an initiative managed by RFL, aims to position Kigali as a regional finance hub and a preferred financial centre for holding companies, fund management companies, fintech organizations, private foundations and international banks. While the initiative is still nascent, if implemented well, it has the potential to leverage large amounts of capital into Rwanda.

**The increasing level of financial cooperation between Rwanda and other EAC member state governments, regulators, reserve banks, securities authorities and tax authorities is aiding in the development of an asset-backed securities market in the region.** There has been good progress made through the East African common market protocol to ease multi-jurisdictional investments. If the trend continues over time, multi-jurisdictional financial aggregation issuances are likely to become viable. 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 – instead of foreign investors. As a member of the EAC, Rwanda is set to benefit from this. The benefits of this are particularly pertinent to Rwanda as its local DRE market is too small to effectively close financial aggregation deals.

**While limited, there is prior experience with DRE financial aggregation in Rwanda:** The Solar Securitization instrument developed by BRD and Access to Finance Rwanda has facilitated a foundational base of knowledge regarding the setup of DRE securitization structures. The involved parties' experience with setting up SPVs, designing legal structures and developing underwriting and credit rating mechanisms bodes well for setup and operation of financial aggregation facilities in Rwanda in the future.

**Debt is expensive in the DRE sector. Aggregation facilities can offer cheaper access to capital:** DRE companies in Rwanda report sourcing local currency debt at rates of 10-20% on average (yet typically closer to 20%) and hard currency at 6-10% (concessional debt at the lower end and commercial debt at the higher end). The difference in local and foreign currency interest rates is a result of perceived exchange rate risk. 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.[195]

**Aggregation structures involving in-country asset companies linked with offshore holding companies can benefit from international tax treaties:** Rwanda's DTAs with tax-efficient economies such as Jersey, Mauritius and Singapore will be beneficial in this regard.

**The Rwanda capital market is fairly small and underdeveloped. The limitation in the number of investment vehicles available in the market creates an open playing field for domestic green assets targeting banks and pension funds.** This can be facilitated by stipulating ESG targets for commercial bank portfolios, for which there are none at present. For example, a newly launched initiative by RFL aims to create a green-credit index for SMEs to enable banks to make lending decisions based on an independently verified ESG score.[196] This initiative should help steer more bank lending towards the DRE sector.

**Rwanda has a relatively stable economy and currency. This creates an opportunity for local currency lending and domiciling aggregation structures within the country.** Currency risk has been noted as a major concern by investors interviewed. Rwanda's relatively stable currency reduces currency risk and opens up the opportunity for local currency financing at competitive rates. It likewise reduces the risk of foreign currency lending.

# 7

# An action plan for DRE financial aggregation in Rwanda



Photo: UNDP/Sophie Guibert

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 chapter provides an action plan setting out two pathways with specific barrier-removal activities to systematically address the barriers holding back the financial aggregation market in Rwanda and enable broader replication and 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. **Such activities and associated barriers are categorized into two distinct pathways:**

**1. The low hanging fruit, quick wins pathway:** A mostly short-term (0-5 years) oriented pathway that aims to leverage existing strengths in the market, thereby focusing on barriers that affect players and technologies that are already considered to be aggregation-ready. This pathway includes market development activities that can enable existing mature and aggregation-ready companies to more easily close financial aggregation transactions;

**2. Structural transformation, long-term pathway:** A long-term (0-10 years) oriented pathway that addresses fundamental barriers, irrespective of time frames involved. These barriers are seen as fundamental in that they impede financial aggregation as well as market growth at large. This is a more holistic approach that aims to strengthen multiple facets of the market from regulations to company maturity, to help build a pipeline of aggregation-ready assets and an enabling environment. These market development activities target less mature and missing middle companies primarily. This pathway looks to position financial aggregation as an instrument that changes the status quo of established multinational companies attracting the majority of funding to a future where smaller (and more numerous) companies are also successful at attracting funding, especially debt, at scale.

The market development activities contained in this action plan were developed in response to the financial aggregation barriers identified through consultation with more than 50 interviewees and contributors in this project. Participants also contributed to designing activities that can be undertaken to address these barriers. The plan was finally validated through consultation with contributors. The focus of the plan is on areas that are most relevant to financial aggregation in the DRE sector in Rwanda. 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.

Finally, while a wide range of possible interventions are presented here, this list is by no means exhaustive. This remains a complex and multifaceted issue and the DRE sector is ever evolving. Hence the market gaps and needs are likely to evolve and various other interventions are likely necessary.

Table 5 below provides an overview of key market development activities and the financial aggregation barriers that they are designed to address.

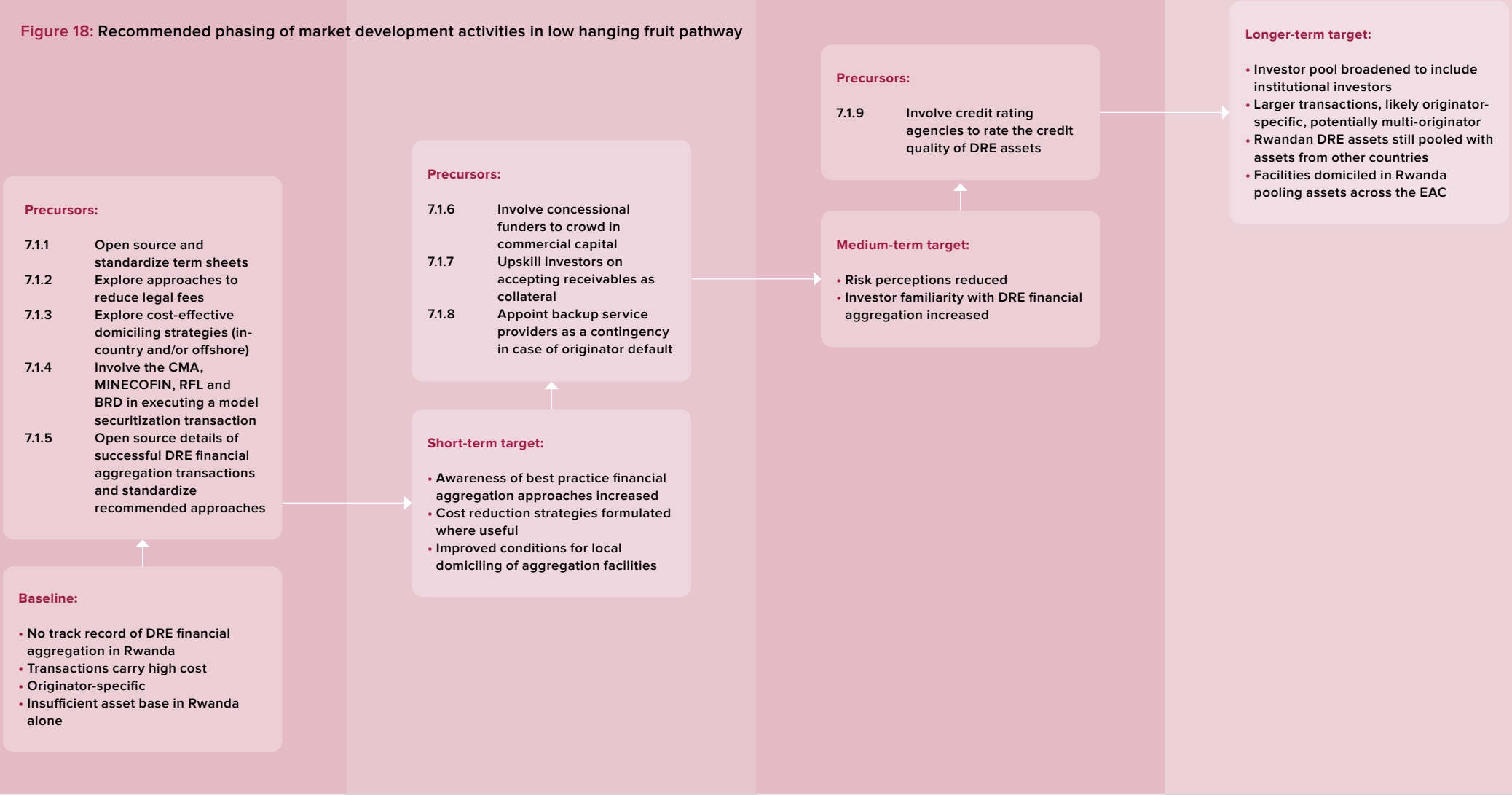
The sections below provide a detailed account of the two pathways and the respective market development activities. Each activity is discussed in detail, including steps involved in the activity, stakeholders that could ideally be involved, high level timelines and more. Some activities, especially those 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 Rwanda and further afield.

Table 5:
## Overview of financial aggregation barriers and associated market development activities

| MARKET DEVELOPMENT PATHWAY | MARKET DEVELOPMENT ACTIVITY | BARRIER TARGETED | GENERAL / RWANDA- SPECIFIC |
|---|---|---|---|
| Quick wins | 7.1.1 Open source and standardize term sheets | High cost of setting up and operating off-balance sheet structures | General |
| | 7.1.2 Explore approaches to reduce legal fees | | General |
| | 7.1.3 Explore cost-effective domiciling strategies (domestic and offshore) | | Rwanda-specific |
| | 7.1.4 Involve the CMA, BRD, MINECOFIN and RFL in executing a model securitization transaction | | Rwanda-specific |
| | 7.1.5 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. | General |
| | 7.1.6 Engage concessional funders to crowd in commercial capital | | |
| | 7.1.7 Upskill investors on accepting credit-assessed receivables as collateral | | |
| | 7.1.8 Appoint backup service providers as a contingency in case of O&M provider insolvency | | |
| | 7.1.9 Engage credit rating agencies to rate the credit quality of DRE assets | | |
| Long-term | 7.2.1 Less mature companies: Raise awareness about good financial reporting, data management and creditworthiness assessment and offer technical assistance to improve in these areas | Majority of DRE companies in Rwanda are not investment ready, while “missing middle” companies lack access to scaling capital. | Rwanda-specific |
| | 7.2.2 Missing middle companies: Bridge the gap between seed funding and late-stage funding | | |
| | 7.2.3 Employ bulk procurement to grow the market | | |
| | 7.2.4 Communicate necessary regulatory improvements to RURA, REG and EDCL | Supply-side regulations and policies that are in place are generally well-formulated, but amendments are recommended. Unregulated DRE sectors would benefit from policy and regulatory guidance. | Rwanda-specific |
| | 7.2.5 Compile a common data reporting framework with input from investors and DRE companies | Lack of data and low levels of standardization | General |
| | 7.2.6 Raise awareness about shared application programming interfaces to standardize mobile money payment flows | | |
| | 7.2.7 Raise awareness about standardization of customer contracts | | |

## 7.1 The low hanging fruit, quick wins pathway

Figure 18: Recommended phasing of market development activities in low hanging fruit pathway



### 7.1.1 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 outside Rwanda. 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;<br>2. Conduct one-on-one consultations with participating arrangers to discuss the term sheets and lessons learnt that are not evident on paper;<br>3. Compile best practices into a single, standardized and anonymous term sheet document and send for peer-review by participating arrangers;<br>4. Publish the term sheet 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), independent experts |
| **Existing initiatives/ resources:** | • The Open Sourcing Infrastructure Investing initiative by CrossBoundary;[xxiv]<br>• Open-sourced PPAs availed by the World Bank as part of the Public-Private Partnership Legal Resource Centre;[197]<br>• The Open Solar Contracts initiative by IRENA and the Terrawatt Institute, which published various generic term sheets and agreements for solar projects.[198] |
| **Timeframe:** | Short term commencement, no preparatory actions needed. Duration estimated to be 1 year. |
| **Budget items:** | Time-based research, publishing costs |

Table 6: **Overview of open sourcing and standardising term sheets**

*xxiv CrossBoundary have expressed intention to publish term sheets that were used in mini-grid project financing deals closed in the past. This is not specific to Rwanda but remains relevant nevertheless. More details available here: CrossBoundary Energy Access, Open sourcing infrastructure investing for mini-grids, 2020 (link)*

### 7.1.2 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 Fullbright 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.[199] 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.[200,201,202] 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);<br>2. Carry out market research into the existence of impact-driven legal counsel;<br>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[xxv]), 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 7: **Overview of exploring approaches to reduce legal fees**

*xxv 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.*

### 7.1.3 Explore cost-effective domiciling strategies (in-country and/or offshore)

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

DRE assets from Rwanda can be securitized and aggregated into facilities that are domiciled in jurisdictions with tax efficient economies and those that Rwanda has DTAs in place with, such as Jersey 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.

A second strategy stems from Rwanda's tax efficient and investment friendly economy lending itself to cost-effective domiciling in-country. Indeed, Rwanda could become a preferred destination 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 harmonising EAC capital markets could mean that domiciling of facilities in Rwanda would be more cost-effective than established destinations. A regional aggregation facility domiciled in Rwanda can benefit from credit enhancement in order to achieve the appropriate credit quality of the assets (see Box 6 for more details on credit enhancement approaches used by financial aggregation facilities).

| | |
|---|---|
| **Steps involved in this market development activity:** | **Offshore domiciling option:**<br>1. Identify preferred jurisdictions to domicile aggregation facilities, keeping in mind that Rwanda should ideally have a DTA in place with the country;<br>2. Obtain quotes from the necessary service providers to determine the cost structure;<br>3. Appoint legal counsel to assist with navigating through cross-country regulatory requirements.<br><br>**Domestic domiciling option:**<br>1. Convene local capital markets stakeholders to test and improve the ABS law (see section 7.1.4 below); |
| **Stakeholders involved:** | Transaction arrangers,[xxvi] legal counsel, DRE companies with experience in transferring DRE assets abroad, RFL, CMA Rwanda. |
| **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;[xxvii]<br>• KIFC has been set up by RFL to attract international investors to domicile investments in Rwanda.[203] |
| **Timeframe:** | Short term commencement, no preparatory actions needed. Duration estimated to be 1 to 3 years. |
| **Budget items:** | Legal fees, time-based research costs, accounting costs |

Table 8: **Overview of cost-effective domiciling options**

*xxvi Regional banks that are registered within Rwanda and across the EAC could be good candidates for multi-jurisdictional aggregation arrangers given that they are already adept at structuring financial products and moving funds across borders.*
*xxvii See for example the Finance Catalyst programme implemented by GET.invest: GET.invest, Finance Catalyst, 2023 (link)*

### 7.1.4 Involve the CMA, Ministry of Finance and Economic Planning (MINECOFIN), RFL and BRD in executing a model securitization transaction

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

To date, no private placements of securities have been conducted in Rwanda. This is despite the CMA's past successful efforts to promulgate laws on asset-backed securitization. Consequently, the laws that are in place remain largely untested. Involving the CMA, MINECOFIN and RFL along with an originator and an arranger in closing a model transaction will go a long way in road testing the regulations and inform policymakers whether the law needs any updates.

This market development activity is key if DRE financial aggregation facilities are to be domiciled in Rwanda. As already discussed, the country's investment friendly and tax efficient conditions deem it suitable as a domiciling destination. Testing and refinement of the ABS law will take the country one step closer to becoming a preferred hub for aggregation facilities.

One possible approach to testing the law is a regulatory sandbox. These 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. A model securitization transaction will likely require regulatory sandbox treatment.

| | |
|---|---|
| **Steps involved in this market development activity:** | 1. Involve financial sector regulatory sandbox experts if necessary, e.g. Consultative Group to Assist the Poor (CGAP);<br>2. Determine the availability of local and/or international arrangers to structure a model transaction;<br>3. Select an appropriate originator (ideally in the DRE sector, but not a requirement). |
| **Stakeholders involved:** | CMA Rwanda,[xxviii] MINECOFIN, RFL, BRD,[xxix] originators (DRE companies) and arrangers, securitization experts in developing markets (e.g. Access to Finance Rwanda, FSD Africa and the Milken Institute). |
| **Existing initiatives/ resources:** | • The Solar Securitization Fund, set up by BRD with assistance from Access to Finance Rwanda is a good example of an existing effort to domicile an aggregation facility in-country (see Box 4 for more details). Arrangers of a model securitization transaction will be well advised to use this existing effort as a stepping stone;<br>• Ireme Invest, albeit not securitization per se, is another example of an in-country facility that aims to attract investment and disburse to local low-carbon assets. One instrument through which this could be done in the future is a green bond. The facility first plans to deploy standard grants, equity, credit guarantees and debt;<br>• As part of its capital markets development programme, FSD Africa provides technical and financial support to originators, arrangers and investors to close demonstration transactions.[204] |
| **Timeframe:** | Commencement in the medium term. A sufficient pipeline of DRE assets in Rwanda is not a precondition as facilities will be domiciled in Rwanda with the intention of aggregating DRE assets across the EAC. |
| **Budget items:** | Time-based costs (design of regulatory sandbox guidelines, workshop costs pertaining to brainstorming the status quo and future of the ABS law) and transaction costs related to origination and structuring of the model transaction. |

Table 9: **Overview of model securitization transaction**

*xxviii The Capital Market Authority of Rwanda is a statutory body with the primary responsibility of promoting and facilitating the development of an efficient capital markets industry in Rwanda. It takes responsibility for promulgating and enforcing laws on asset-backed securitization and would thus be the key organization to liaise with in making necessary legislative amendments where necessary.*

*xxix Rwanda's relatively well governed and progressive development bank will likely be a key resource in successfully implementing financial aggregation at scale. BRD's prior experience with securitization of solar assets will also be key.*

### 7.1.5 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 – to date, there is limited information on past transactions that have been shared in this way. Such information tends to be 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;

Extracting key lessons learned and 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;<br>2. Implement approaches to address concerns as necessary (from the list above or beyond);<br>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;[xxx]<br>• 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.[205] |
| **Timeframe:** | Short term commencement, no preparatory actions needed. Duration estimated to be 1 year. |
| **Budget items:** | Time-based remuneration for researching previous transactions and writing up findings in white paper format. |

Table 10: **Overview of open sourcing details of successful DRE financial aggregation transactions**

*xxx CrossBoundary have open sourced some details of their mini-grid project financing approach and have expressed intention to publish term sheets that were used in these transactions. This is not specific to Rwanda but remains relevant nevertheless. More details available here: CrossBoundary Energy Access, Open sourcing infrastructure investing for mini-grids, 2020 (link)*

### 7.1.6 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 (DFIs, etc.) to take up guarantee and junior debt positions in the capital stack. Indeed, there is now increased interest in the DRE segment from specialized investment funds that mobilize guarantees, debt and equity from donors and crowd-in private sector investors. These funds usually operate with global or regional focus, but Rwanda can be proactive and develop a portfolio of projects that can attract such funding, especially in the projects' early stages.

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 international and local senior lenders and leverage private, commercial capital. These instruments will especially be beneficial for a potential regional financial aggregation facility domiciled in Rwanda.

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 the 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;<br>2. Consult with local and international senior lenders to exactly determine the preferred structure of risk mitigation measures in the capital stack;<br>3. Offer technical assistance to local banks who might not be fully skilled in assessing DRE investments;<br>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 (see longlist in Appendix E), commercial investors (see longlist in Appendix E), DRE companies |
| **Existing initiatives/ resources:** | • 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;[206]<br>• 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.[207]<br>• Window 2 of the Rwanda Renewable Energy Fund disburses World Bank funding to local commercial banks, to, in turn, on lend to DRE companies in Rwanda. I&M Bank and KCB Bank are examples of banks that have made investments enabled by this facility. Established OGS companies such as Ignite have raised funding through this window;<br>• A good example of blended capital earmarked for a financial aggregation transaction is the 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;[208]<br>• Multiple examples of standard, non-financial aggregation transactions involving capital blending exist, and lessons from these experiences are also relevant. Often guarantee facilities from organizations such as GuarantCo are in place. |
| **Timeframe:** | Medium term commencement, following confirmation of ideal transaction structure/best practice approaches. |
| **Budget items:** | Time-based research costs |

Table 11: **Overview of engaging concessional funders to crowd-in commercial capital**

### 7.1.7 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. Investors would need to be comfortable with accepting receivables as collateral. Research however indicates that this is a challenge for investors.[209] 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;
  - Add risk mitigation measures as discussed in section 7.1.6 above;
  - Make use of credit enhancement techniques as described in Box 6 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.[210] 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.[xxxi]

| | |
|---|---|
| **Steps involved in this market development activity:** | 1. Convene a group of DRE investors interested in financial aggregation;<br>2. Arrange training days/webinars on DRE financial aggregation with a focus on receivables as collateral;<br>3. Garner input from investors on the difficulties inherent in accepting only receivables as collateral;<br>4. Embark on brainstorming exercises in an attempt to address investors' concerns (such as mentioning strategies listed above);<br>5. Road test real-world scenarios – showcase receivables data from operational DRE companies. |
| **Stakeholders involved:** | DRE investors (especially new ones with limited experience),[xxxii] financial sector development agencies (e.g. FSD Africa, Access to Finance Rwanda). |
| **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.[211] |
| **Timeframe:** | Medium term commencement, following confirmation of ideal transaction structure/best practice approaches. |
| **Budget items:** | Venue costs for in-person workshop(s) |

Table 12: **Overview of upskilling investors to accept receivables as collateral**

*xxxi In particular those that have an established relationship with the DRE sector. Zigama, for example, has been approved as one of the disbursing entities under the window 2 REF on-lending programme.*

*xxxii Local commercial banks can especially benefit from such inputs. Banks that have already invested in the DRE sector are good candidates. These include, for example, I&M Bank and KCB Bank Rwanda (formerly Banque Populaire du Rwanda).*

Photo: UNDP Rwanda/Constantin Uwase

Box 6:

## 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.[xxxiii]

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.

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*xxxiii See for example: EnerGrow, About us, 2023 (link)*

### 7.1.8 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.[212] 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**

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| **Steps involved in this market development activity:** | 1. Consult with mature, reputable DRE companies to determine conditions for backup servicing;<br>2. Consult with business rescue and liquidation experts to better understand and put in place contingencies if the originator goes bankrupt;<br>3. Develop standardized backup servicing contract templates;<br>4. 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, business rescue and liquidation experts |
| **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 here, 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 13: **Overview of backup servicing**

### 7.1.9 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 who is employed to assess the underlying risk of financial assets. Moody's, Standard and Poor's (S&P) and Fitch Ratings are trusted market leaders. Beyond the big household names, there are a multitude of trusted, locally based rating agencies. These agencies reduce the level of due diligence required by investors and provide 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 developmental agencies to finance 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**

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| **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;<br>2. Assess costs involved for abovementioned rating agencies to rate DRE assets;<br>3. Consult with established DRE customer creditworthiness assessment providers on the possible transferability of knowledge and skills to credit rating receivables as assets;<br>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 DRE credit referencing initiatives. |
| **Existing initiatives/ resources:** | • TransUnion's Menyesha initiative provides information about the credit status of individuals and businesses in Rwanda;[213]<br>• CGAP published a guide on credit risk management approaches for asset finance companies in 2021.[214] |
| **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 14: **Overview of rating the credit quality of DRE assets**

## 7.2 Structural transformation, long-term pathway

Figure 19: Recommended phasing of market development activities in the long-term pathway

### 7.2.1 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: Majority of DRE companies in Rwanda 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 Rwandan 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 improving in these areas 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.

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| **Steps involved in this market development activity:** | 1. Appoint a technical assistance expert in the field of SME financial reporting and data management;<br>2. Alternatively, coordinate with existing technical assistance initiatives (see examples below) to incorporate investment readiness content for financial aggregation into their offers;<br>3. Convene Rwandan DRE companies in a bootcamp format to upskill in the areas of financial reporting, data management and customer creditworthiness assessment;<br>4. Follow workshops and bootcamps up with continued technical assistance, either through external check-ins or internal, embedded assistance as described above.[xxxiv] |
| **Stakeholders involved:** | DRE companies, technical assistance providers (e.g. OCA, EnDev, PFAN, etc.), technical assistance funders (e.g. Power Africa), industry associations (e.g. Energy Private Developers). |
| **Existing initiatives/ resources:** | • Power Africa's open-sourced financial modelling tools for PAYGO energy access companies (in partnership with Persistent Energy);[215]<br>• Power Africa's business development resources for OGS companies including distribution best practices, microfinancing approaches and more;[216]<br>• 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;[217]<br>• Odyssey Energy Solutions offers an end-to-end platform for development of DRE projects;[218]<br>• PROSPECT, an open-source data platform developed by the Access to Energy Institute and GET.invest, collects, harmonizes, analyses and visualizes renewable energy system data;[219]<br>• Energy Private Developers, a DRE industry association in Rwanda, conducts capacity needs assessments among its members and hosts capacity building sessions;[220]<br>• Solar Power Europe, in partnership with GET.invest published best practice guidelines for engineering, procurement and construction of solar projects.[221] |
| **Timeframe:** | Short term commencement, no preparatory actions needed. Duration estimated to be 1 year. |
| **Budget items:** | Technical assistance budget, workshop convening costs, time-based remuneration for preparation of materials. |

**Table 15: Overview of raising awareness about areas for improvement among DRE companies**

*xxxiv Continued support is important because one or two workshops are unlikely to achieve tangible impact alone.*

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

**Barrier targeted: Majority of DRE companies in Rwanda 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.

Possible 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.

Photo: UNDP Rwanda

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| **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.<br>2. Identify and involve appropriate providers of these financing instruments;<br>3. Identify and involve a guarantee provider if deemed a necessary precondition for involvement from above-mentioned financiers;<br>4. Consider improvements on existing initiatives such as the Rwanda Renewable Energy Fund, for example improving windows that are not reaching disbursement targets and increasing access to smaller companies;[xxxv]<br>5. Link missing middle companies with financiers by curating deals to suit both investor and investee;<br>6. 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:** | BRD (in its capacity as the managing entity of the Renewable Energy Fund), DRE companies, return-seeking patient investors, guarantee providers, investment matchmakers (e.g. GETinvest)[222] |
| **Existing initiatives/ resources:** | • The Rwanda Renewable Energy Fund is a $50 million initiative funded by the World Bank and managed by BRD. It offers loans and subsidies to qualifying DRE companies in Rwanda (see Box 3);<br>• FONERWA offers grants and 11.45% local currency credit lines to low-carbon projects and companies. By April 2022 the fund has mobilized $217 million worth of investments;[223]<br>• Ireme Invest, launched at COP27 in 2022, is a $110.5 million multi-donor investment facility managed by FONERWA and BRD that aims to support the private sector to access climate finance;[224]<br>• EnDev launched the Rwanda Mini-Grid Results-based Financing project in 2021, which will run until September 2024;[225]<br>• 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;[226]<br>• 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;[227]<br>• The Renewable Energy Performance Platform, managed by Camco, offers development phase capital, gap financing and long-term loans to small-scale projects below 25 MW;[228]<br>• 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.[229] The programme is looking to expand to more countries. |
| **Timeframe:** | Short term commencement, no preparatory actions needed. Duration estimated to be 1 to 3 years. |
| **Budget items:** | Time-based research costs, investment matchmaking services. |

Table 16: **Overview of bridging the gap between seed funding and late-stage funding**

Photo: UNDP Rwanda

*xxxv Window 3, designed to lend to mini-grid companies, has not disbursed any funds to date. In terms of OGS, smaller companies have been less successful than larger companies to raise capital through window 4.*

### 7.2.3 Explore bulk procurement to grow the market

**Barrier targeted: Majority of DRE companies in Rwanda are not investment ready while "missing middle" companies lack access to scaling capital.**

Less mature and missing middle companies are not mature enough 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. The issue however is that large-scale procurement of mini-grids does not occur frequently in Rwanda, mainly due to the small role that mini-grids play in the country's electrification efforts. For example, preferred bidders for a government tender for mini-grids issued in 2020 were only announced by the end of 2021. By Q3 2022, the preferred bidders were still waiting for contracts to be signed.[230]

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.

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| **Steps involved in this market development activity:** | 1. Consult with DRE companies on which hardware can be standardized;<br>2. Explore opportunities with central procurement agencies to allocate lots and/or concessions of sites;<br>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.[231] The programme is currently being piloted in Nigeria and is supported by a $10 million funding facility;[232]<br>• The Mini-Grid Innovation Lab, implemented by CrossBoundary, launched a study on the impact of bulk procurement on mini-grid procurement costs in 2020.[233] |
| **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 17: **Overview of exploring bulk procurement**

### 7.2.4 Communicate necessary regulatory improvements to RURA, REG and Energy Development Corporation Limited (EDCL)

**Barrier targeted: Supply-side regulations and policies that are in place are generally well-formulated, but some amendments are recommended. Unregulated DRE sectors would benefit from policy and regulatory guidance.**

Regulations play an extremely important role in catalysing DRE markets. To attain an extensive operating base and pipeline of DRE assets, regulations need to be as favourable to DRE companies as possible. **The following improvements are recommended in Rwanda:**

- **Mini-grids:** Mini-grids (along with OGS) are significantly deprioritized in the 2021 NEP, chiefly due to REG's impressive grid extension progress over the past few years. This progress has meant that future plans for grid extension have become more ambitious. Based on Rwanda's track record (see chapter 3) there is reason to believe that the target of 90% grid electrification by 2024 could be achieved. However, connecting an additional 40% of the population to the grid within two years will require mobilizing significant investment which could represent a major roadblock.[xxxvi] Considering the high absolute cost of grid extension compared to DRE deployment, opening the market up for private mini-grid operators and OGS suppliers to raise their own funds and assist with electrifying a portion of the population earmarked for grid electrification (in addition to the portion already earmarked to mini-grids and OGS) could be a more cost effective and rapid pathway towards 2024 universal electrification.

- **Captive power:** Publish draft captive power regulations, as there are currently no regulations specifically for captive power.

- **EVs:** Rwanda's supportive e-mobility policy directions and attractive incentives will foster the growth of the sector. However, continued subsidization of fossil fuels (estimated at $40 million per year)[234] reduces the impact of these policies and incentives. While the immediate removal of fossil fuel subsidies is admittedly unrealistic, development of strategies to gradually reduce subsidies is advised. Such strategies would likely need to be based on a quantitative assessment of the impact of fossil fuel subsidies on the e-mobility market.

*xxxvi 50% of Rwanda's population is estimated to be electrified through the grid in 2022.*

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| **Steps involved in this market development activity:** | 1. Create a forum that coordinates alignment between stakeholders and organizations from different spheres of the sector (see row below). This forum would be a vehicle for awareness raising and policy advocacy;<br>2. Collect socio-economic impact data and service level data from mini-grid developers and OGS suppliers in Rwanda;<br>3. Share this data with RURA, REG and EDCL along with wider awareness raising on the importance and benefit of DRE for Rwanda's electrification and energy security efforts;<br>4. Quantify the impact of fossil fuel subsidies on e-mobility to advise on strategy development for gradual reduction of subsidies. |
| **Stakeholders involved:** | RURA, industry associations (e.g. Energy Private Developers), mini-grid developers, US National Association of Regulatory Utility Commissioners (NARUC), Power Africa, USAID. |
| **Existing initiatives/ resources:** | • 60 Decibels collect performance and socio-economic impact data from the off-grid solar sector across the world and presents this data on an online dashboard;[235]<br>• NARUC with support from USAID and Power Africa has previously delivered technical assistance to RURA on proposed captive power regulations;[236]<br>• The African Forum for Utility Regulators' recent project, Mainstreaming Mini-Grid Tariff Settlement Tools and Methodologies Across African Regulators, assists national regulators to use best practice tariff setting approaches for mini-grids;[237]<br>• The Africa Mini-Grid Developers Association offers advisory on designing and implementing optimal policies and regulations for mini-grids;[238]<br>• Energy Private Developers, a DRE industry association in Rwanda, has worked with public sector organizations to improve on aspects related to the structure of the Rwanda Renewable Energy Fund and has been involved with policymaking discussions;[239]<br>• The Africa Clean Energy Technical Facility offers support to enabling environment actors to ensure that operating conditions in the DRE industry are favourable.[240] |
| **Timeframe:** | Commencement in the short term. Duration estimated to be 1 to 3 years. |
| **Budget items:** | Time-based costs related to convening a group of developers, compiling a data pool and liaising with RURA |

Table 18: **Overview of communicating necessary regulatory improvements**

### 7.2.5 Create 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 to ensure comparability between assets, which will in turn ease due diligence on 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 existing 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 existing 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 these 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.

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| **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;<br>2. Determine barriers to adoption of existing frameworks during consultations;<br>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;<br>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;<br>5. Explore the possibility of a reporting framework with standardized metrics across DRE sectors. |
| **Stakeholders involved:** | DRE companies, data standardization expert, 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, 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;[241]<br>• GOGLA's Standardized Impact Metrics for the OGS Sector;[242]<br>• The mini-grid quality assurance framework developed by NREL and adapted by TFE;[243,244]<br>• 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.[245] |
| **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 19: **Overview of creating a common data reporting framework**

### 7.2.6 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 a SPV, the ongoing 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.

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| **Steps involved in this market development activity:** | 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);<br>2. Determine the precursors for redirecting customer payment flows from DRE companies to SPVs. |
| **Stakeholders involved:** | DRE companies, mobile money providers, mobile money aggregators, software experts (e.g. Solaris Offgrid)[xxxvii] |
| **Existing initiatives/ resources:** | • 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;[246]<br>• Stitch offers a standard API integration to streamline the processing of online payments.[247] |
| **Timeframe:** | Medium term commencement |
| **Budget items:** | Time-based remuneration for research and convening of workshops and/or webinars |

Table 20: **Overview of raising awareness about shared APIs**

*xxxvii Solaris Offgrid's PayGops Disruptive Receivables Finance Project is a receivables-based financing platform that streamlines the flow of asset and payment information using the company's last-mile operation management software PayGops. The company would naturally be a key stakeholder to involve in this market development activity.*

### 7.2.7 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**

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| **Steps involved in this market development activity:** | 1. In a workshop format, communicate the value of contract standardization ;<br>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);<br>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;[248]<br>• 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.[249] |
| **Timeframe:** | Medium term commencement |
| **Budget items:** | Research, workshop costs |

Table 21: **Overview of raising awareness about standardization of customer contracts**

# Appendices




Photo: UNDP/Benoit Almeras-Martino

# Appendix A: Environmental and social risk assessment

The UNDP's social and environmental standards[250] will guide the design and implementation of UNDP market development activities to grow the market towards financial aggregation readiness, any 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 projects targeted by possible financial aggregation facilities for low-carbon assets, natural resource depletion risks are not foreseen. However, hydro-based projects 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 the focus of the CAP is financial aggregation to fund 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. Incentivising the construction of projects (by virtue of quick and affordable access to capital) 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 community involved with the renewable energy industry in Rwanda. At the project level, there is a risk that construction of projects funded through the aggregation facility or transaction will lead 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 small-scale DRE financial aggregation facilities.

6. **Incorporate the needs of indigenous peoples:** To ensure that participating projects and companies secure land in a manner that does not encroach on indigenous lands. This requires consultation with community leaders in programme and project design.

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. Companies and projects funded through the 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 the MININFRA Ministerial Guidelines on Minimum Standards Requirements for Solar Home Systems of 2022;
   c. A financial aggregation facility would need to incorporate recycling and other "after life" considerations in programme design.

# Appendix B: Data privacy risk assessment

Law Nr. 058/2021 of 13/10/2021 relating to the protection of personal data and privacy is the foundational legislation on digital data privacy in Rwanda. It sets out guidelines for personal data collection and processing in Rwanda. **It stipulates the following:**

- 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 at any time;
- Personal data should be protected through appropriate measures that ensure sufficient levels of security;
- Data about a subject may only obtained from a third party under predefined conditions;
- Data should be complete, up-to-date and accurate;
- Data should be accessible to the subject upon request;
- Data subjects have the right to request erasure and rectification of their data as well as the right to restrict processing of their data.[251]

Entities collecting, processing and controlling data should apply for registration with the supervisory authority of the law, which is the National Cyber Security Authority. Article 30 of the law specifies information to be submitted as part of the registration application. Information about registered data collections, processors and controllers will be maintained in the Authority's data protection register. Each entity that processes or controls personal data must 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 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 scenario:

**Inputs (data sources and assumptions in footnotes):**

- **Estimated current connections:**[252] 6500
- **ARPU per month:**[253] $4.65 per connection

**Calculation:**

- **Total aggregatable revenue per annum:** 6500 connections x $4.65 x 12 months = $362,700

### Medium term scenario:

**Inputs (data sources and assumptions in footnotes):**

- **Mini-grid allocation in NEP:**[254] 182 villages
- **Estimated number of villages per mini-grid:** 1
- **Estimated connections per village:**[255] 100
- **ARPU per month:**[xxxviii] $6.05 per connection
- **Estimated number of projects per portfolio:** 25
- **Estimated years that a mini-grid will operate:** 20

**Calculation for annual aggregatable revenue:**

1. **Total estimated connections by 2025:** 182 sites x 100 connections = 18200 connections
2. **Total aggregatable revenue per annum:** 18200 connections x $6.05 x 12 months = $1,32 million

**Calculation for portfolio financing case:**

1. **Estimated number of portfolios:** 182 sites / 25 sites per portfolio = 7 portfolios
2. **Estimated deal size per portfolio:** 25 sites x 100 connections x $6.05 x 12 months x 20 years = $3.6 million

### Long term scenario:

**Inputs (data sources and assumptions in footnotes):**

- **Estimated connections by 2030:** 18200 connections
- **ARPU per month:**[xxxix] $9.07 per connection

**Calculation:**

1. **Total aggregatable revenue per annum:** 18200 connections x $9.07 x 12 months = $1.98 million

*xxxviii 30% growth from current ARPU as an estimate of medium term ARPU growth based on AMDA data*
*xxxix 30% growth from current ARPU as an estimate of medium term ARPU growth based on AMDA data*

## Off-grid solar

### Short term scenario:

**Inputs (data sources and assumptions in footnotes):**

- **Projected number of PAYGO units sold in 2022:**[xl] 151203
- **Estimated current average PAYGO revenue per unit per year**[xli]**:** $226

**Calculation:**

**Estimated total value of PAYGO market in 2022:** 151203 units x $226 = $34.1 million

### Medium term scenario:

**Inputs (data sources and assumptions in footnotes):**

- **OGS allocation in NEP:**[256] 1320 villages
- **Estimated connections per village:**[257] 100
- **Share of PAYGO in total sales:**[xlii] 58%
- **Estimated average PAYGO revenue per unit per year:**[xliii] $293

**Calculation:**

1. **Estimated number of OGS connections in 2025:** 1320 villages x 100 connections = 132000
2. **Estimated number of PAYGO connections in 2025:** 132000 x 58% = 76560 connections
3. **Estimated total value of PAYGO market in 2025:** 76560 connections x $293 = $22.4 million

### Long term scenario:

**Inputs (data sources and assumptions in footnotes):**

- **Estimated connections by 2030:**[xliv] 76560 connections
- **Share of PAYGO in total sales:**[xlv] 58%
- **Estimated average PAYGO revenue per unit per year:**[xlvi] $410

**Calculation:**

1. **Estimated total value of PAYGO market in 2030:** 76560 connections x $410 = $31.4 million

*xl Calculated by applying pre-pandemic annual growth rate to 2021 PAYGO semi-annual sales data from GOGLA.*
*xli 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.*
*xlii Calculated by dividing PAYGO sales (units) by total sales (units) from 2018-2020 GOGLA data*
*xliii Factors in a 30% escalation from the baseline value to account for growing consumer purchasing power*
*xliv No customer growth from 2024 until 2030 as per NEP.*
*xlv Calculated by dividing PAYGO sales (units) by total sales (units) from 2018-2020 GOGLA data*
*xlvi Factors in a 40% escalation from the baseline value to account for growing consumer purchasing power*

# Captive power (C&I solar only)

## Short term scenario:

### Inputs (data sources and assumptions in footnotes):

- **Baseline installed capacity:**[258] 5.73 MW
- **Share of installed capacity on rent to own/PPA model:**[xlvii] 49%
- **General PV performance ratio:** 78%
- **Rainy days per year (Kigali as assumption):** 122
- **Average sun hours per day in Rwanda:** 9
- **Estimated PPA tariff:**[xlviii] $0.15/kWh

### Calculation:

1. **Sun hours per year:** 9 x (365 days - 122 days) = 2187 hours
2. **Total installed capacity on rent to own/PPAs:** (5.73 MW x 49%) x 1000 = 2808 kW
3. **Annual kWhs (assuming everything is consumed):** 2808 kW x 78% x 2187 hrs = 4789543 kWh
4. **Total aggregatable revenue per annum:** 4789543 kWh x $0.15/kWh = $718,431

## Medium term scenario:

### Inputs (data sources and assumptions in footnotes):

- **Estimated installed capacity by 2025:**[xlix] 7.5 MW
- **Share of installed capacity on ESCO models by 2025:**[l] 60%
- **Estimated PV performance ratio by 2025:**[li] 85%
- **Sun hours per year:** 2187 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:** (7.5 MW x 60%) x 1000 = 4513 kW
2. **Annual kWhs (assuming everything is consumed):** 4513 kW x 85% x 2187 hrs = 8391043 kWh
3. **Total aggregatable revenue per annum:** 8391043 kWh x $0.15/kWh = $1.3 million

### Calculation for portfolio financing case:

1. **Estimated number of operational C&I sites:** 4513 kW / 100 kW = 45 sites
2. **Estimated energy generated per year per project:** 100 kW x 85% x 2187 hrs = 185895 kWh
3. **Estimated number of portfolios:** 45 projects / 15 projects per portfolio = 3 portfolios
4. **Estimated deal size per portfolio:** 185895 kWh x 15 projects x $0.15 x 20 yrs = $8.4 million

## Long term scenario:

### Inputs (data sources and assumptions in footnotes):

- **Total installed capacity by 2030:**[lii] 11.8 MW
- **Share of installed capacity on ESCO models by 2030:**[liii] 75%
- **Estimated PV performance ratio by 2030:**[liv] 90%
- **Sun hours per year:** 2187 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 rent to own/PPAs by 2030:** (11.8 MW x 75%) x 1000 = 8882 kW
2. **Annual kWhs (assuming everything is consumed):** 8882 kW x 90% x 2187 hrs = 17483168 kWh
3. **Total aggregatable revenue per annum:** 17483168 kWh x $0.15/kWh = $2.6 million

### Calculation for portfolio financing case:

1. **Estimated number of new ESCO C&I sites:** (8882 kW / 150 kW) – 45 sites = 14 sites
2. **Estimated energy generated per year per project:** 150 kW x 90% x 2187 hrs = 295245 kWh
3. **Estimated number of portfolios:** 14 projects / 15 projects per portfolio = 1 portfolio
4. **Estimated deal size per portfolio:** 295245 kWh x 15 projects x $0.15 x 20 yrs = $13.3 million

*xlvii Derived from Uganda and Kenya data: Magala, J., et al., Captive solar pv market – Insights from Uganda, 2022 (link) and Bhamidipati, P.L. et al., Clean captive power: Understanding the uptake and growth of commercial and industrial (C&I) solar PV in Kenya, 2020 (link)*

*xlviii Based on LCOE values from Nsengimana, C., Comparative analysis of reliable, feasible and low-cost photovoltaic microgrid for a residential load in Rwanda, 2020 (link) and Mburu, A., Solar + battery energy storage vs diesel in East Africa, 2020 (link).*

*xlix Based on estimated rooftop solar CAGR of 9.5%. This is slightly elevated from the current CAGR of solar C&I projects in Rwanda (8.1%).*

*l Assuming growth as the rent to own/PPA market matures over time*

*li Considering improvements in solar PV technology*

*lii Based on estimated rooftop solar CAGR of 9.5%. This is slightly elevated from the current CAGR of solar C&I projects in Rwanda (8.1%).*

*liii Assuming growth as the rent to own/PPA market matures over time*

*liv Considering improvements in solar PV technology*

# Appendix D: DRE companies in Rwanda

| COMPANY NAME | TECHNOLOGY |
|---|---|
| Absolute Energy | Mini-grid, Captive power |
| Amahoro Energy | Mini-grid, Captive power |
| Ampersand | EV |
| ARC Power | Mini-grid |
| Az Implex | Captive power |
| Bboxx | SHS, SAS productive use |
| Centennial Generating Company | Captive power |
| Clean Energy Technology Ltd | Captive power, SAS productive use, Mini-grid |
| d.light | SHS |
| East African Power | Captive power |
| ECOS | Mini-grid |
| Elerai Global Services LLC | Captive power |
| Elite technologies Limited | Captive power |
| ELV Technologies Ltd. | Captive power |
| Engie Energy Access | Mini-grid, SHS |
| EnGreen | Mini-grid |
| Equatorial Power | Mini-grid |
| Fotis energy | Captive power |
| Futurepump | SAS productive use |
| Great Lakes Energy | Captive power |
| Greenlight Planet | SHS |
| Guraride | EV |
| Hello Renewables | SHS, Captive power |
| Ignite Power | SHS, SAS productive use |

| COMPANY NAME | TECHNOLOGY |
|---|---|
| Intertech | SHS, Captive power |
| Klean NRG | SHS, Mini-grid |
| MeshPower | Mini-grid, Captive power |
| Munyax Eco | SHS, Captive power |
| Neseltech | Captive power, Mini-grid, SHS |
| NICOF Electrical Engineering Services | Captive power |
| NOTS Solar Lamps | SHS |
| Nuru Energy | SHS |
| Offgridbox | SAS productive use, Captive power |
| OFGEN | Captive power, Mini-grid |
| One Acre Fund | SHS |
| Ox | EV |
| Power Point Systems | Captive power, SAS productive use, SHS, Mini-grid |
| RENERG(R) | Mini-grid |
| Rwanda Electric Motors Limited | EV |
| Safiride | EV |
| Sawa Energy | Captive power |
| Solarise Africa | Captive power |
| Solektra | SHS |
| Victoria Motors (Mitsubishi Distributors) | EV |
| Volkswagen | EV |
| WakaWaka Power | SHS |
| ZOLA Electric | SHS |

# Appendix E: Relevant DRE investors

| INVESTOR NAME | INVESTOR ARCHETYPE | TARGETED SECTOR | COUNTRY / REGION |
|---|---|---|---|
| Acumen | Concessional funder | Sector agnostic, Mini-grids, Captive power, SHS | Global |
| Africa Enterprise Challenge Fund | Concessional funder, Grant funder | agribusiness, Mini-grids, SHS, SAS productive use | sub-Saharan Africa |
| African Development Bank | Grant funder | Mini-grids, SHS, SAS productive use, Sector agnostic | sub-Saharan Africa |
| African Frontier Capital | Concessional funder | SHS, SAS productive use | sub-Saharan Africa |
| Alpha Mundi | Concessional funder | Sector agnostic | sub-Saharan Africa |
| Ashden Trust | Grant funder | Climate change, agribusiness, renewable energy | Global |
| Bamboo Capital Partners | Concessional funder | Sector agnostic | Global |
| Bank of America | Foreign commercial | Mini-grids, SHS, SAS productive use, Captive power, Sector agnostic | Global |
| Belgian Investment Corporation (BIO) | Grant funder | Mini-grids, SHS, SAS productive use, Sector agnostic | Global |
| BMZ | Grant funder | SHS, SAS productive use, Sector agnostic | Global |
| Calvert Impact Capital | Grant funder | Mini-grids, SHS, SAS productive use, consumer financing, agribusiness | Global |
| CAMCO | Fund manager | Mini-grids, Captive power, SHS, SAS productive use, Utility scale RE | Global |
| CDC Group / British International Investment | Concessional funder | Sector agnostic | sub-Saharan Africa, Asia |
| Ceniarth | Concessional funder | Sector agnostic | Global |
| CrossBoundary | Fund manager | Mini-grids, Captive power | sub-Saharan Africa |
| DANIDA | Concessional funder | Mini-grids, SHS, SAS productive use, Sector agnostic | Global |
| Developing World Markets | Concessional funder | Sector agnostic, SHS | Global |
| Development Bank of Rwanda | Concessional funder | Mini-grids, Captive power, SHS, SAS productive use, Sector agnostic | Rwanda |
| Development Bank of Southern Africa | Concessional funder | Sector agnostic | sub-Saharan Africa |
| DFC | Concessional funder | Sector agnostic | Global |
| E3 Capital (formerly Energy Access Ventures) | Concessional funder | Captive power, Mini-grids, SHS, SAS productive use | sub-Saharan Africa |
| Ecoligo | Crowdfunding platform | Captive power | Global |
| EEP Africa | Grant funder | Mini-grids, Captive power, SHS, SAS productive use | sub-Saharan Africa |
| Efficiency for Access | Concessional funder | SAS productive use, Energy efficiency | Global |

| INVESTOR NAME | INVESTOR ARCHETYPE | TARGETED SECTOR | COUNTRY / REGION |
|---|---|---|---|
| ElectriFi | Concessional funder | Mini-grids, SHS, Captive power | Global |
| EnDev | Grant funder | Mini-grids, SHS, SAS productive use | Global |
| Energise Africa | Crowdfunding platform | Mini-grids, Captive power, SHS, SAS productive use, agribusiness | sub-Saharan Africa |
| Energy for Impact | Fund manager | SAS productive use, Mini-grids, SHS | sub-Saharan Africa |
| European Investment Bank | Foreign commercial | Sector agnostic | Global |
| FCDO | Concessional funder | Mini-grids, Captive power, SHS, SAS productive use, Sector agnostic | Global |
| Finnfund | Concessional funder | Mini-grids, Captive power, SHS, SAS productive use, agribusiness, consumer financing | Global |
| FMO | Concessional funder | Mini-grids, Captive power, SHS, SAS productive use, Sector agnostic | Global |
| GIZ | Grant funder | Mini-grids, Captive power, SHS, SAS productive use, Sector agnostic | Global |
| Good Energies Foundation | Concessional funder | Mini-grids, Captive power, SHS, SAS productive use | Global |
| Greenmax Capital | Fund manager | Captive power, Mini-grids, SHS, SAS productive use, Utility scale RE | Global |
| IFC | Concessional funder | Sector agnostic | Global |
| IKEA Foundation | Grant funder | Mini-grids, SHS,SAS productive use | Global |
| Inspired Evolution | Foreign commercial | SHS, Captive power | sub-Saharan Africa |
| KawiSafi Ventures | Concessional funder | SHS, SAS productive use | sub-Saharan Africa |
| KfW | Grant funder, Concessional funder | Sector agnostic | Global |
| Lendable | Foreign commercial | Fintech, SHS | Global |
| Lion's Head Global Partners | Fund manager | Mini-grids, SHS, SAS productive use | sub-Saharan Africa |
| Maris Africa | Foreign commercial | Captive power, EVs | sub-Saharan Africa |
| Mercy Investment Services | Grant funder | Sector agnostic | Global |
| NEFCO | Fund manager, Concessional funder | Mini-grids, SHS, SAS productive use, Sector agnostic | Global |
| NeoT | Fund manager | Mini-grids, SHS, EVs, SAS productive use | Global |
| Nithio | Fund manager | Mini-grids, SHS, SAS productive use | sub-Saharan Africa |
| NORAD | Grant funder | Climate change, renewable energy, Education, Health | Global |
| Norfund | Concessional funder | Sector agnostic | Global |

| INVESTOR NAME | INVESTOR ARCHETYPE | TARGETED SECTOR | COUNTRY / REGION |
|---|---|---|---|
| OeEB | Concessional funder | renewable energy, Sector agnostic | Global |
| OFID | Concessional funder, Grant funder | SAS productive use, Sector agnostic | Global |
| Oikocredit | Concessional funder | Mini-grids, SHS, SAS productive use, consumer financing, agribusiness | Global |
| Persistent Energy | Fund manager | Mini-grids, SHS, SAS productive use | sub-Saharan Africa |
| PFAN | Concessional funder | Sector agnostic | Global |
| REEEP (Renewable Energy and Energy Efficiency Partnership) | Concessional funder | Utility scale RE, Mini-grids, Captive power, SHS, SAS productive use | Global |
| responsAbility | Fund manager | Mini-grids, Captive power, SHS, SAS productive use, consumer financing, agribusiness | Global |
| Rockefeller Foundation | Grant funder | agribusiness, Health, Mini-grids, SHS, SAS productive use | Global |
| Shell Foundation | Grant funder | Mini-grids, Captive power, SHS, SAS productive use | Global |
| SIDA | Concessional funder | Sector agnostic | Global |
| SIMA Funds | Fund manager | SHS, SAS productive use, consumer financing | Global |
| Stanbic Bank East Africa | Local commercial | SHS | East Africa |
| SunFunder | Concessional funder, Fund manager | Mini-grids, Captive power, SHS, SAS productive use | Global |
| Swedfund | Concessional funder | Mini-grids, SHS, SAS productive use, Utility scale RE, Health, consumer financing | Global |
| Swiss Agency for Development and Cooperation | Concessional funder | Mini-grids, SHS, SAS productive use, Sector agnostic | Global |
| Symbiotics Group | Fund manager, Concessional funder | Sector agnostic, SHS | Global |
| TRINE | Crowdfunding platform | Mini-grids, Captive power, SHS, SAS productive use | Global |
| Triodos Bank | Concessional funder | SHS, SAS productive use, Utility scale RE, Sector agnostic | Global |
| Triple Jump | Fund manager | Mini-grids, Captive power, SHS, SAS productive use, consumer financing | Global |
| UNCDF | Grant funder | Sector agnostic | Global |
| Urwego Bank | Local commercial, Fund manager | Mini-grids, Sector agnostic | Rwanda |
| USAID / Power Africa | Grant funder | Mini-grids, Captive power, SHS, SAS productive use, Sector agnostic | Global |
| Venture South (.net) | Concessional funder | SHS | sub-Saharan Africa |

# Appendix F: Relevant investment funds

| NAME | COUNTRY / REGION | PROGRAMME TYPE | FUND SIZE (IF RELEVANT) | MANAGING ORGANIZATION | FUNDERS |
|---|---|---|---|---|---|
| Rwanda Renewable Energy Fund | Rwanda | Debt fund | $48.9 million | Development Bank of Rwanda | World Bank |
| EnDev RBF | Rwanda | RBF grants | $17.5 million | Urwego Bank | GIZ,UKAid,Dutch Ministry of Foreign Affairs,Norwegian Ministry of Foreign Affairs,Swiss Agency for Development and Cooperation |
| Solar Irrigation in Rwanda | Rwanda | Technical assistance, Grant support | $1 million | Energy for Impact | OFID |
| Scaling up Offgrid Energy in Rwanda | Rwanda | Grant support, Commercial equity | | Energy for Impact | SIDA |
| AlphaJiri Fund | SubSahara africa | Debt fund, Technical assistance, Mezzanine debt, Commercial equity | | AlphaMundi, Triodos Investment Management | Stiftung Abendrot |
| KawiSafi Ventures (KSV) fund | East Africa | Commercial equity | | KawiSafi Ventures | |
| E3 Low Carbon Economy Fund I | SubSahara africa, East Africa | Commercial equity, early stage | | E3 Capital, Lions Head Capital | |
| SunFunder Solar Transformation Fund | East Africa, West Africa | Debt fund | $70 million | Sunfunder | Calvert Impact Capital, DFC, IKEA Foundation, Swedfund, Bank of America, Mercy Investment Services, Schmidt Family Foundation, OeEB |
| ResponsAbility access to clean power fund | SubSahara africa, South Asia | Debt fund | $151 million | responsAbility | FMO, FCDO, OeEB, IFC, Norfund, AHL Venture Partners, Ashden Trust, Bank of America, Calvert Impact Capital, EIB, Facebook, Good Energies Found, Gov of Luxembourg, Shell Foun, Snowball, Swiss State Secretariat for Economic Affairs |
| Pioneer Energy Investment Initiative | SubSahara africa | Convertible debt,Preferred equity | $22.5 million | Acumen | FMO, FCDO, IKEA Foundation, Signify Foundation, Autodesk Foundation |
| Energy Entrepreneur Growth Fund | SubSahara africa | Mezzanine debt | $120 million (targeted) | Triple Jump, Persistent Energy | FCDO, FMO, Shell Found |
| Africa Renewable Energy Fund II | SubSahara africa | Commercial equity | $300 million (targeted) | Berkeley Energy | AfDB, FMO, Swedfund, CDC Group, CDP, Proparco |
| Bamboo Energy Access Mutiplier | SubSahara africa | Commercial equity | $25 million | Bamboo capital partners | ElectriFi |
| EEP Africa trust fund | SubSahara africa | Grant support | EUR 28 million | EEP Africa | NDF, Austrian Development Agency, Swiss Agency for Development and Cooperation, Finnish Ministry of Foreign Affairs |
| SIMA Angaza Distributor Financing Fund | SubSahara africa | Debt fund | | SIMA Funds, Angaza | Shell Foun, UKAid, USAID, Power Africa, Skoll Foundation, Ceniarth |
| Climate Investor 1 | Global | Commercial equity, Senior Debt, Technical assistance | $1.65 billion | Climate Fund Managers | GCF, FMO, Swedfund, Triodos Bank, AEGON, AfDB, KLP, Dutch Ministry of Foreign Affairs, NDF, NWB Bank, Sanlam, USAID |

| NAME | COUNTRY / REGION | PROGRAMME TYPE | FUND SIZE (IF RELEVANT) | MANAGING ORGANIZATION | FUNDERS |
|---|---|---|---|---|---|
| Climate Investor 2 | Global | | $2.1 billion | Climate Fund Managers | GCF, FMO, Swedfund, FMOKLP, Dutch Ministry of Foreign Affairs, NDF, Sanlam, Triodos Bank, USAID, AEGON, AfDB |
| ARCH Africa Renewable Power Fund | SubSahara africa | Ordinary equity | $250 million | ARCH Emerging Markets Partners | AfDB, Africa Rainbow Capital, EU |
| SIMA Energy Access Relief Fund | Global | Debt fund | $80 million (target), currently $68 million | SIMA Funds | CDC Group, DFC, FMO, GCF, Shell Foun, IKEA Foundation, SIDA, Swiss Agency for Development and Cooperation, FCDO, USAID, Power Africa |
| Renewable Energy Performance Platform (REPP) | SubSahara africa | Debt fund | | CAMCO | DFC, FMO, EDFI ElectriFi, Empower New Energy, Finnfund, Trade & Development Bank, Sunfunder, Oikocredit, GuarantCo, Global Climate Partnership Fund, West African Development Bank |
| Virunga Africa Fund window 1 | Rwanda, SubSahara africa | | $250 million | Admaius | Qatar Investment Authority, Rwanda Social Security Board |
| FMO Infrastructure Development Fund | Global | Debt fund, Direct equity, Mezzanine debt | $355 million | | |
| Africa50 Venture Fund | SubSahara africa | Commercial equity, Quasi equity | | | |
| Investment Fund for Developing Countries (IFU) | Kenya, SubSahara africa | Commercial equity, Debt fund | | | |
| FONERWA Rwanda Green Fund | Rwanda | Debt fund, Grant support | $100 million | FONERWA | KFW, UKAid, GCF, UNDP, Adaptation Fund, AfDB, NDF, World Bank, SIDA, GGGI, Development Bank of Rwanda, CDKN, GASCA, Government of Rwanda |
| Solar Securitization Fund | Rwanda | Debt fund | $9 million (target) | Development Bank of Rwanda | N/A |
| Sustainable Energy Fund for Africa | SubSahara africa | Technical assistance, Grant support | | AfDB | AfDB |
| SUNREF | SubSahara africa | Debt fund | | AFD | GCF |
| Transforming Energy Access programme | Global | Technical assistance, Grant support | GBP 225 million | Shell Found. | FCDO |
| EnDev RBF phase 1 | Rwanda | RBF grants | | | |

# Appendix G: Market assessment framework indicators

## Country level

### Political

#### Tariffs

Tariffs and the processes governing how they are determined have a significant impact on several of the sectors considered by the CAP. The sector most exposed to this is the mini-grid sector. In some countries, a 'universal tariff' is applied to any electricity sold. This is often artificially below the cost of production and the regulation surrounding it is commonly manipulated by political aspirants looking to gain national popularity. Countries with a universal tariff are often difficult markets for mini-grid operators. Delivering rural energy is often more expensive than the national electricity tariff (which is often heavily subsidized). If mini-grid developers are allowed to charge **a cost reflective tariff** they are much more likely to be able to run a profitable operation. A lack of regulation or a specific willing-buyer-willing seller approach to tariffs can be beneficial for a mini-grid developer, but in a regularity vacuum or if there is regulatory uncertainty, this will often be perceived to be an added risk from the perspective of any potential investors.

The indicators included here for 'mandated tariff revision cycle' and 'volatility in national grid tariffs over the last 5 years' are proxies for regulatory stability and will have a bearing on perceived risk.

National grid tariff affects the low carbon sectors included in the CAP differently. Because mini-grids and captive power business models are arguably competing against the national grid, a market with high grid tariffs will be advantageous to these businesses. Conversely as the 'fuel' for EVs, cheap electricity (low grid tariffs) is advantageous to the EV sector in a country. For this reason national tariffs are not included in the **Country Level** indicators. Separate indicators have been included for each sector within the **Sector Specific** section and certain indicators are included in multiple sectors but occasionally with different scoring rules.

#### Taxes

Taxes can affect the expenses of a company as well as the profits that can be extracted by third parties from that company. As such they are relevant when discussing investment. Indeed, **this section, including both low carbon asset company-targeted taxes and investor-targeted taxes, was rated extremely important by the stakeholders interviewed.**

Different sectors and different financial aggregation instruments will be exposed to the different taxes to varying degrees. For example, C&I and mini-grid companies are significantly exposed to import duties on renewable energy components whereas EV companies will be more exposed to VAT and taxes specific to that sector.

Indicators in this section include: VAT on renewable energy components, import duties on renewable energy components, tax rate on asset transfers between originators and SPVs, withholding tax rate and corporate tax rate.

#### Government support

The extent to which a government is supportive of an industry can make a huge impact on its commercial viability. There are a great number of indicators that could be included as proxies for this including the existence of actual or planned regulation for specific sectors. Related indicators might include details of any industry lobby groups. For the sake of this work however and with the selection criteria in mind, only one indicator has been included at the Country Level. Others, including the presence of a functional rural electrification agency have been included in the Sector Specific section as appropriate.

#### International ratings

There are many global KPI frameworks and country ratings that have been developed and continue to be developed. For the purposes of this aggregation-based framework the long list of potentially useful systems was reduced to six simplified indicators.

These cover national level investor and operational risks based on a country's credit worthiness and levels of corruption (including Transparency International's Corruption Index and sovereign credit ratings by Fitch, S&P and Moody's). These are useful to investors regardless of the sector. They also include more industry specific indicators that provide some insight into market dynamics affecting the specific business models covered by the CAP. For example, ESMAP's Regulatory Indicators for Sustainable Energy (RISE) provides an excellent consolidated score

for how supportive a country's policy landscape is for renewable energy projects. The PAYGO Market Attractiveness Index is designed largely for PAYGO business models but many of the indicators used are relevant to any **digitally enabled business**. Virtually every company and start-up considered during the course of this work, from all the sectors including EV and C&I can be classified as being digitally enabled businesses.

There were numerous other frameworks suggested by stakeholders during our interviews that were considered and not included. The principal reason being the uncertainty and in some cases openly doubted lack of credibility of the sources. One of these is the World Bank Ease of Doing Business index, which has suffered from inaccurate and falsified data.[259]

### Competing energy services

The cost of incumbent energy services has a significant bearing on the commercial viability of all of the sectors under consideration for CAP. In the case of C&I, any proposed solar energy system will be competing against large diesel generators, the biggest cost of which is the ongoing diesel fuel expense. In countries where there is a significant subsidy on diesel and other fossil fuels, solar C&I projects will have tougher competition. Although the same is true between kerosene and solar home systems, there are immediate benefits (not least of all to improved safety in the home) with using SHS systems that are generally obvious to consumers and will be valued beyond a simple kerosene/SHS price comparison.

Government subsidies on petrol, kerosene and other 'essentials' are often very politicized; manipulated to increase political popularity as elections draw near for example. This can, as we've seen in several African markets, make and break nascent national industries. As such, we have included price volatility here. Greater stability leads to lower risk.

This indicator is calculated as a percentage change in price over a five-year period. Because prices are naturally expected to increase over time, the scoring is more tolerant to a small upward variance in price.

Table G1:

## Political-related indicators in the financial aggregation market assessment framework

| POLITICAL |
|---|
| **Tariffs** |
| Mandated national grid tariff revision cycle? (Y/N) |
| Change in residential grid tariffs over five years (%) |
| Change in C&I grid tariffs over five years (%) |
| **Taxes** |
| VAT on RE components (Solar modules) |
| VAT on RE components (Solar products) |
| VAT on RE components (Batteries) |
| Import duties on RE components (Solar modules) |
| Import duties on RE components (Solar products) |
| Import duties on RE components (Batteries) |
| Tax rate on initial asset transfers between originator and SPV |
| Tax rate on interest payment from SPVs to investors |
| Tax rate on interest payments from originators to SPVs |
| Withholding tax rate |
| Corporate tax rate |
| **Government support** |
| No. of government credit guarantee schemes for RE sector |
| **International ratings** |
| Corruption Index (Transparency International) |
| Big Three Sovereign Credit' rating (Fitch, S&P, Moody's) |
| Regulatory indicators for Sustainable Energy (RISE) Score |
| Regulatory indicators for Sustainable Energy (RISE) Ranking |
| PAYGO Market Attractiveness Index Overall Score |
| PAYGO Market Attractiveness Index Ranking |
| **Competing energy services** |
| Diesel price ($/l) |
| Change in diesel price over five years (%) |
| Petrol price ($/l) |
| Change in petrol price over five years (%) |
| Kerosene price ($/l) |

## Economic

The headline indicators in this section include standard indicators of the size and vibrancy of a national economy as well as its growth and the stability of this growth. Within the context of CAP, countries in Africa with a larger GDP will generally be more conducive to starting, growing and investing in businesses in any of the sectors under consideration.

These indicators are, however, simple and do not capture the complex and multifaceted nature of a healthy economy or a well-developed financial infrastructure. To address this, the IMF developed the Financial Institutions Index[260] that quantifies the 'depth' (size and liquidity) of financial institutions and markets, the access that people have to financial services and the efficiency with which institutions can provide these services (measured by costs and sustainable revenues).

### Monetary policy

The indicators included in this section are designed to provide visibility on factors specific to international investment. Currency risk is a standard metric for any international investor and this was echoed by the results of our stakeholder interviews; **the entire cross section of respondents considered this indicator to be very important.** To capture this risk in a measurable and comparable metric we have used currency volatility, measured as a standard deviation variance against the dollar over 5 years.

### Fiscal policy

A government's fiscal policy will be a good measure of how well the national finances are managed. Poor management is a clear risk indicator for investing in a country. There are numerous qualitative indicators that provide necessary nuance on these issues, but some quantitative data has also been gathered to allow comparison between countries.

Table G2:

**Economic-related indicators in the financial aggregation market assessment framework**

| ECONOMIC |
|---|
| **Size and state of the economy** |
| Annual % GDP growth rate (5-year data) |
| GDP ($ billion) |
| Rolling 5-year GDP average ($ billion) |
| Financial Markets Index |
| **Monetary policy** |
| Currency volatility against USD over five years (standard deviation) |
| Inflation rate (%) |
| Risk free rate (%) |
| Article 14 Country (Y/N) |
| **Fiscal policy** |
| Balance of Payments (% of GDP) |
| National budget deficit (% of GDP) |
| **Inward investment** |
| Total foreign direct investment in RE sectors (% GDP) |
| Total international investment in RE sectors ($ million) (5-year data) |
| Total foreign direct investment (% GDP) |
| **Local finance** |
| Financial Institutions Index |
| Size of Finance Sector -assets held ($B) |
| Domestic credit to private sector (% of GDP) |
| Domestic credit to private sector by banks (% of GDP) |

## Social

The social indicators included in this section provide visibility on the spending power of a population as well as the size of the population and equality with which the wealth is distributed among them.

Table G3:

### Social-related indicators in the financial aggregation market assessment framework

| SOCIAL |
|---|
| **Demographics** |
| Real GDP per capita ($ PPP) -2020 (5-year data) |
| Population size (millions) |
| Population growth rate (%) -2020 (5-year data) |
| Gini coefficient |

## Technological

The indicators describing access to digital services are included to provide insight on the viability of business models relying on digital technologies such as PAYGO or mobile phone apps. These can be seen as technological enabling environment indicators.

Table G4:

### Technological-related indicators in the financial aggregation market assessment framework

| TECHNOLOGICAL |
|---|
| **Access to digital services** |
| Proportion of population using Facebook -2020 |
| Mobile cellular subscriptions per 100 people (5-year data) |
| Mobile money accounts per 1000 people -2020 (5-year data) |

## Legal

Enabling environment indicators also include factors relating to the ease of doing business generally as well as those more relevant to an aggregation platform. Many aggregation models, particularly those built on recurring revenues, benefit from having a local SPV to receive ongoing receivables. Likewise, the costs and ease with which money can be periodically transferred from a country where operations are taking place to investors is of vital importance to a long term, receivables-based engagement.

**Strength of Legal Rights Index**

Strength of Legal Rights Index is a World Bank metric that measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. The data used in this index measure business regulation, regulatory outcomes, and the extent of legal protection of property. They also measure the flexibility of employment regulation and the tax burden on businesses. The fundamental premise of this indicator is that healthy economic activity requires good rules and regulations that are efficient, accessible to all who need to use them, and simple to implement. The index ranges from 0 to 12, with higher scores indicating that these laws are better designed to expand access to credit.

Table G5:

### Legal-related indicators in the financial aggregation market assessment framework

| LEGAL |
|---|
| **Ease of business/aggregation indicators** |
| Time taken to register a company (days) |
| Time taken to open a bank account (days) |
| Cost of setting up a business/special purpose vehicle (SPV) ($) |
| **Competence of transaction market actors** |
| Strength of Legal Rights Index |

## Impact

The data included in this section is of particular importance to investors with an interest in the social and environmental impact of an investment. These could include private foundation-type impact investors as well as ethical funds with a mandate to invest solely in ethically sound portfolios. The existence of well thought through policies on factors like gender and the environment also **provide an indirect measure of the governance of a country and the degree to which a government might want to come into line with international norms.** Therefore they also provide some indication of a more investor friendly environment.

Table G6:
### Environment and gender-related indicators in the financial aggregation market assessment framework

| IMPACT |
|---|
| **Environmental** |
| Environmental protection policies in place? |
| Environmental targets in place? |
| **Gender** |
| Percentage of women in parliamentary seats |
| Percentage of women in ministerial positions |
| Presence of policies and legal frameworks to support gender equality Y/N |
| Presence of policy and legal and institutional frameworks to guide gender mainstreaming in the energy sector Y/N |
| Female graduates from upper secondary institutions % |
| Female graduates from tertiary Science, Technology, Engineering and Mathematics (STEM) courses % |
| Female participation in labour force % |
| Percentage of female professional and technical workers % |
| Percentage of women who have accessed credit from formal or informal financial institutions % |

## Detailed sector level indicators

Sector level indicators are a mix of factors relevant to all sectors (mini-grids, OGS, captive power and EVs) as well as those unique to specific sectors. For example the importance of 'Number of players in the market' should be considered whether one is investing into EVs or mini-grids whereas 'Number of charging stations across the country' will only be relevant to EVs. Tables G7 to G10 show what these indicators are.

At the start of every sector specific section in this report, each sector is rated according to three macro categories; Market maturity, Taxes and Sector Support (see for example Figure G1). The indicators that make up each category differ depending on the sector to which they are relevant. As an example, Figure G2 shows the indicators that are used in the calculation of the "market maturity" macro categories for mini-grids, as well as the weighting given to each of those indicators.

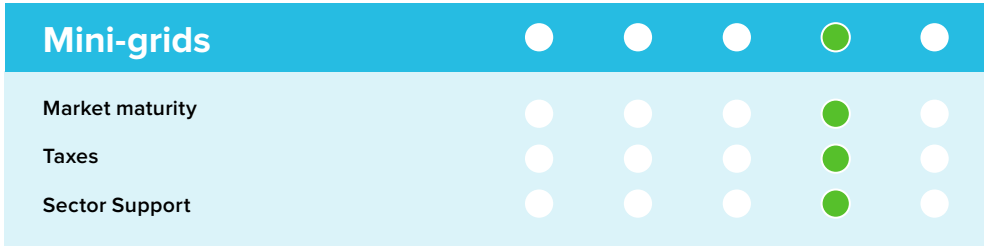


Figure G1: **Example of macro categories used to score a DRE sector**

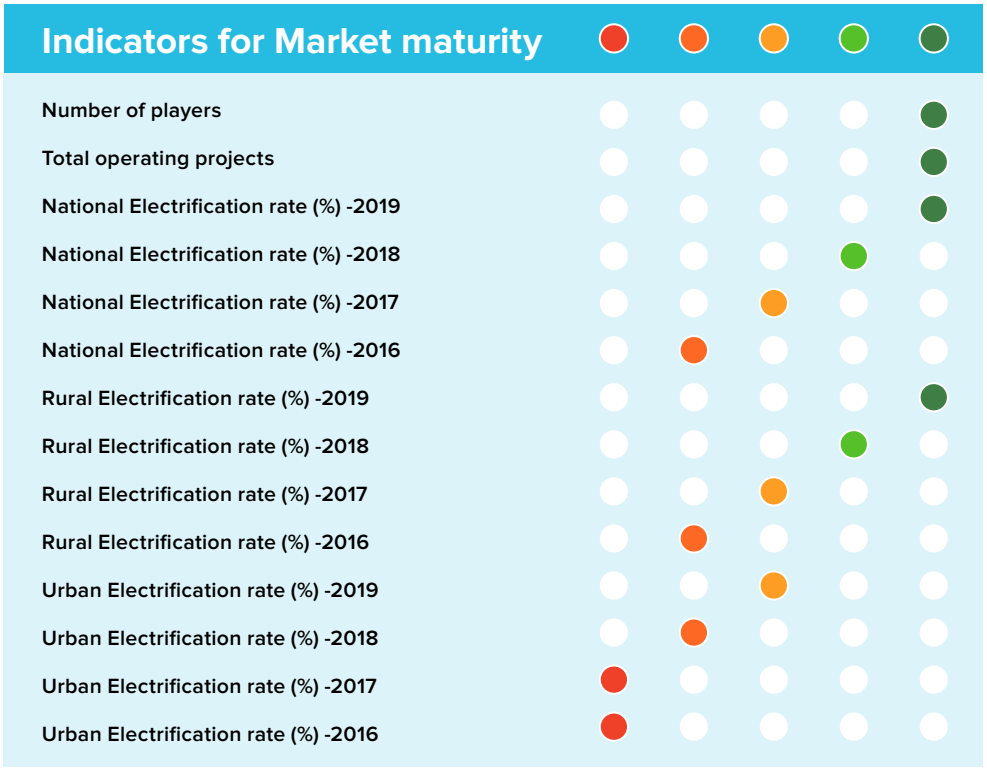


Figure G2: **Indicators used to calculate the market maturity category for mini-grids**

Table G7:

## OGS-related indicators in the financial aggregation market assessment framework

### SHS AND SAS

| **Market** |
|---|
| Number of players |
| CAGR 3 years (%) |
| Cumulative total sales -2020 |
| Cumulative total sales -2019 |
| Cumulative total sales -2018 |
| PAYGO share (%) -2020 |
| PAYGO share (%) -2019 |
| PAYGO share (%) -2018 |
| Average ticket sizes of investment in SHS and SAS sectors ($) |
| **Social** |
| National Electrification rate (%) -2019 |
| National Electrification rate (%) -2018 |
| National Electrification rate (%) -2017 |
| National Electrification rate (%) -2016 |
| Rural Electrification rate (%) -2019 |
| Rural Electrification rate (%) -2018 |
| Rural Electrification rate (%) -2017 |
| Rural Electrification rate (%) -2016 |
| **Regulatory** |
| Presence of a subsidy programme? |
| Dedicated regulations (Y/N) |
| Quality standards (Y/N) |

Table G8:

## Mini-grid-related indicators in the financial aggregation market assessment framework

| MINIGRIDS |
|---|
| **Market** |
| Number of players |
| Total operating projects |
| Total projects commissioned over past year |
| CAGR 3 years (%) |
| Average ticket sizes of investment in Minigrids sector ($) |
| **Social** |
| National Electrification rate (%) -2019 |
| National Electrification rate (%) -2018 |
| National Electrification rate (%) -2017 |
| National Electrification rate (%) -2016 |
| Rural Electrification rate (%) -2019 |
| Rural Electrification rate (%) -2018 |
| Rural Electrification rate (%) -2017 |
| Rural Electrification rate (%) -2016 |
| Urban Electrification rate (%) -2019 |
| Urban Electrification rate (%) -2018 |
| Urban Electrification rate (%) -2017 |
| Urban Electrification rate (%) -2016 |
| **Political** |
| Clear national policies specifically for Minigrids (Y/N) |
| Presence of a functional rural electrification agency |
| Presence of an industry association (Y/N) |
| Cost reflective tariffs allowed? (Y/N) |
| Grid tariffs for Households ($/kWh) |
| Grid tariffs for Businesses ($/kWh) |
| Feed-in-tariff ($/kWh) - solar |
| **Regulatory** |
| Presence of a grid encroachment policy? (Y/N) |
| National technical assistance programme for companies? (Y/N) |
| Presence of subsidy programmes? (Y/N) |
| Dedicated regulations (Y/N) |
| Quality standards (Y/N) |

Table G9:

## Captive power-related indicators in the financial aggregation market assessment framework

| CAPTIVE POWER |
|---|
| **Market** |
| Number of players |
| Total known installed capacity (MW) |
| Total projects commissioned over past year |
| CAGR 3 years (%) |
| Average ticket sizes of investment in captive power sector ($) |
| **Social** |
| National Electrification rate (%) -2019 |
| National Electrification rate (%) -2018 |
| National Electrification rate (%) -2017 |
| National Electrification rate (%) -2016 |
| Rural Electrification rate (%) -2019 |
| Rural Electrification rate (%) -2018 |
| Rural Electrification rate (%) -2017 |
| Rural Electrification rate (%) -2016 |
| Urban Electrification rate (%) -2019 |
| Urban Electrification rate (%) -2018 |
| Urban Electrification rate (%) -2017 |
| Urban Electrification rate (%) -2016 |
| **Political** |
| Clear national policies specifically for captive power? |
| Grid tariffs for Households -2021 ($/kWh) |
| Grid tariffs for Businesses -2021 ($/kWh) |
| Feed-in-tariff ($/kWh) - solar |
| **Regulatory** |
| Is grid interconnection allowed? |
| Is wheeling allowed? |
| Dedicated regulations (Y/N) |
| Quality standards (Y/N) |

Table G10:

## EV-related indicators in the financial aggregation market assessment framework

### EVS

| |
|---|
| **Market** |
| Number of players |
| Estimated number of registered EVs |
| Number of registered motor vehicles |
| Total sales over the past year ($) |
| Average ticket sizes of investment in EV sector ($) |
| **Social** |
| National Electrification rate (%) -2019 |
| National Electrification rate (%) -2018 |
| National Electrification rate (%) -2017 |
| National Electrification rate (%) -2016 |
| Rural Electrification rate (%) -2019 |
| Rural Electrification rate (%) -2018 |
| Rural Electrification rate (%) -2017 |
| Rural Electrification rate (%) -2016 |
| Urban Electrification rate (%) -2019 |
| Urban Electrification rate (%) -2018 |
| Urban Electrification rate (%) -2017 |
| Urban Electrification rate (%) -2016 |
| **Political** |
| Grid tariffs for Households -2021 ($/kWh) |
| Grid tariffs for Businesses -2021 ($/kWh) |
| **Regulatory** |
| Dedicated regulations (Y/N) |
| Quality standards (Y/N) |

Feed-in tariffs have the most relevance to the C&I sector and if well designed can make a significant difference to the commercial viability of C&I business models. Feed-in tariffs provide an additional revenue stream for C&I models and means there is less penalty for over-sizing generation capacity as additional electricity generated can be sold into the grid. Without them, C&I models are forced to be either islanded (not connected to the grid) or one-way (only buying power from the grid). As they will typically be servicing a single customer, this makes them more exposed to off-taker risk.

Additionally, the national grid tariff affects the specific low carbon sectors included in the CAP differently. Because mini-grids and captive power business models are arguably competing against the national grid, a market with high grid tariffs will be advantageous to these businesses. Conversely as the 'fuel' for EVs, low grid tariffs are advantageous to the EV sector in a country. For this reason separate indicators have been included for each sector and certain indicators are included in multiple sectors but occasionally with different scoring implications.

Photo: UNDP Rwanda/Mazane Singles

# References


1 Africa Solar Industry Association, Annual Solar Outlook, 2023 (link)

2 Africa Solar Industry Association, Annual Solar Outlook, 2021 (link)

3 GOGLA, Semi-annual sales and impact data – July-December, 2021 (link)

4 GOGLA, Semi-annual sales and impact data – January-June, 2021 (link)

5 Energy Private Developers Rwanda, Mini-grids, 2022 (link)

6. Africa Solar Industry Association, Annual Solar Outlook, 2023 (link)

7. Africa Solar Industry Association, Annual Solar Outlook, 2021 (link)

8. GOGLA, Semi-annual sales and impact data – July-December, 2021 (link)

9. GOGLA, Semi-annual sales and impact data – January-June, 2021 (link)

10. Energy Private Developers Rwanda, Mini-grids, 2022 (link)

11. Borschiver, F. & Lonsdale, A., Solar Securitization for Rwanda, 2019 (link)

12. Republic of Rwanda, President Kagame launches Ireme Invest at COP27, 2022 (link)

13. UNDP & CBI, Linking Global Finance to Small-Scale Clean Energy, 2022 (link)

14. Aidun, C. & Muench, D., Securitization: Unnecessary complexity or key to financing the DESCO sector? 2018 (link)

15. World Bank, Country Partnership Framework for the Republic of Rwanda for the period FY21-FY26, 2020 (link)

16. Rwanda Governance Board, Home grown solutions, 2022 (link)

17. World Bank, CPIA transparency, accountability, and corruption in the public sector rating for Rwanda, 2022 (link)

18. World Bank, Population total, 2022 (link)

19. The Global Economy, GDP per capita, current dollars, 2021 (link)

20. African Development Bank, African Economic Outlook, 2022 (link)

21. World Bank, GDP per capita (current US$) Rwanda, 2020, (link)

22. RMB, Where to Invest in Africa, 2021 (link)

23. Government of Rwanda, Economy and Business, 2022 (link)

24. African Development Bank, Africa's Macroeconomic Performance and Outlook, 2023 (link)

25. Ministry of Finance and Economic planning, Rwanda, 2020 (link)

26. World Bank News, World Bank Supports Rwanda's COVID-19 Response, 2020 (link)

27. Asian Infrastructure Investment Bank, AIIB Supports Resilience and Recovery of Private Sector in Rwanda, 2021 (link)

28. International Monetary Fund, Rwanda Article IV consultation and fifth review under the policy coordination insturment, 2021 (link)

29. AfricaNews, Rwanda faces soaring food prices amid Ukraine crisis, 2022 (link)

30. African Development Bank, African Economic Outlook, 2022 (link)

31. TFE analysis based on data from: IMF, International Financial Statistics, 2022 (link)

32. TFE analysis based on data from: IMF, International Financial Statistics, 2022 (link)

33. IMF, IMF Executive Board Completes the Sixth Review of the Policy Coordination Instrument for Rwanda, 2022, (link)

34. African Development Bank, African Economic Outlook, 2022 (link)

35. National Institute of Statistics of Rwanda, Rwanda's inflation is 21.7 pct year on year in November 2022, (link)

36. Butera, S., Rwanda raises rate to nine-year high on stubborn inflation, 2023 (link)

37. World Bank, Rwanda – Tax Revenue as a percentage of GDP, 2020 (link)

38. World Bank, Rwanda – Government expenditure as a percentage of GDP, 2020 (link)

39. African Development Bank, Rwanda Economic Outlook, 2022 (link)

40. Fitch Ratings, Fitch affirms Rwanda at 'B+'; Outlook negative, 2022 (link)

41. World Bank, Rwanda Overview: Development news, research, data, 2022 (link)

42. IMF, World Economic Outlook, 2022 (link)

43. Fitch Ratings, Fitch Affirms Rwanda at 'B+'; Outlook Negative, 2022 (link)

44. ENSAfrica, Doing business in Rwanda, 2022 (link)

45. ENSAfrica, Doing business in Rwanda, 2022 (link)

46. ENSAfrica, Doing business in Rwanda, 2022 (link)

47. BDO East Africa Advisory Services, The East African Regional Handbook on Solar Taxation, 2022 (link)

48. Rwanda Development Board, Investment Registration, 2021 (link)

49. The World Bank, Foreign Direct Investment, Net Inflows Rwanda, 2021 (link)

50. The World Bank, Foreign Direct Investment, Net Inflows Rwanda, 2021 (link)

51. World Bank, Net ODA received (% of GNI), 2020 (link)

52. World Bank, Foreign Direct Investment, Net Flows (% of GDP) – Rwanda, 2020 (link)

53. OECD, ODA Flows: Rwanda, (2018-2019) & (2019-2020) (link)

54. OECD, ODA by Sector, Rwanda, 2011-2020 (link)

55. National Bank of Rwanda, Press Release – Quarterly Financial Stability Committee Meeting, 2023 (link)

56. Financial Sector Regulators, Kenya Financial Sector Stability Report, 2022 (link)

57. National Bank of Rwanda, Annual Report, 2019-2020 (link)

58. Bank of Uganda, Supervised Financial Institutions, 2022 (link)

59. Central Bank of Kenya, Bank Supervision, 2022 (link)

60. Bank of Tanzania, Annual Report 2020-2021 (link)

61. EAC, Financial Sector, 2022 (link)

62. National Bank of Rwanda, Press Release, 2022 (link)

63. National Bank of Rwanda, Financial Stability Reports 2019-2020, (link)

64. National Bank of Rwanda, Quarterly Financial Stability Committee Meeting, August 2022 (link)

65. National Bank of Rwanda, Financial Stability Reports 2019-2020, (link)

66. National Bank of Rwanda, Financial Inclusion, 2020 (link)

67. EU & IFAD, Creating an enabling environment for private equity funds in Uganda, 2021 (link)

68. EY & EAVCA, East Africa Private Equity Industry Survey, 2022 (link)

69. African Private Equity and Venture Capital Association, 2021 African Private Equity Industry Survey, (link)

70. Private Equity Wire, RFL and EAVCA partner to enable private investment in Africa, 2021 (link)

71. Forbes Africa, Rwanda's $620mn In Second Eurobond And Increased Investor Appetite, 2021 (link)

72. Reuters, Rwanda raises $620 million through a 10-year Eurobond, 2021 (link)

73. iGST, Consistency Case Study, Actions Supporting Article 2.1c of the Paris Agreement in Rwanda, 2022, (link)

74. National Bank of Rwanda, Financial Stability Reports, 2019-2020, (link)

75. Capital Market Authority, Energicotel 'ECTL' PLC corporate bond begins trading at Rwanda's Capital Market, 2021, (link)

76. Stakeholder interview

77. Capital Markets Authority, Licensees, 2022 (link)

78. PWC, Leveraging Rwanda's position as a tech hub, 2021, (link)

79. Ashimwe, E., Rwanda to Host $1 Billion Pan-African Innovation Hub, 2022 (link)

80. GSMA, State of Mobile Internet Connectivity, 2018 (link)

81. World Bank, Mobile Cellular Prescriptions Rwanda, 2020 (link)

82. Datareportal, Digital Rwanda 2022, (link)

83. IMF, Macroeconomic and Financial Data Rwanda, 2020 (link)

84. National Bank of Rwanda, Payment system statistics, 2021 (link)

85. Bank of Uganda, Data and statistics, 2022 (link)

86. Oluwole, V., Kenya's mobile money transactions surge by 63% in 2021 – report, 2022 (link)

87. ENS Africa, Doing business in Rwanda, 2021 (link)

88. RMB, Where to Invest in Africa, 2021 (link)

89. Stakeholder interview
90. PWC, Rwanda's Investment Facilliation Laws, 2021 (link)
91. PWC, Rwanda's Investment Facilliation Laws, 2021 (link)
92. World Bank, $CO_2$ emissions (metric tons per capita), Rwanda, 2021 (link)
93. iGST, Consistency Case Study, Actions Supporting Article 2.1c of the Paris Agreement in Rwanda, 2022 (link)
94. ND-GAIN Index, Rwanda, 2022 (link)
95. UNFCCC, Rwanda's First Biennial Update, 2021 (link)
96. Aid Atlas, About the OECD's CRS data, 2022 (link)
97. D-REC Initiative, Creating a new global mechanism for the certification of distributed renewable energy, 2023 (link)
98. Government of Rwanda, Official gazette no. 15 of 15/04/2019, (link)
99. Samo, J., Irungu, J., Chelimo, Z., Kinyanjui, J., Musizana, E., Uwanyiligira, A., Quevedo, A. & Feyertag, J., Consistency case study: Actions supporting Article 2.1c of the Paris Agreement in Rwanda, 2022 (link)
100. Rwanda Energy Group, Least Cost Power Development Plan, 2022 (link)
101. Bimenyimana, S., Asemota, G.N.O. & Li, l., The state of the power sector in Rwanda: A progressive sector with ambitious targets, 2018 (link)
102. Rwanda Energy Group, Least Cost Power Development Plan, 2022 (link)
103. Rwanda Energy Group, Electricity Access, 2022 (link)
104. World Bank, Access to electricity (% of the population) – Rwanda, 2020 (link)
105. African Development Bank and Energia, Gender and Energy Country Brief, Rwanda, 2020 (link)
106. EDCL, National Electrification Plan Revision, 2021 (link)
107. Rwanda Energy Group, National Electrification Plan Revision, 2021 (link)
108. Stakeholder interviews
109. TFE analysis
110. Stakeholder interviews
111. Climate Finance Lab, Solar Securitization for Rwanda, 2019 (link)
112. Interview data
113. TFE analysis
114. CNBC Africa, Rwanda launches $100mn facility for private sector green financing, 2022 (link)
115. African Development Bank, Rwanda: African Development Bank approves loans of $180 million to reinforce transmission and last mile connectivity, 2022 (link)
116. AfDB, Rwanda Transmission System Reinforcement and Last Mile Connectivity, 2020 (link)
117. Energy Private Developers Rwanda, Off-grid solutions and clean cooking market sales report, 2021 (link)
118. National Association of Regulatory Utility Commissioners, Exploring Africa's mini-grid tariff methodologies, 2020 (link)
119. RURA, Guidelines No 02/GL/EL-EWS/RURA/2019 on Minimum Technical Requirements for Mini-Grids in Rwanda, 2019 (link)
120. RURA, Regulation No 03/R/EL-EWS/RURA/2019 Governing the Simplified Electricity Licensing Framework for Rural Electrification in Rwanda, 2019 (link)
121. RURA, Draft Tariff Methodology for Isolated Grid in Rwanda, 2020 (link)
122. MININFRA, Ministerial Guidelines on Minigrid Development, 2019 (link)
123. The Republic of Rwanda, Updated Nationally Determined Contribution, 2020 (link)
124. Stakeholder interview
125. EDCL, Rwanda National Electrification Plan – 2021 revision, 2021 (link)
126. Energy Private Developers Rwanda, Mini-grids, 2022 (link)
127. Energy Private Developers Rwanda, Off-grid solutions and clean cooking market sales report, 2021 (link)
128. Stakeholder interview
129. TRAIDE Rwanda, Investment Opportunities in the Rwandan Energy Sector, 2020 (link)
130. REPP, ARC Power, 2020 (link)
131. Mammoser, A., ARC Power to continue mini-grid development in Rwanda, 2022 (link)
132. EPD Rwanda, 2022 (link)
133. GOGLA, Semi-Annual Sales and Impact Data July-December, 2020, (link)
134. GOGLA, Semi-Annual Sales and Impact Data January-June, 2020 (link)
135. GOGLA, Semi-Annual Sales and Impact Data July-December, 2019, (link)
136. GOGLA, Semi-Annual Sales and Impact Data January-June 2019, (link)
137. GOGLA, Semi-Annual Sales and Impact Data July-December 2018, (link)
138. GOGLA, Semi-Annual Sales and Impact Data January-June 2018, (link)
139. GOGLA, Semi-annual sales and impact data – January-June, 2021 (link)
140. GOGLA, Semi-annual sales and impact data – July-December, 2021 (link)
141. MININFRA, Ministerial guidelines on minimum standards requirements for solar home systems, 2022 (offline)
142. Rwanda Energy Group, National Electrification Plan Revision, 2021, (link)
143. Development Bank of Rwanda, Renewable Energy Fund Project, 2020 (link)
144. Stakeholder interview
145. Development Bank of Rwanda, Renewable Energy Fund Project, 2020 (link)
146. UNDP & CBI, Linking Global Finance to Small-Scale Clean Energy, 2022 (link)
147. Stakeholder interview
148. Africa Solar Industry Association, Annual Solar Outlook, 2023 (link)
149. Stakeholder interview
150. IRENA, The Renewable Energy Transition in Africa, 2020 (link)
151. World Bank, Power outages in firms in a typical month, Rwanda, 2019 (link)
152. Rwanda Energy Group, Electricity tariffs, 2022 (link)
153. Nsengimana, C., Comparative analysis of reliable, feasible and low-cost photovoltaic microgrid for a residential load in Rwanda, 2020 (link)
154. Mburu, A., Solar + battery energy storage vs diesel in East Africa, 2020 (link)
155. Magala, J., Essien, J., Sembatya, E., Bhamidipati, P.L. & Pedersen, M.B., Captive solar pv market – Insights from Uganda, 2022 (link)
156. Bhamidipati, P.L. & Gregersen, L.E. Clean captive power: Understanding the uptake and growth of commercial and industrial (C&I) solar PV in Kenya, 2020 (link)
157. EWURA, TANESCO Tariff review, 2016 (link)
158. Shah, S., Electricity cost in Kenya, 2022 (link)
159. Bhamidipati, P.L. & Gregersen, L.E., Clean captive power: Understanding the uptake and growth of commercial and industrial solar in Kenya, 2020 (link)
160. Rwanda Energy Group, Tariffs, 2022 (link)
161. World Trade Organization, Annex 1 Burundi, 2018 (link)
162. RURA, Electricity Licensing Regulations adopted by the regulatory board of Rwanda Utilities Regulatory Authority, 2013 (link)
163. RURA, Electricity Safety Regulations adopted by the regulatory board of Rwanda Utilities Regulatory Authority, 2013 (link)
164. RURA, Regulation No 02/R/EL-EWS/RURA/2016 Governing electricity quality of service in Rwanda, 2013 (link)
165. Bhamidipati, P.L. & Gregersen, L.E., Clean captive power: Understanding the uptake and growth of commercial and industrial solar in Kenya, 2020 (link)
166. Interview data
167. Conzade, J., Kendall, A. & Pais, G., Power to move: Accelerating the electric transport transition in sub-Saharan Africa, 2022 (link)
168. Ange, Y., Rwanda's transition to electric buses, 2022 (link)
169. IRENA, Renewable energy market analysis, Africa and its regions, 2022 (link)
170. Stakeholder interviews
171. Mwai, C., Rwandan startup secures US$9 million to expand electric taxi moto rollout, 2021 (link)
172. Adeyemi, D., Rwandan startup Ampersand raises $3.5m, largest ever e-mobility investment in sub-Saharan Africa, 2021 (link)
173. Bboxx, Bboxx partners with Ampersand to provide thousands of taxi e-motos for drivers in Rwanda, 2022 (link)
174. World Bank, Rwanda, 2022 (link)
175. World Bank, Rwanda Country Partnership Framework for the Period of FY21-FY26, 2020 (link)
176. WeForum, Global gender Gap, 2020 (link)
177. Naicker, V et al., Factors that Constrain Women Entrepreneurs in Kigali Rwanda, 2020 (link)
178. USAID, Engendering Utilities Partner Profile, Rwanda, 2020 (link)
179. WeForum, Global gender Gap, 2020 (link)
180. Rwanda Gender Monitoring Office, Strategic Plan 2017-2022 (link)
181. USAID, Engendering Utilities Partner Profile, Rwanda, 2020 (link)
182. USAID, Engendering Utilities Partner Profile, Rwanda, 2020 (link)
183. ENERGIA, Gender and Energy Country Briefs, Rwanda, 2020 (link)
184. Power Africa, Women in Rwanda Energy, 2019 (link)

185. TFE analysis

186. Rwanda Ministry of Infrastructure, Strategic Paper for e-mobility adaptation, 2021 (link)

187. Conzade, J., et al., Power to move: Accelerating the electric transport transition in sub-Saharan Africa, 2022 (link)

188. UNDP & CBI, Linking Global Finance to Small-Scale Clean Energy, 2022 (link)

189. Samo, J. et al., Consistency case study: Actions supporting Article 2.1c of the Paris Agreement in Rwanda, 2022 (link)

190. Stakeholder interviews

191. TFE, Energy access, data and digital solutions, 2020 (link)

192. Curry D., Stock trading & investing app revenue and usage statistics, 2022 (link)

193. Reportlinker, Digital asset management market with COVID-19 impact analysis, 2022 (link)

194. UNCTAD, World Investment Report, 2021 (link)

195. TFE analysis

196. iGST, Consistency Case Study, Actions Supporting Article 2.1c of the Paris Agreement in Rwanda, 2022, (link)

197. World Bank, Power purchase agreements and energy purchase agreements, 2021 (link)

198. Open Solar Contracts, Streamlining project development and finance processes to accelerate solar power deployment around the World, 2019 (link)

199. Stakeholder interviews

200. Allen & Overy, A&O advises on a receivables financing to help over a million people living off-grid in Kenya access solar products, 2020 (link)

201. Mizner, A., Norwegian investment in Kenyan renewable scheme, 2021 (link)

202. ABDAS, Winch Energy obtains $16 million to finance 49 mini-grids in two countries, 2021 (link)

203. Rwanda Finance Limited, Kigali International Financial Centre, 2022 (link)

204. FSD Africa, Overview, 2022 (link)

205. UNDP, CAP Financial innovation challenge, 2022 (link)

206. European Commission, European Fund for Sustainable Development Plus, 2022 (link)

207. Swedish International Development Cooperation Agency, Guarantee Portfolio, 2022 (link)

208. Theron, A., Financing off-grid energy projects: new securitization programme launched, 2020 (link)

209. Stakeholder interviews

210. FICO, FICO Score, 2022 (link)

211. RENAC, Green banking – Capacity building on green energy and climate finance, 2022 (link)

212. UNDP & CBI, Linking Global Finance to Small-Scale Clean Energy, 2022 (link)

213. TransUnion, TransUnion Menyesha, 2023 (link)

214. Waldron, D., Siek, H., Mattern, M. & Tukahiirwa, W., Getting repaid in asset finance – a guide to managing credit risk, 2021 (link)

215. Power Africa, Financial modeling tool for PAYGO energy access companies, 2021 (link)

216. Power Africa, Additional off-grid market resources, 2021 (link)

217. African Development Bank, Green Mini-Grid Helpdesk, 2022 (link)

218. Odyssey Energy Solutions, Finance, build and operate distributed renewable energy at scale, 2023 (link)

219. GET.invest, GET.invest and A2EI launch global open-source data platform PROSPECT, 2022 (link)

220. Energy Private Developers, Our services, 2021 (link)

221. Solar Power Europe, Engineering, procurement and construction best practice guidelines, 2022 (link)

222. GET.invest, GET.invest matchmaking, 2022 (link)

223. Rwanda Green Fund, How the fund works, 2023 (link)

224. Stakeholder interview

225. Urwego Bank, EnDev Rwanda, 2021 (link)

226. UNCDF, UNCDF finances landmark investment in the BUILD Fund, 2021 (link)

227. EEP Africa, Financing, 2021 (link)

228. REPP, REPP support, 2022 (link)

229. African Development Bank, African Development Bank approves LEAF programmeto promote investment in decentralized renewable energy, 2022 (link)

230. Stakeholder interviews

231. Global Energy Alliance for People and Planet, Lowering costs for renewable energy developers (DART), 2021 (link)

232. The Rockefeller Foundation, New $10M aggregated solar equipment procurement financing facility launches in Nigeria, 2021 (link)

233. CrossBoundary, Study design: Bulk procurement, 2020 (link)

234. Samo, J. et al., Consistency case study: Actions supporting Article 2.1c of the Paris Agreement in Rwanda, 2022 (link)

235. 60 decibels, Off-grid energy benchmarks, 2023 (link)

236. National Association of Regulatory Utility Commissioners, Approaches to captive power regulation, 2021 (link)

237. African Forum for Utility Regulators, Mainstreaming mini-grid tariff settlement tools and methodologies across sub-Saharan Africa Regulators, 2022 (link)

238. Africa Mini-Grid Developers Association, What we do, 2023 (link)

239. Energy Private Developers, EPD Annual report 2021, (link)

240. Africa Clean Energy, Standalone solar market update: Rwanda, 2021 (link)

241. Khaki, N., Borst, R., Kennedy, K. & Mattern, M. PAYGO PERFORM – Financial, Operational, and Portfolio Quality KPIs for the PAYGO solar industry, 2021 (link)

242. GOGLA, Standardised Impact Metrics for the Off-Grid Solar Energy Sector, 2020 (link)

243. NREL, Quality assurance framework for Mini-Grids, 2016 (link)

244. NREL, Performance monitoring of African micro-grids: Good practices and operational data, 2020 (link)

245. PayGops, Disruptive Receivables Finance Project, 2023 (link)

246. PayGops, OpenPAYGO Metrics, 2023 (link)

247. Stitch, Accept and send online payments to grow your business faster, 2023 (link)

248. Lockhart, E., Booth, S & Baring-Gould, I., Customer agreement considerations for micro-grids in sub-Saharan Africa, 2018 (link)

249. GOGLA, GOGLA Consumer protection code, 2023 (link)

250. UNDP, Social and Environmental Standards, 2021 (link)

251. Government of Rwanda, Official Gazette nr. Special of 15/10/2021, (link)

252. Energy Private Developers Rwanda, Off-grid solutions and clean cooking market sales report, 2021 (link)

253. Africa Mini-Grid Developers Association, Benchmarking Africa's Minigrids, 2022 (link)

254. EDCL, Rwanda National Electrification Plan – 2021 revision, 2021 (link)

255. IFC, Creating Markets in Uganda, 2022 (link)

256. EDCL, Rwanda National Electrification Plan – 2021 revision, 2021 (link)

257. IFC, Creating Markets in Uganda, 2022 (link)

258. Africa Solar Industry Association, Annual Solar Outlook, 2023 (link)

259. World Bank, World Bank Group to discontinue Doing Business Report, 2021 (link)

260. IMF, Financial development index database, 2022 (link)



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