



Mozambique: Solar Investment Opportunities

Emerging Markets Task Force Report



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“There is huge potential for the development of solar in emerging markets, where different paths to the sustainable energy transition are possible: the Task Force will allow members to analyse and benchmark the accessibility of selected markets, untangle barriers to investment and engage with local stakeholders”.

Stefano Mantellassi - Eni
Emerging Markets Task Force Chair

SolarPower Europe would like to thank the members of its Emerging Markets Task Force that contributed to this report including:



FOREWORD

BY STEFANO MANTELLASSI, VICE-PRESIDENT ENERGY SOLUTIONS, ENI SPA
Chair of the SolarPower Europe Emerging Markets Task Force

In March 2018, SolarPower Europe launched the Emerging Markets Task Force to identify business and cooperation opportunities and thereby contribute to the energy transition in emerging markets outside Europe. Since then, the Task Force has become an active working group of nearly 100 experts from almost 50 companies, working on a suite of market reports and investigating available financing instruments for solar project development in emerging markets.

The task force has operated through a series of physical and virtual meetings, visits in the selected markets and conferences. We have also engaged in productive discussions with other relevant initiatives such as the Africa-EU Renewable Energy Cooperation Programme (RECP), GET.invest and the IRENA Coalition for Action's Business and Investors Group. After a year of intense work, we are proud to present the Task Force's first report on Mozambique.

This report developed by Eni, with the support of the Task Force, looks into the investments opportunities for solar deployment in Mozambique. It provides a snapshot of the country's business environment and an overview of the major demographic and macroeconomic trends. It also analyses issues related the country's credit and political risk. The report focuses on the energy context, relevant actors and the regulatory framework for investments in renewables. The research finds that Mozambique has an incredible potential for renewable resources, driven by 23,000 GW estimated for solar. The rising electricity demand, the rapid demographic growth and the support from international stakeholders make the country attractive for investments in solar power.

With the support and excellent contribution of our Task Force members, we will soon publish additional reports on India, Ivory Coast, Morocco, Myanmar, Senegal and Tunisia. If you want to be part of this initiative and discover new business opportunities, join SolarPower Europe's Emerging Markets Task Force.



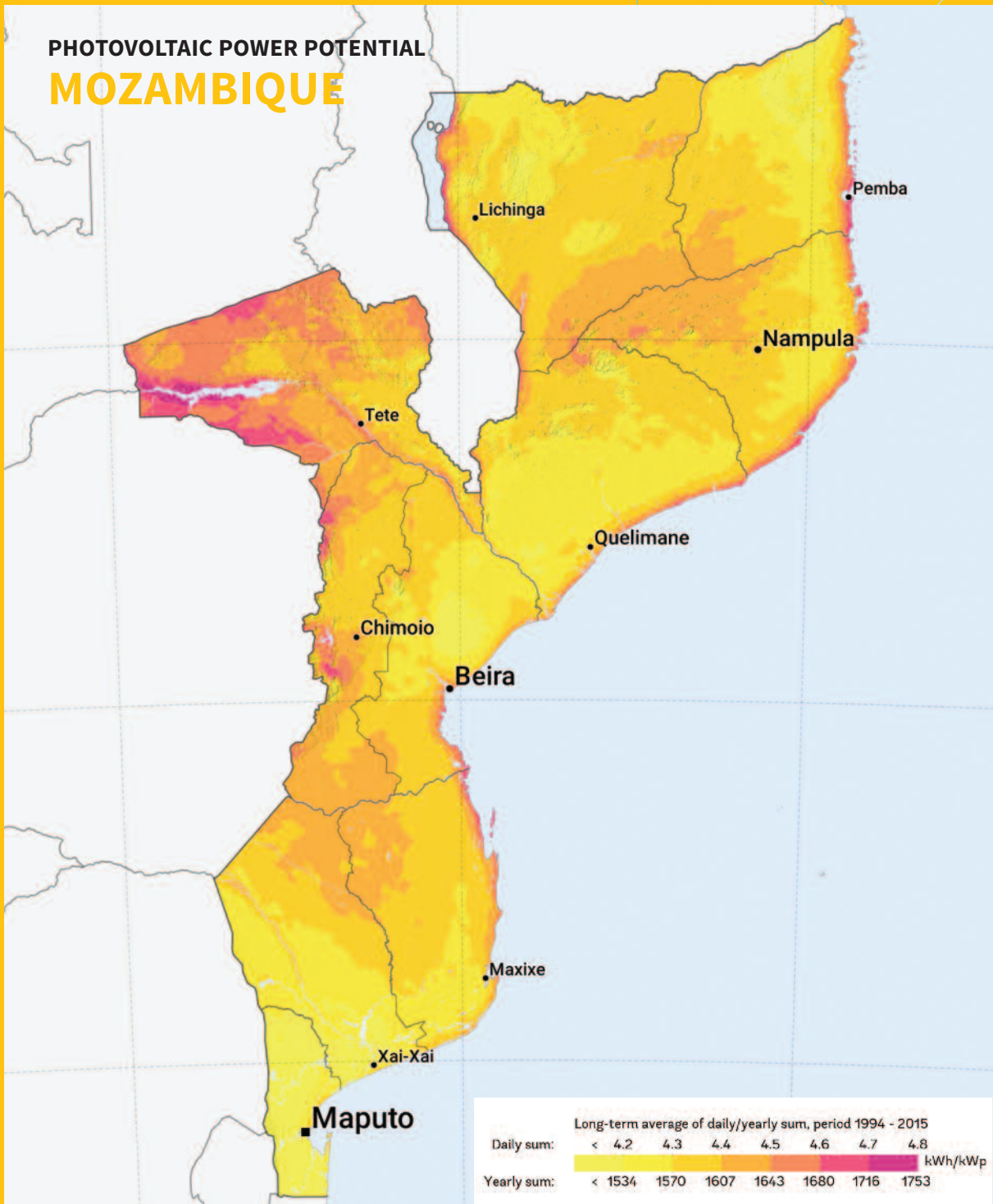
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Chair of the SolarPower Europe
Emerging Markets Task Force.



PHOTOVOLTAIC POWER POTENTIAL MOZAMBIQUE



SOURCE: World Bank, Solargis, 2017.

1. CONTEXT

WORK STREAM

MOZAMBIQUE



OFFICIAL LANGUAGE

CAPITAL

CURRENCY

SURFACE

POPULATION (2017)

POPULATION DENSITY (2017)

EMPLOYMENT IN AGRICULTURE (2017)

GDP (2017)

SUB SAHARAN AFRICA GDP GROWTH AVERAGE (2017)

GDP GROWTH (2017)

LITTERACY RATE (2017)

INTERNET CONNECTIONS (2016)

MOBILE PHONE CONNECTIONS (2017)

Portuguese
Maputo
Metical (MZN)
799,380 m ²
28,829,476
37.72 people per km ²
81%
USD 12.3 billion
2.6%
3.7%
47%
17.52% of the population
40.3 subscriptions per 100

SOURCE: (The World Bank, 2017) (USAID, 2017) (International Telecommunication Unit UN, 2017).

ENERGY GEOGRAPHY

Mozambique has a vast potential to develop renewable energies, especially solar PV. The Mozambican government through the “Fundo de Energia” (FUNAE), published the Renewable Energy Atlas of Mozambique (ALER Associação Lusófona de Energias Renováveis, 2017). The ATLAS shows an overall potential for renewable resources of 23,026 GW driven by solar source 23,000 GW, followed by hydro 19 GW, wind 5 GW, biomass 2 GW and geothermal 0.1 GW. The ATLAS identified 189 locations for grid-connected power plants with a total capacity of 599 MW (ATLAS-FUNAE, 2013).

The Renewable Energy Atlas identified 189 locations for grid-connected power plants with a total capacity of 599 MW. Solar potential is highest around the area of Albufeira de Cahora Bassa and the District of Magoé, in Chimoio District and in the coast from Pemba to Quelimane and from Beira to Maxixe. Global horizontal irradiation varies in a range between 1,785 and 2,206 kWh/m²/year. This potential offers opportunities for both grid-connected and rural electrification (micro-grid or off grid) projects (Trending Economics, 2016).

DEMOGRAPHICS

Mozambique has a population of nearly 29 million inhabitants, mostly very young (the median age of the population is 17.2, currently the 9th youngest in the world) and with a higher-than-average demographic growth of +2.88% in 2016 (compared to the African average of 2.6%).

The population is concentrated mostly in three areas of the country: (i) along the southern coast between Maputo and Inhambane, (ii) in the central area between Beira and Chimoio along the Zambezi river, and (iii) in and around the northern cities of Nampula, Cidade de Nacala, and Pemba. The northwest and southwest are the least populated areas. The vast majority of the population (67%) lives in rural areas with an annual population growth of around 2.5% in 2016 (Trading Economics, 2016).

Urban population represents only 33% but grows at a much faster 3.8% in 2016 compared to 2.5% outside of cities (Trading Economics, 2016).

Therefore, Mozambique has a relatively low urbanisation rate, low population density and an irregular distribution of the population. This makes the country's electrification process more challenging as it requires multiple solutions to meet the population's electricity needs in both rural areas and fast-growing cities.

MACROECONOMIC CONTEXT

After the mid-2000s, Mozambique was marked by several years of fast economic growth with an average GDP growth of 7.5% between 2000 and 2015. Growth prospects remain very high despite the debt crisis of 2016 (Deloitte, 2016).

From the beginning of 2015, Mozambique's GDP growth decreased from 6.6% in 2015 to 3.8% in 2016 following a debt scandal that undermined the credibility of the country in the financial markets (IHS, 2018). The Mozambican government was accused of hiding an unofficial state guaranteed private-debt of USD 1.4 billion (approximately 10.4% of GDP). This greatly affected corporate confidence, reducing liquidity, and triggering a political and financial crisis (ALER Associação Lusófona de Energias Renováveis, 2017).

Multiple international financial institutions withdrew their support to Mozambique following the government's announcement on the real status of its financial situation. This severely affected prospects for foreign direct investments (FDIs). FDIs dropped from more than USD 6 billion in 2013 to around USD 2 billion in 2018 (The World Bank, 2017).

The country experienced significant growth of its public debt, from 88% of GDP pre-crisis in 2015 to 112% in 2017 (International Monetary Fund, 2018).

However, Mozambique's economic prospects remain positive in the medium and long term. The International Monetary Fund forecasts the GDP's increase up to 11% in 2023 (International Monetary Fund, 2018) due to starting natural gas production. The government has also initiated a process of debt restructuring with external creditors. The last visit of the IMF in August 2018 approved the government's measures to contain the fiscal deficit.

Between 2015 and 2016, the Metical (MZN) suffered a sharp depreciation against the US dollar (USD) with the exchange rate dropping from 38.2 MZN per USD in 2015 to 63.6 MZN per USD in 2017 (IHS, 2018). This was due mainly to rising inflation¹, reduced FDIs and the sizeable external debt of the public sector.

As of 2016, Mozambique had a negative trade balance of USD 3.06 billion in net imports. Total imports accounted for USD 7 billion in 2016, driven mostly by refined petroleum products (13% of the total). In 2016,

Mozambique's exports account for USD 3.9 billion and rely mostly on raw aluminium (USD 861 million). Mozambique has a negative trade balance with South Africa, which is Mozambique's main trading partner (USD 810 million). South Africa imports mainly electricity and gas (50% of the imports) from Mozambique through Eskom, the South Africa electricity public utility. China is the second export destination of Mozambique (USD 435 million), followed by Italy (USD 387 million) and India (USD 360 million) (OEC, 2016).

Mozambique is part of a free trade agreement with the South African Development Community (SADC).² It is linked to the EU through the Economic Partnership Agreement (EPA) and with the US through the African Growth and Opportunity Act.

BUSINESS ENVIRONMENT

The business environment still suffers from several constraints. The Doing Business Index published annually by the World Bank provides a general picture of the efficiency of the country's system. It measures the impact of regulatory and fiscal discipline on business activity and the ease/difficulty of doing business in the country through the analysis of selected criteria such as fiscal discipline, access to credit, international trade, tax, register of property titles and investor protection.

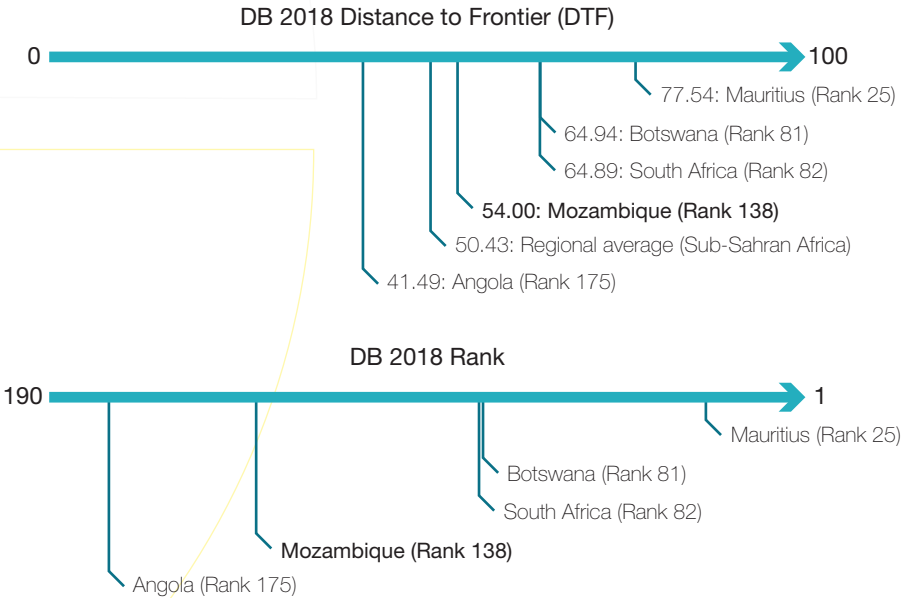
In the evaluation of Mozambique's business environment, weak contract enforcement hampers investor initiative. The law offers some protection for bureaucratic and administrative disputes, but resolutions result in a costly and complex process. The lack of financial inclusion and weak banking regulation and supervisions makes getting credit in Mozambique considerably difficult. Finally, electricity supply remains one of the main constraints for doing business in the country mainly due to the weakness of the electricity infrastructures.

Government effectiveness still remains moderate and the legal system remains in transition and requires structural reforms. The availability of a skilled workforce, the education system and the existence of quotas, which put a limit on the number of foreign workers allowed in the country, represent a significant constraint for business development.

1 Inflation rate jumped from 3.6% in 2015 to 15.1% in 2017.

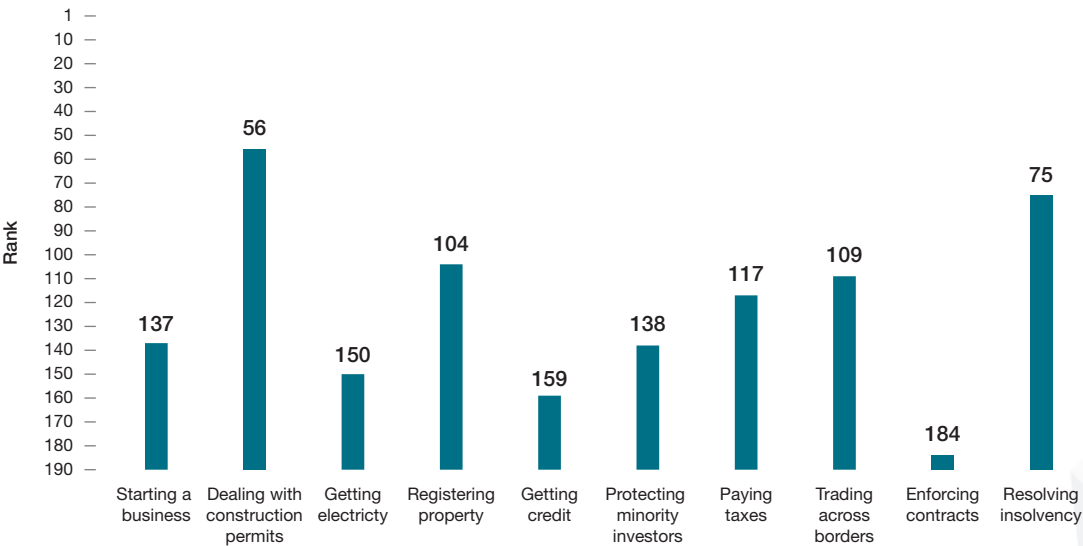
2 The SADC is an inter-governmental organization founded in 1992 and composed by Angola, Botswana, Comoros, Democratic Republic of Congo, Swaziland, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zambia and Zimbabwe.

FIGURE 1 MOZAMBIQUE DOING BUSINESS INDEX 2018



SOURCE: World Bank.
NOTE: The distance to frontier (DTF) measure shows the distance of each economy to the 'frontier', which represents the best performance observed on each of the indicators across all economies in the *Doing Business* sample since 2005. An economy's distance to frontier is reflected on a scale from 0 to 100, where 0 represents the lowest performance and 100 represents the frontier. The ease of doing business ranking ranges from 1 to 190.

FIGURE 2 RANKINGS ON DOING BUSINESS TOPICS - MOZAMBIQUE



SOURCE: World Bank.

1 CONTEXT / CONTINUED

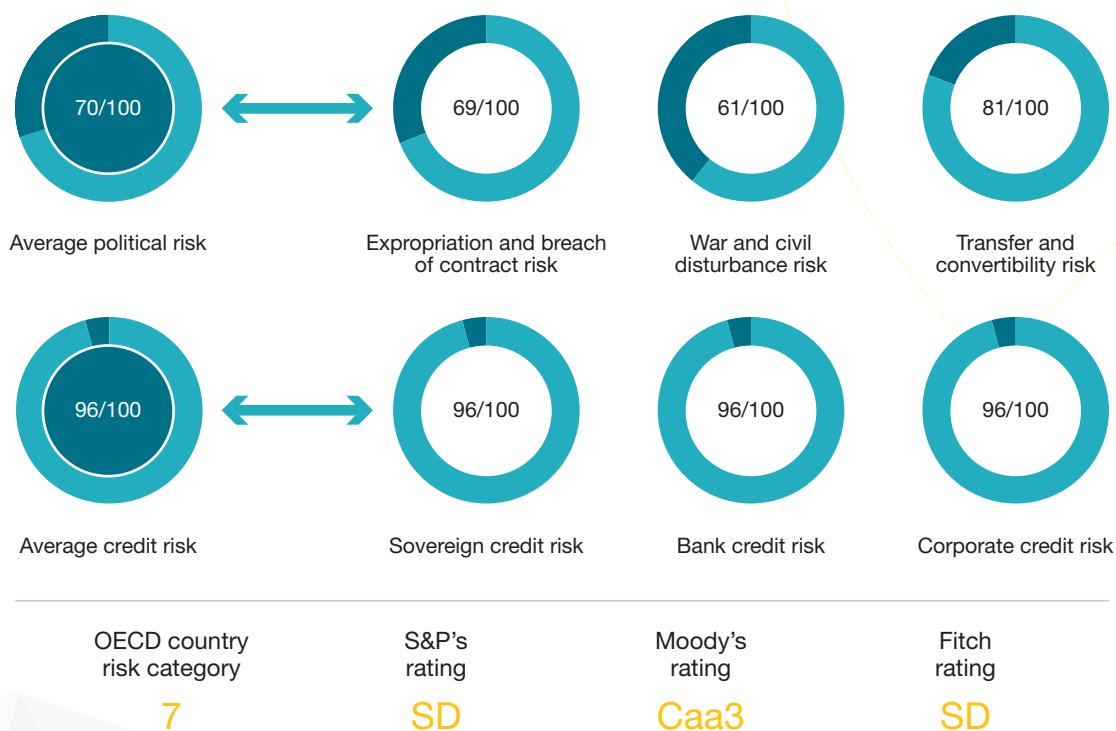
The tax system of Mozambique is considered more transparent than comparable emerging markets in Africa and does not pose any serious risk to business operations. Companies with headquarters or effective management in Mozambique are subject to corporate income tax (CIT) based on their worldwide income. On the other hand, entities without headquarters or with a permanent establishment (PE) in Mozambique (i.e. non-resident entities) are only subject to CIT on the income earned in Mozambique. CIT is levied on taxable profits, defined as accounting profits adjusted to comply with tax law rules, at a tax rate of 32%. Non-resident entities without a PE in Mozambique are only subject to withholding tax (WHT) in Mozambique in respect to income earned in Mozambique (PwC, 2018).

In Mozambique, the land belongs to the State and it cannot be sold in any way. Land is subject to the Right of Use and Land Use (DUAT). This permission can be obtained via customs duties, via the occupation for over 10 years, or upon request. Accordingly, any project, including any project in the renewable energy sector, must comply with Law 19/97 of 1 October 1997, the

Land Law, which aims to simplify administrative procedures relating to DUAT, facilitating access to land by national and foreign investors (ALER Associação Lusófona de Energias Renováveis, 2017).

To obtain a DUAT from the State, there are no minimum or maximum sizes of land, and investors must have submitted an exploitation/land use plan. For areas over 10,000 hectares, this plan must include the terms of any partnership agreement negotiated with the existing DUAT holders (local communities and/or individuals). If the application for a DUAT is accepted, the DUAT issued must be registered in the cadastral register. The state issues a provisional grant for either two years (to foreign persons or entities) or five years (to nationals). If the exploitation/land use plan is fulfilled, the grant becomes final. If the plan is not fulfilled, the land goes back to the state, and investors have to provide their justification. If land rights are revoked due to lack of fulfilment of the exploitation/land use plan, the state receives rights to any improvements made to the land and the grantee has no right to compensation (USAID, 2017).

FIGURE 3 MOZAMBIQUE OECD RISK CATEGORY AND S&P'S, MOODY'S, FITCH RATINGS



SOURCE: (SACE, 2018) Indicators' explanations: OECD Country Risk Category, S&P's rating, Moody's rating, Fitch rating.

Negotiations with commercial creditors to restructure the country's external debt are still ongoing. Consequently, the limited access of Mozambique to external financing generates liquidity pressures, although the external demand and an upturn in export earnings are providing some relief to the country's macroeconomic fundamentals and extend to the sovereign risk rating.

Following the Metical's depreciation in 2016 and aggressive monetary tightening, the Metical has stabilized. However, the monetary reserves are still too limited to allow the central bank to protect effectively the Metical against market fluctuations. Banks' dependence on state-owned companies (as both borrowers and depositors) leaves the financial system strongly exposed to fiscal pressures. The banking sector as a whole remains adequately capitalized, but liquidity levels can vary, especially in smaller financial institutions. Moreover, the liquidity crunch - stemming from a sharp drop in aid, investment and credit inflow - will increase payment risk (The Economist Intelligence Unit, 2017).

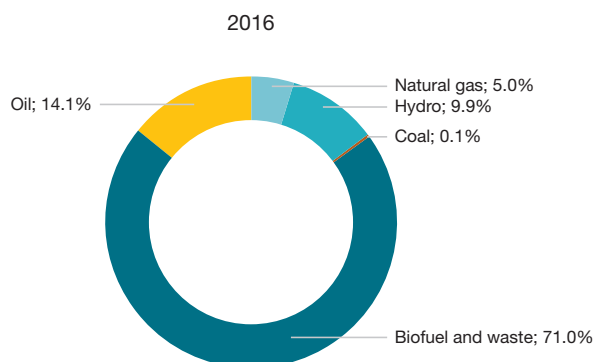
POLITICAL AND SOCIAL CONTEXT

Mozambique is a multi-party system. The President is both the Head of State and Head of Government. This became an independent country in 1975, and immediately experienced a decade of economic crisis and civil war between the Front for the Liberation of Mozambique (Frelimo) and the Mozambican National Resistance (Renamo). A new constitution was adopted in 1990, which enabled free elections, multi-party politics, and a market-based system (Worldatlas, 2017). Frelimo and Renamo remain the country's main political forces, followed by the Mozambique Democratic Movement (MDM). While Frelimo won the most recent presidential elections, held in 2014, and retains a comfortable majority in Parliament, the two main opposition parties have both gained ground. A definitive ceasefire has been in place since December 2016 and negotiations with the government continue to make gradual progress and are ultimately likely to result in a peace deal, further reducing the risk of a return of the insurgents' threat. The next presidential election will take place in October 2019.

In April 2018, Mozambique's National Energy department stated that the country needs to invest in renewable energies. The country's Deputy Energy Director, Marcelina Mataveia, added that the use of renewable energies is an essential part of the challenge of getting electricity to the country. As for renewable energies' public perception, recent research publications on Mozambique point out that an increase in income corresponds to a more diversified use of appliances and sources of energy. The most basic form of energy, firewood, is used for cooking, heating and lighting. Recent assessments of the Mozambican market also show that latent demand for solar PV systems exists at the lower tier of the pyramid, which primarily uses free firewood for cooking, and has little desire or incentive to change. As the income rises and those vital necessities have been fulfilled, households start buying basic appliances and making use of refrigeration, which require electricity.

2 MOZAMBIQUE ELECTRICITY MARKET

FIGURE 4 MOZAMBIQUE ENERGY MIX (2016)



SOURCE: IEA, 2018.

SOURCE	Mtoe
Natural gas	0.67
Hydro	1.34
Coal	0.01
Biofuel and waste	9.62
Oil	1.91
Total	13.55

COUNTRY ENERGY SECTOR SITUATION

The Ministério dos Recursos Minerais e Energia (MIREME) is the principal authority in the country responsible for the energy sector. It plans the national energy strategy and oversees the operations and development of the energy sector. Supervised by the Minister, the Energy Regulatory Authority (ARENE) is a fully independent body with the role of regulating, sanctioning and supervising in the area of energy. The Electricidade de Moçambique (EDM) is the government-owned company in charge of generating, transmitting and commercializing the electricity in the country. Finally, the FUNAE has been established to develop and promote a sustainable management of power sources and to develop off-grid projects to increase electricity access for people living in rural areas.

To meet its energy demand, in 2016 Mozambique used 13.55 MTOE of primary energy sources with a strong year-on-year growth. The energy mix of Mozambique is

dominated by biofuel and waste, covering more than 70% of energy consumption. Then imported oil is the second energy sources followed by hydro and natural gas.

The electricity appetite of Mozambique (defined as the ratio of power consumption vs power production) is lower than the African average due to the country's power export capacity and the lower-than-average electrification. Mozambique has a low electricity appetite, slightly under other comparable countries. Electricity output in 2016 was about 19 TWh, coming mostly from the traditional hydropower. Electricity generation is dominated by hydro with 13 TWh in 2016 (IEA, 2018). The country has one of the largest hydro dams of the continent, the Cahora Bassa Dam which has an installed capacity of 2,075 MW and produces electricity for Mozambique, South Africa, Zimbabwe, Botswana (RECP, 2017). The rest of the electricity production, 3 TWh, comes from natural gas. In 2015, the electricity consumption was 15 TWh and this decreased to 12 TWh in 2016, after growing by 19% between 2014-2015.

FIGURE 5 MOZAMBIQUE ELECTRICITY APPETITE 2016

TWh	ANGOLA	MOZAMBIQUE	SOUTH AFRICA	TANZANIA	ZAMBIA	AFRICA
Electricity production	10	19	249	7	12	801
Electricity consumption	9	12	225	6	11	706
Electricity consumption/ production	0.89	0.64	0.9	0.85	0.96	0.88

SOURCE: IEA, 2018.

NOTE: Index explanation: the correlation between electricity generation and electricity consumption allows to measure the electricity appetite of the country.

Electricity consumption in the country in 2016 was about 12 TWh. Residential and large customers cover a large part of electricity demand. Mozambique's electricity consumption per capita has been regularly increasing and reached 535 kWh per capita in 2015 (413 kWh in 2016), aligning with the African average (583 kWh in 2015, 576 kWh in 2016). Demand for electricity has increased by an average of 7% per annum on average between 2009 and 2015 and is expected to continue to rise rapidly.

The electrification rate of Mozambique is 28%, which is below the average of the SADCs countries. There is a considerable difference in the household with access to the grid in different parts of the country: around 18% in the north, 17% in the centre, and 56% in the south (ALER Associação Lusófona de Energias Renováveis, 2017). Population density in the north of the country is lower and some areas are not yet connected to the national grid. Moreover, in these parts of the country it is difficult to cover electricity demand in the three to four hours after sunset when demand is higher than in the rest of the day. To overcome these obstacles, storage projects in the off-grid-area could help satisfy rising demand. Large-scale energy storage projects can support the development of the region in the next years. In fact, the north of the country will be the main target of foreign investment in oil, gas and mining activities in the 2020s. This region will see production starting in multiple facilities, including downstream operations linked to gas and mining discoveries. This is bound to reshape the region in economic and demographic terms, bringing demographic growth and additional energy needs. This will lead to an increase in electricity demand, thus calling for additional investments in the grid and in power generation.

Mozambique borders with South Africa, the second largest economy in Africa and also has a broader region with a high energy demand. This means that electricity exports could play an important role in supporting the development of large energy projects by balancing the uncertainties linked to the domestic market. Electricity accounted for 6.4% of Mozambique's exports in 2016. South Africa is the recipient of 89% of the country's electricity exports, in large part produced by Hidroeléctrica de Cahora Bassa (HCB) (OEC, 2016). This is followed by Zimbabwe (11%) and, by 2022, Malawi via a 400 kV transmission line between two substations, one at Matambo, in the western Mozambique province of Tete and the other at Phombeya in Malawi.

Mozambique is a member of the Southern African Power Pool (SAPP)³, an association of the national electricity companies created in 1995 under the framework of the SADC. The SAPP aims to coordinate the planning and operation of the electric power system among member utilities and to increase accessibility to rural communities. The SAPP accounts for 40% of EDM's annual revenues and the utility's strategy is to strengthen the regional market through bilateral agreements with Botswana, Lesotho, Namibia, Swaziland and Zambia, and expand exports to Malawi, Tanzania, Zimbabwe and South Africa (EDM, 2018).

ELECTRICITY INFRASTRUCTURE

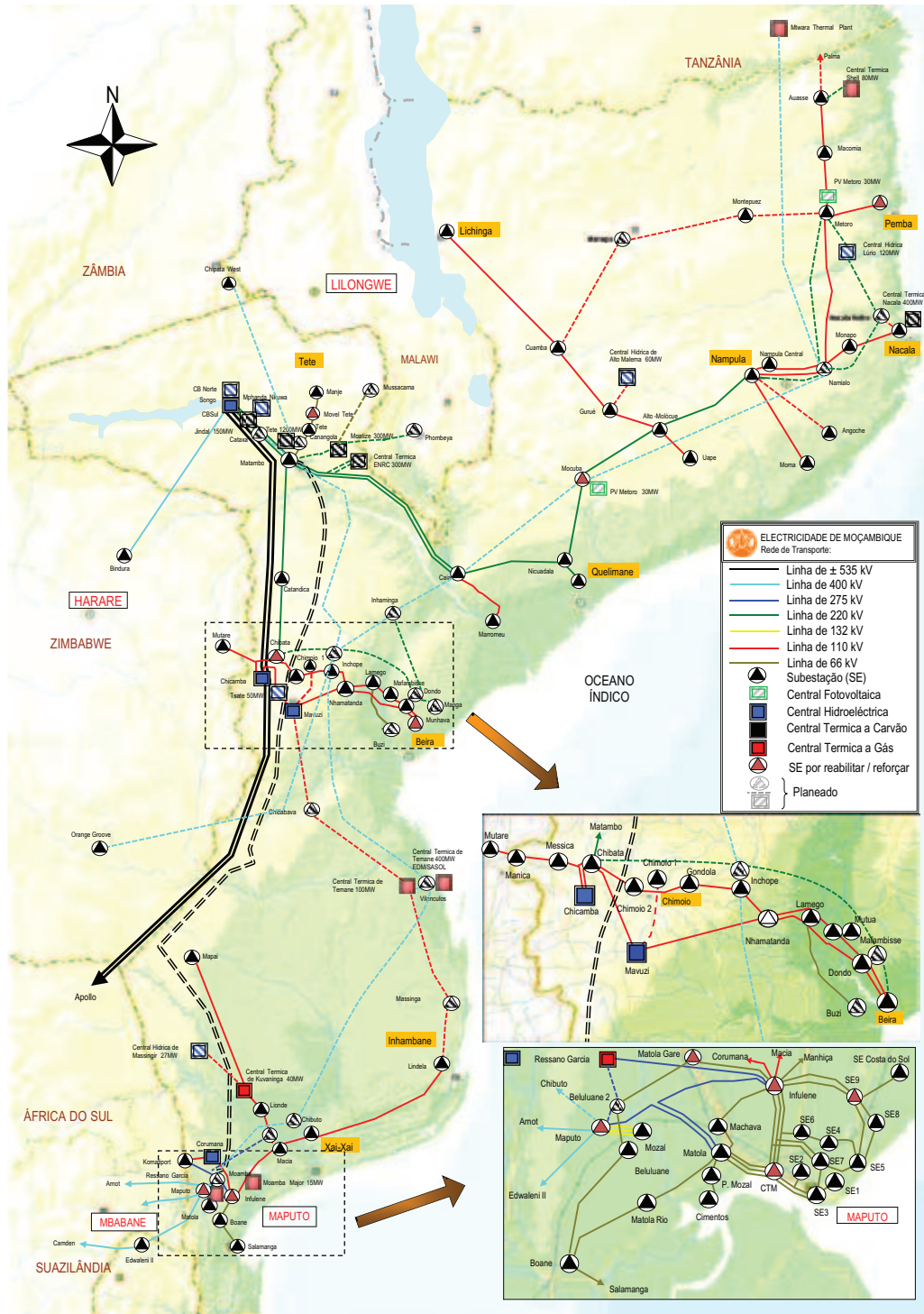
The transmission system is divided into three separate sections and, although the northern and central systems are interconnected, the network does not cover all areas of the country. The city of Maputo is not directly connected to the HCB's plant and it re-imports the electricity from South Africa's main utility – ESKOM. There is only a single transmission line which delivers power to the north-eastern region, making power supply vulnerable to blackouts.

The EDM manages the national grid and is the main counterpart for whoever intends to invest in the national electricity market of Mozambique. In fact, foreign investors have to negotiate grid access directly with EDM. The EDM transmission system includes three regions. In the north, there is a 220 kV transmission system that covers about 1,000 km from the Songo substation to Nampula and continues at 110 kV to the town of Nacala. A separate 220 kV system (operated at 110 kV) extends from Tete, linking with the central region at Chibata. The central region has a 110 kV system connecting the hydroelectric power stations at Chicamba and Mavuzi with the load centres in the Beira-Manica corridor. The southern region comprises a 110 kV network extending from Maputo to XaiXai, Chokwe and Inhambane, together with a 275 km single-circuit line from Maputo to Komatipoort, where it connects with the system operated by ESKOM (ALER Associação Lusófona de Energias Renováveis, 2017).

³ SAPP members: Botswana, Mozambique, Malawi, Angola, South Africa; Lesotho, Namibia, the Democratic Republic of Congo, Swaziland, Tanzania, Zambia and Zimbabwe.

2 MOZAMBIQUE ELECTRICITY MARKET / CONTINUED

TRANSMISSION AND DISTRIBUTION NETWORK IN MOZAMBIQUE



SOURCE: ALER Associação Lusófona de Energias Renováveis, 2017.

The HCB is the operator of the Cahora Bassa hydroelectric plant in the province of Tete. It manages a range of infrastructures including the dam, the South Bank Hydroelectric Power Station, the Songo converter station and the transmission lines. Two monopolar transmission lines connect Songo to the Apollo converter station near Johannesburg in South Africa covering a distance of 1,400 km, 900 of them in Mozambican territory along the border with Zimbabwe. The other two lines link the Songo substation to the Matambo substation, near Tete city. Among the transmission lines leaving the Matambo substation there is a 22 kV line belonging to HCB with the capacity to carry 120 MW, which feeds the Chibata substation, near Chimoio, the capital of Manica Province (Hidroelectrica de Cahora Bassa, 2018).

Finally, the Mozambique Transmission Company (MOTRACO) supplies power to the Mozal aluminium smelter through two 400 kV substations and transmission lines of 132 and 400 kV in the Maputo Province (MOTRACO, 2018).

Facing the constraints of the national grid, the government intends to improve the national connections, especially between the north and the south of the country. Mozambique's government planned to expand the transmission grid by 2025. It aims to connect the resource-rich north to the capital Maputo in the south, and to establish a grid to service the country's major consumption zones and connect to the South African market for exporting energy. The expansion of the grid includes the creation of a transmission project consisting of one 400 kV (High Voltage Direct Current) HVDC line and one 800 kV or 500 kV HVDC line. The lines will carry electricity generated from the Mphanda Nkuwa and Cahora Bassa extension generation projects and will provide power to the SAPP, at an estimated cost of USD 2 billion.

The principal constraints of the electricity infrastructures are:

- the large distances between the main power generation and consumption centres;
- the absence of a sole and national transmission grid, low security of supply and quality standards;
- the existence of a sole dispatch centre to ensure real-time control of all actors in the power system and in its regional interconnection with neighbouring countries and SAPP members;

- the lack of access to the grid in large parts of the country (mostly in the north);
- grid breakdowns;

Overall the fragility of the grid has been highlighted by the loss of supply following the floods of January 2015, and by the over 59 hours of transmission interruptions in 2013. In 2015, floods have damaged the main transmission line connecting the northern part of the country, which led to 4 weeks of outages for some consumers. The average interruption time raised up to 68 minutes in 2013 from 30 minutes in 2009 per day (RECP, 2017).

ACTORS, TARIFFS AND REGULATORY FRAMEWORK

The Conshelho Nacional de Electricidade (CNELEC) is a governmental body in charge of approving tariffs and issuing generation concessions for the electricity supplied through the National Transmission Grid. EDM divides consumers into Large Low Voltage Consumers, Medium Voltage, Medium Agriculture Voltage, High Voltage and Low Voltage. In August 2017 it modified its tariff structure corresponding to a 35% increase. This proposal emerged after the increase in EDM's operating costs including energy acquisition costs, services, materials, equipment and financial costs. In addition to these costs, the company has to face investment costs to renovate and replace obsolete infrastructures. Currently the company is running a deficit on electricity sales, purchasing at between USD 0.09 and USD 0.10 per kWh, and selling at an average of USD 0.076 per kWh, while it is additionally constrained by the Metical's devaluation. EDM connection fees do not comprehend the full cost of connecting new customers and in 2015, the World Bank estimated that it costs EDM an additional USD 1,000 for each ordinary connection. Rules relating to the setting up and approval of tariffs for the electricity supplied through the National Transmission Grid divide consumers into Large Low Voltage Consumers, Medium Voltage, Medium Agriculture Voltage, High Voltage and Low Voltage. Customers pay EDM through bank deposit, ATM payment, direct debit and pre-payment.

2 MOZAMBIQUE ELECTRICITY MARKET / CONTINUED

FIGURE 6 MOZAMBIQUE ELECTRICITY TARIFFS AS OF FEBRUARY 2017

RECORDED CONSUMPTION (kWh)	SALE PRICE				FLAT RATE (Mt/kWh)
	SOCIAL TARIFF (Mt/kWh)	HOUSEHOLD TARIFF (Mt/kWh)	FARMING TARIFF (Mt/kWh)	GENERAL TARIFF (Mt/kWh)	
From 0 to 100	1.07				
From 0 to 200		5.46	3.40	8.24	205.70
From 201 to 500		7.73	4.84	11.77	205.70
Above 500		8.11	5.30	12.88	205.70
Pre-payment	1.07	6.95	4.71	11.80	

MAJOR CONSUMERS OF LOW, MEDIUM AND HIGH VOLTAGE

CLASS OF CONSUMERS	SALE		FLAT RATE (Mt/kWh)
	(Mt/kWh)	(Mt/kWh)	
Major cons. LV (GCBT)	4.70	361.19	602.28
From 0 to 100	4.06	422.63	2,826.99
From 0 to 100	2.51	288.59	2,826.99
High voltage (HV)	3.99	510.27	2,826.99

SOURCE: EDM 2017.

On 17 October 2014, Decree 58/2014 Mozambique created the Renewable Energy Feed-in Tariff (REFIT). Feed-in tariffs should apply to wind and small hydro and solar projects from 10 kW to 10 MW. Prices vary according to technology and capacity. All projects must sell

electricity to the state-owned utility EDM and to become eligible projects, they must be located within 10 km or less from the connection point to the national grid at the time of the conclusion of the PPA. For the time being, EFIT is still under revision and its implementation is supported

FIGURE 7 MOZAMBIQUE REFERENCE PRICES FOR FIT

BIOMASS	SOLAR
Capacity up to 0.5 MW - MZN 5.7/kWh	Capacity up to 10 kW - MZN 13.0/kWh
Capacity up to 1 MW - MZN 5.4/kWh	Capacity up to 1 MW - MZN 10.7/kWh
Capacity up to 5 MW - MZN 4.4/kWh	Capacity up to 5 MW - MZN 8.4/kWh
Capacity up to 10 MW - MZN 4.1/kWh	Capacity up to 10 MW - MZN 7.9/kWh
SMALL HYDRO	WIND
Capacity up to 10 kW - MZN 4.8/kWh	Capacity up to 10 kW - MZN 8.0/kWh
Capacity up to 1 MW - MZN 3.4/kWh	Capacity up to 1 MW - MZN 5.6/kWh
Capacity up to 5 MW - MZN 2.7/kWh	Capacity up to 5 MW - MZN 4.7/kWh
Capacity up to 10 MW - MZN 2.3/kWh	Capacity up to 10 MW - MZN 4.1/kWh

SOURCE: Climate Scope, 2017, Moçambique, Publicação Oficial da República de, 2014.

by the United States Agency for International Development, the Agence Française de Développement (AFD) and KfW Development Bank.

The Electricity Act, approved in 1997, regulates the production, transmission, distribution and commercialisation of the electricity in Mozambique. It has opened the sector to private actors through concession contracts agreed with the MIREME and the PPAs (Power Purchase Agreement) established by EDM. The act established the principle that all activities should be carried out under concessions and created the Conselho Nacional de Electricidade CNELEC as well as FUNAE. The Electricity Act aimed to open all areas of electricity production, distribution and sales to private operators through concession contracts. However, the involvement of private sector operators has been limited so far. IPPs that intend to generate power require a concession granted by the MIREME through public procurement procedures. Concessions are limited to 50 years for hydropower projects and 25 years for all other technologies. The concessionaire has to pay annual concession fees based on its gross revenues. Additionally, to obtain the concession, the project company needs to enter into a PPA for the sale of its capacity and energy with EDM. For the time being, no standardized PPA exists (RECP, 2017).

NEW DEVELOPMENTS FOR SOLAR POWER

Solar capacity in Mozambique has grown from 1 MW in 2011 to 15 MW in 2017, but it still represents a rather small contribution to the overall supply, considering the country's high potential.

There are currently 1.3 MW of solar PV-based mini-grids installed in Niassa, funded by the Government of South Korea, approximately 200 kW (50x 4 kW each) of solar PV-based mini-grids funded through the Portuguese Carbon Fund, and a handful of multi- and bi-lateral programmers (e.g. World Bank, Belgian Development Agency (BTC), UNIDO, Energizing Development) focused on the installation of Solar Home Systems (SHS) on rural institutions, micro-enterprises, and households.

The majority of these projects are off-grid, stand-alone systems and decentralized mini-grids scaled to meet the needs of highly dispersed rural communities. In these areas there are also several operational projects such as PAYGO projects carried out by SolarWorks! and Epsilon Energia. Priority in the selection of the location

of PV systems is given to government institutions including schools, hospitals, and government/administrative functions. In the absence of an incentive system, active commercial markets have not yet developed and there is relatively little private participation (RECP, 2016).

As regards utility-scale projects, Scatec Solar is engaged in building the first large scale solar plant of 40 MW in Mocuba in the Zambézia Province. The project costs are estimated at USD 76 million, funded through equity of USD 14 million, a grant of USD 7 million, and project debt of USD 55 million. Equity partners are Scatec Solar (52.5%), KLP Norfund Investments (22.5%) and EDM (25%) (Scatec Solar, 2018). The project is funded through the project "Climate Investment Fund (ICF)" and Emerging Africa Infrastructure Fund (EAIF). Finally, NEOEN energy group will lead the project of the solar plant in Metoro 30 MW) in Cabo Delgado.

International institutions are important partners of Mozambique in developing renewable energies. The European Union, through the EU Trust Fund for Africa, invests to promote renewables and together with the AFD it launched the "Project to Promote Auctions for Renewable Energies" (PROLER) in partnership with EDM. This will identify areas that could be electrified and will hire contractors through the selection of whoever makes the best technical and financial bids in the public tenders. This project aims to provide technical, financial and legal assistance to EDM. PROLER plans to launch four tenders for the realization of three solar and one wind project, of 30 MW each, by 2021.

KfW, the German government-owned development bank supports the "GET.FIT" Mozambique Program. This aims to foster private investments in renewable energy projects by co-financing a Premium Payment Mechanism which will enable RES projects to reach financial implementation. The scope is facilitating investments through four main instruments: viability gap funding, technical assistance, risk mitigation and grid integration facility. The size of the projects will be around 15-30 MW and each project will include energy storage. In fact, through the storage, GET.FIT aims to increase access to energy in remote areas.

The United States Agency for International Development (USAID) is helping Mozambique in the creation of its Energy Regulatory Authority (ARENE) and is currently working with the Mozambican government to review the electricity energy law. The United States Trade and

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Development Agency (USTDA) has awarded a USD 1.2 million grant for a feasibility study assessing the viability of an up to 100 MW solar PV plant, coupled with storage in the country. In 2017, the World Bank launched the Power Efficiency and Reliability Improvement Projects (PERIP) that will run until the end of 2022. The EU (EEAS, 2016) pledged USD 150 million to improve the operational capacity of the electricity network in the project areas and the operational efficiency of EDM.

Finally, the development of renewable energies in Mozambique is supported by investment and development funds which provide financing for private

investors. In this regard the Africa-EU Renewable Energy Cooperation Programs (RECP) provides a platform to get information on the funds available, their size and type.

Recently, the Mozambican government approved an “Integrated Electricity Master Plan 2018- 2043” that aims to increase the country's capacity to generate, consume and export electricity. In the meantime, EDM published its strategy for the years 2018-2028, aiming to support and lead the initiative of the government. In this, EDM highlighted the need to integrate renewables with the national grid and, at the same time, develop commercial off-grid systems for remote areas (EDM, 2018).

FIGURE 8 RECP FUNDING DATABASE

FUND NAME	TYPE	SIZE
Impact Assets Emerging Markets Climate Fund	Equity or Debt	USD 0.5-5 million
NEFCO Carbon Fund (NeCF)	Equity or Debt	USD 4-5 million
responsAbility-Energy Access Fund	Equity and quasi-equity	USD 0.5-3 million
Energy Access Ventures	Equity/Debt	USD 0.5-4 million
Inspired Evolution Investment – Evolution One Fund	Equity and quasi-equity	USD 10-20 million
Emerging Africa Infrastructure Fund (EAIF)	Debt	USD 10-50 million
Sustainable Energy Fund for Africa (SEFA)	Grant or equity	USD 1-3 million
IRENA/ADFD Project Facility	Debt	USD 5-15 million
OFID – Energy Poverty Program	Grant	USD 0.1-2 million
DI Frontier Investment	Equity, Mezzanine capital (e.g. convertible debt or preferred shares), and short-term debt financing	USD 3-10 million

SOURCE: RECP, 2017.

INTEGRATED ELECTRICITY MASTER PLAN 2018/2043

- The plan defines the needs and the investment priorities for the development of the electricity system that will have to accompany the expected growth in demand over the next 25 years.
- In 2043, the plan envisages an energy demand of about 8000 MW (10 times higher than the current level) and a 7000 MW capacity dedicated to exports.
- The total cost of the plan is estimated to be USD 34 billion as follows: USD 18 billion will be allocated to electricity generation projects, USD 9 billion in the transmission network and USD 7 billion in the distribution. The plan includes the involvement of the government, donors, development finance institutions and the private sector.
- As for the power mix, the plan includes 4,300 MW of hydro, 1,350 MW of coal, 530 MW of solar, 150 MW of wind and 8,500 MW of gas.
- As for the transmission, 400 kV lines will be used for interconnections as well as for connecting the south, center and north of the country. About 70% of this investment will have to be mobilized by 2025 to allow the completion of the transmission line between Cataxa-Tete and Maputo.
- As for distribution, the plan envisages reaching the universal energy access by 2030, through the connection of 7 million families (2 million through off-grid systems).

The regulatory framework is under revision with the support of USAID. The reform of the Electricity Act aims to improve market conditions in the country providing adequate legal guarantees for the investors in the energy market. The current electricity act regulates mainly utility-scale projects. To reach the objectives of the Integrated Master Plan of EDM, the new act intends to simplify authorization procedures for mini-grid projects, which are seen as a priority to increase electricity access in remote areas. This assigns ARENE the role of control over the permissions to private actors to generate, commercialize and transport energy in the country. Actors that intend to start a business activity in the field of electricity generation are subject to obtain different types of permits according to the size of the project and the type of natural resources involved. The new regulatory framework establishes three different kinds of authorization: concession, licence and simplified licence.

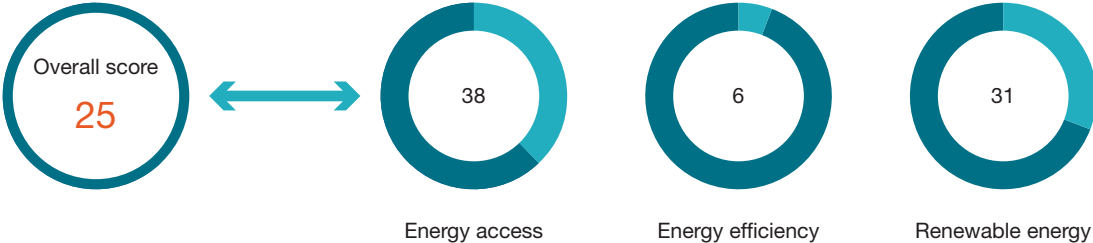
The concession includes projects initiated by the state or state-owned companies with the participation of external stakeholders (private funds, international development institutions, etc.), using hydropower of nominal power from 50 MW, natural gas intended for the development of the national market, and coal required for use in the local industry for the purpose of producing electricity. The concession is granted through public tendering, but exceptionally it may be assigned through a direct award in case of public interest defined by the

government, the participation of a legal person governed by public law and the election by public tender of private investors who enter into a partnership with the legal public corporation. The license affects a project that uses an energy source not covered by concession and with a size more than 4 MW. This is issued at the request of the interested party instructed by ARENE. Then, the simplified license refers to a project, using any power source with a nominal power of less than 4 MW and this shall be issued by ARENE.

These new initiatives should help the government in achieving the target of having universal access to electricity by 2030. The electricity coming from renewable energies should support Mozambique’s climate targets. The country estimates, on a preliminary basis, a total CO₂eq reduction of about 76.5 MtCO₂eq in the period from 2020 to 2030, with 23.0 MtCO₂eq by 2024 and 53.4 MtCO₂eq from 2025 to 2030 (MIREME, 2015).

These efforts will allow Mozambique to improve its position in the Regulatory Indicators for Sustainable Energy (RISE). RISE scores reflect a snapshot of a country’s policies and regulations in the energy sector, organized by the three pillars of the SEforAll initiative: Energy Access, Energy Efficiency, and Renewable Energy. Indicators are assigned to each pillar to determine scores. According to this index, Mozambique’s score is 25/100, in line with the average of African countries.

FIGURE 9 MOZAMBIQUE’S SCORE IN THE REGULATORY INDICATORS FOR SUSTAINABLE ENERGY



SOURCE: RISE, 2018.

3 RECOMMENDATIONS

FOR INVESTORS

Mozambique has the largest power generation potential of all Southern African countries and is ideally located to develop cross-border electricity export projects serving the South African market, Zimbabwe, Zambia and Tanzania.

The northern regions of the country offer the most immediate growth opportunities. High solar irradiation, the presence of industrial activities and the growing presence of multinational companies especially active in mining and oil and gas provide a positive basis for renewable investments.

Furthermore, solar PV also represents a solution to provide access to electricity to local populations of a relatively underdeveloped area of the country, thus contributing or reducing the gap between the south and the north of Mozambique.

The country's current regulatory framework for solar power projects does not involve the use of standard PPAs in the negotiation with the government. Prospective investors should design a bankable PPA when they negotiate with the sovereign counterpart. They should take into account instruments to hedge against currency risk, inflation and economic volatility to mitigate the macro-economic risk associated with projects.

Finally, prospective investors should support the growth of Mozambique's Renewable Energy Association (AMER) as a useful platform to represent the interests of solar investments in the country vis-à-vis decision makers and local regulators.

FOR LOCAL PUBLIC DECISION-MAKERS TO IMPROVE THE FRAMEWORK CONDITIONS FOR SOLAR

The improvement of framework conditions for doing business in solar PV is a first step to develop Mozambique's high potential. Tendering in renewable energy projects can support project development and attract investments given a non-discriminatory and transparent allocation scheme.

It is fundamental to clarify the rules of engagement. In fact, tenders should be based on clear rules and technical parameters on the nature of the projects such as size, targets, location and timeline, in order to produce the expected outcomes and to attract participants.

The participation of free riders to the calls should be discouraged. Pre-qualification criteria such as exit cost in tendering should aim to attract only those actors able to take responsibility for the projects. At the same time, compelling pre-selection criteria should not compromise the competitiveness.

Auctions in solar power should be announced only for projects already planned out. According to the rules of an auction, actors bid for the realization of a project already defined and planned or to obtain the authorization to develop an own business initiative. For the functioning of an auction scheme for solar power, at the time of the auction, the actors should bid for projects already developed in their size, utility and timeline. The higher the level of project design is at the time of the auction, the higher the chance of its finalization.

The adoption of a PPA in the new regulatory framework should follow international standards. This type of PPA includes inflation, exchange rate and default risk of the sovereign counterparts. Moreover, financial development institutions should be part of the contract providing financial guarantees for the counterparts.

The regulatory framework should also clarify and simplify procedures for land access and the rules to get access to the grid.

FOR LOCAL PRIVATE STAKEHOLDERS

Capacity building and skills should be the focus of stakeholders working locally to increase Mozambique's potential to attract investments in solar PV. Training and skills could open up opportunities not only in the operations, but also in local production of technologies and materials applied in PV projects.

Increased work opportunities, skills and technological transfer would also contribute to support renewable energies' deployment politically.

As solar projects advance in the country, the pressure to include local content, capacity building and technology transfer clauses will grow. Rather than waiting for pressure to build up, interested parties should seek public-private partnerships with international actors (e.g. UNDP, World Bank, GIZ) and local players (e.g. EDM, FUNAE) to invest in a socially sustainable value chain.

FOR DEVELOPMENT FINANCE INSTITUTIONS

Development finance institutions are key players in Mozambique and should continue to assist the development of a sustainable market for private investments. Their financial, technical and governance support currently drives investments in renewables. Furthermore, their presence reassures investors concerned by the country's macroeconomic fundamentals and contributes to share best practices.

Development finance institutions' long-term commitment in a country contribute to providing credibility to national policies and their country strategies are taken into high consideration by international investors. Technical assistance programs and other forms of support from international development are key to improve energy access rate in the continent.

Thus, development finance institutions have a central role to play in easing investment conditions for renewable energies in Mozambique. A report of the World Bank highlights that in 37 out of 39 countries in sub-Saharan Africa, revenues collected by utilities do not fully cover costs. All the players involved in the African energy sector should contribute to finding effective solutions to this problem that represents the most important barrier to private investment in the African power sector. In the meantime, credit enhancement mechanisms can play a central role in making renewable electricity projects in Sub-Saharan Africa financially sustainable. Commercial or sovereign-backed guarantees provide the security that energy produced and sold to the national utility will be paid and that costs can be recovered over the project's long lifetime.

Multilateral development finance institutions such as the World Bank and the African Development Bank already provide credit enhancement instruments ('partial risk guarantees'). Also, starting from 2019, the European Fund for Sustainable Development within the framework of the EU External Investment Plan will provide guarantees for renewable energy projects. Ease of access to such schemes and correct pricing are two key factors to attract investments.

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“There is huge potential for the development of solar in emerging markets, where different paths to the sustainable energy transition are possible: the Task Force will allow members to analyse and benchmark the accessibility of selected markets, untangle barriers to investment and engage with local stakeholders”.

Stefano Mantellassi - Eni
Emerging Markets Task Force Chair



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