



Ministry of Foreign Affairs

# *Final Energy report Mozambique*

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# Report Mozambique



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### **Disclaimer**

This document is based on information which is publicly available on the internet. The used publications and websites are mentioned in the Annex 1 of this document.

The information is checked with other sources. The information in Chapter 7 is based on interviews with several experts.

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## 1. Mozambique General overview



Official name	Republic of Mozambique
Area (km <sup>2</sup> )	799.380 (19x Nederland)
Land Area (km <sup>2</sup> )	786.380 (23 x Nederland)
Population	26.573.706 (1,6 x Nederland)
GDP per capita (2016 est) (WB)	\$ 382
Agriculture	cotton, cashew nuts, sugarcane, tea, cassava (manioc, tapioca), corn, coconuts, sisal, citrus and tropical fruits, potatoes, sunflowers; beef, poultry
Industry	aluminium, petroleum products, chemicals (fertilizer, soap, paints), textiles, cement, glass, asbestos, tobacco, food, beverages
CO <sub>2</sub> emissions (t CO <sub>2</sub> /capita)	0.18
Price of electricity (US cents/kWh)	8.9

Source: CIA Factbook, World Bank and Doingbusiness.org

## 2. Energy overview

### Overview of the energy sector/General description

Mozambique's power sector consists predominantly of hydro-electric power generation. However, this mix can be expected to change in the future following large discoveries of coal reserves and offshore natural gas. [5]

Mozambique has large reserves of coal. Total coal reserves are estimated to be about 3 billion tons. There are exploitable reserves of natural gas that might be as high as 3 trillion cubic feet. Natural gas is exported to South Africa via a pipeline. [3]

Mozambique's electricity is largely utilized for exports to neighbouring South Africa and Zimbabwe via the Southern African Power Pool (SAPP). [1]

Nearly all of Mozambique's electricity is produced by the Cahora Bassa Dam, built and completed before independence. Some 60% of Cahora Bassa electricity is used by the Mozal aluminium plant, 30% is a net export to South Africa and, to a lesser extent, Zimbabwe, and the rest used in Mozambique. However, there is no direct line within Mozambique to the main consumption center, the Maputo province. The main line goes through South Africa. [3]

Energy demand is growing considerably, at an average annual rate around 7-8% per year. The electric supply is not consistent and there are blackouts. It is reported to be one of the reasons for the failure of some industries, particularly the clothing industry. All businesses, except Mozal, are constrained by very high electricity costs. In addition, service is unreliable and available only 60–70% of the time. As a result, many businesses and individuals purchase small fuel generators, which add to investment costs and pollution. [3]

Several hydro-generation projects are designed or in the feasibility phase. A major thermal plant project of 600 MW in phase I, to be upgraded to 2,400 MW in phase 2, is being implemented near the new coal mine of Moatize. [3]

As per a 2015 World Bank Policy Note, the power sector in Mozambique faces three key challenges: i) providing reliable and efficient electricity supply; ii) expanding generation and transmission capacity to meet current and future demand; and, iii) providing access to electricity to the vast majority of the population. [1]

Agricultural growth and discoveries of coal and natural gas reserves have boosted Mozambique's economy. However, the GDP dropped to 3.3% growth in 2016, down from 6.6% in 2015. It has been mainly affected by the decline on international commodity prices plus the effects of regional drought. In the power sector, aging transmission and distribution networks create capacity constraints and difficulties for maintenance and collection. [5]

### Primary energy use/Energy supply

<b>Total Primary Energy Supply</b>	<b>ktoe</b>
Coal	498
Crude Oil	0
Oil products	1163
Natural gas	761
Nuclear	0
Hydro	1480
Geothermal, solar, wind, etc.	0
Biofuels and waste	9249
Electricity	-200
Heat	0
<b>Total</b>	<b>12951</b>

Source IEA Statistics 2015

### Energy consumption

<b>Total final consumption</b>	<b>ktoe</b>
Coal	0
Crude Oil	0
Oil products	1122
Natural gas	137
Nuclear	0
Hydro	0
Geothermal, solar, wind, etc.	0
Biofuels and waste	7998
Electricity	1157
Heat	0
<b>Total</b>	<b>10414</b>

Source IEA Statistics 2015

### Electricity use per sector

<b>Final Electricity Consumption</b>	<b>GWh</b>
Industry	9426
Transport	0
Residential	1654
Commercial and Public Services	702
Agriculture/Forestry	30
Fishing	0
Other non-specified	1637
<b>Final Electricity Consumption</b>	<b>13449</b>

Source IEA Statistics 2015

### Electricity production

As of 2016, Mozambique's installed generating capacity was 2.6GW, and Cahora Bassa large hydro accounted for 78% of this. The remaining capacity is comprised of thermal plants and small hydro. Due to the country's natural resources, the energy mix is beginning to transform from a strictly hydro mix to a more diversified one. [5]

Electricity production	GWh
Coal	0
Oil	152
Gas	2554
Biofuels (solid biofuels)	0
Waste	0
Nuclear	0
Hydro	17207
Geothermal	0
Solar PV	0
Solar thermal	0
Wind	0
Tide	0
Other sources	0
Electricity production	19913

Source IEA Statistics 2015

### Transmission and distribution

Power transmission in Mozambique is an especially critical issue for the country for two reasons. First, the large size of the country and its dispersed settlement patterns make dispatching power to the entire population extremely expensive. Secondly, HCB must first export power to Eskom, which in turn sells the power back to southern Mozambique at an increased rate. There are serious technical, financial and national security implications of this. In addition, long-distance dispatching of power wastes a considerable amount of power due to line losses. [3]

The national grid is largely managed by state-owned utility Electricidade de Moçambique (EdM). A small proportion of the lines are owned by Hidroelétrica de Cahora Bassa (HCB), the operator of the Cahora Bassa hydroelectric plant, and by Mozambique Transmission Company (MOTRACO), which supplies power to the Mozal aluminium smelter owned by BHP Billiton. The smelter is not supplied by EdM; it imports power directly from ESKOM SA.

The transmission system has developed as three separate systems, although the northern and central systems have some interconnection. The transmission system does not cover all areas of the country, while power to Maputo is re-imported from South Africa's ESKOM, as no direct connection exists from HCB's plant to Maputo. A single transmission line also delivers power to the north-eastern region, making power supply vulnerable to outages on the line.[1]

The EdM transmission system comprises three regions:

- The northern region has a 220 kV transmission system covering about 1,000 km from the Songo substation to Nampula and continuing 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 linking 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 South African utility ESKOM. [1]

The large distances between generation and consumption, dependency on single lines as well as large parts of the country not covered are major challenges for electricity supply and electrification. Grid breakdowns have led to widespread electricity outages, due to a lack of resilience on the system. This fragility has been evidenced by the loss of supply following the floods of January 2015, and by over 59 hours of transmission interruptions in 2013. The average interruption time increased from 30 minutes in 2009 to 68 minutes 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. [1]

The power is supplied through HVDC (High Voltage Direct Current) lines, owned by MATRACO, a joint venture transmission company between Eskom, EDM and Swaziland Electricity Board (SEB). [5]

On 10 August 2011, the Public-Private Partnership (IPP) law was published, opening up a space for private generators. All IPPs must sell electricity to EDM and negotiate prices on a contract-by-contract basis. As of May 2017, the country had four IPP plants operating. In 2012, 100MW AGGREEKO's thermal plants portfolio came on line. In 2015, the 175MW CTEG and 120MW Gigawatt thermal plants were commissioned. In March 2016, the floating 115MW Nacala thermal plant was inaugurated. [5]

Mozambique targets the provision of grid-connected access to 50% of all households by 2030. This would require EdM to connect 175,300 households per year to the grid. Current EdM plans budget for 100,000 new connections per annum which would result in approximately 38% of all households being connected to the grid by 2030. Off-grid solutions are thus an important element in Mozambique's electrification future. [1]

The urban electricity access rate is estimated at 67%, the rural electricity access is estimated at 27%, with overall electricity access rates standing at 39-40%.

In rural districts, kerosene is the main fuel for lighting. [3]

Access to electricity (2015)	% of the population
Electrification total %	24 %
Electrification urban areas %	64 %
Electrification rural area %	5 %
Access to clean cooking	4 %

Source TRACKING SDG7: THE ENERGY PROGRESS REPORT 2018

### Off-Grid Electrification

Private sector off-grid electrification initiatives in Mozambique are scarce but emerging, with an identified market potential of approximately 4 million households. The majority of the country's direct experience with off-grid technologies has been built through the pilot implementation experiences of Fundo de Energia/National Fund for Rural Electrification (FUNAE). [1]



FUNAE currently acts as both financier and operator. Institutional capacities need strengthening, as well as support in developing clear mandates for off-grid development for relevant institutions such as FUNAE. [6]

FUNAE has installed approximately 70 diesel-based mini-grids operated by local communities, and approximately 1,500 solar home systems (SHS) as of end 2015. It also manages the 50 Vilas Solaires project, which installs 4 kW solar plants with battery backup to electrify rural institutions, micro-enterprises, and households in 50 villages. FUNAE has additionally installed several (approximately 60) solar irrigation systems between 2006 and 2016.

There are a handful of off-grid solar product vendors distributing pico-PV solar lighting products (e.g. lanterns) with at least one company piloting Pay As You Go (PAYG) solar home solutions. Three solar PV-based mini-grids have been installed in Niassa Province, financed by the Government of South Korea, with capacities of 400 kW (Mavago), 400 kW (Mecula) and 500 kW (Muembe).

The UK's Department for International Development is currently preparing a market development initiative, BRILHO, to accelerate investments in the country's off-grid energy access sector. BRILHO has identified five "fast track" private energy access providers, and is expected to attract regional off-grid energy market leaders to the Mozambican market. At least one Portugal-based mini-grids developer has been assessing the feasibility for a broad-based roll out of hybridized PV/Diesel mini-grids with established telecommunications and agricultural sector partners.

The multi-donor supported Energising Development (EnDev) programme, operating in the country since 2005, has prioritized activities in grid densification, improved and clean cookstoves, pico- and micro-hydro (PHP and MHP), and small-scale PV systems. EnDev Mozambique provides training for importers, wholesalers and retailers of solar products and focuses on the establishment of training centres, testing facilities and a research centre, while supporting marketing campaigns. Hydropower activities include the establishment of commercial operator models for MHP and PHP plants and the provision of grants for hydro investments. EnDev provided technical assistance to local developers. The biomass component of EnDev Mozambique supports the implementation of the Mozambique Biomass Energy Strategy (BEST) by supporting marketing, introducing new stove models, and ensuring product quality in the sector. In the first half of 2015, a results-based financing (RBF) scheme aimed at the clean cooking sector was initiated and managed through a call for proposals. [1]

The focus on off-grid systems has shifted from standalone systems to mini-grids, due to its greater rural development potential. However, major institutional and regulatory constraints remain, including the lack of a formal regulator or mini-grid specific policies. [6]

The SEforALL Africa Hub, within the Africa Development Bank, has published in April 2017 the first report assessing the potential for green mini-grids in Mozambique, where they estimate that for 22% of the country's population, or 5.6 million people, the best electrification solution would be mini-grids.

The report shows that mini-grid's highest potential sites are located in the northern coastlines of Cabo Delgado, Nampula, Zambezia and Inhambane as well as inland in Tete and Zambezia close to the Malawi border, in particular near the settlement of Vila Coutinho (Tete), the only major settlement that remains un-electrified under current grid extension plans.

In terms of all different renewable energy sources, and based on results from FUNAE's Energy Atlas, there is a total of 452 sites with hydro or biomass potential, corresponding to 743.26 MW for priority projects and 2,366.05 MW for non-priority projects. As for solar power, given Mozambique's high level of global level irradiation, from the 23 TWp of national estimated potential only 2.7 GW are near existing substation, and the remaining capacity is available for off-grid projects, namely mini-grids. The northern and coastal regions of Maputo and Gaza are the ones with higher wind speeds of

over 7 m/s, but significant wind resource is also available in the provinces of Sofala, Cabo Delgado, Zambezia, Inhambane and Tete.

In terms of costs, estimated costs are approximately USD 550 per MWh for biomass projects for the 10,000 off-grid villages assessed. As for hydro projects, the exact costs are highly site specific depending on several factors such as annual head and flow rate, and vary between USD 100 and 200 per MWh for 1.4 GW of the Atlas' priority sites and varying costs above USD 400 per MWh for the remaining 1GW Atlas' estimated capacity. The average cost for solar off-grid solutions at the 10.000 villages assessed is around USD 375 per MWh for hybrid solar and USD 600 per MWh for 100% solar-battery systems. The estimated cost for hybrid wind solutions is the same as the one for hybrid solar, but for wind only systems they increase significantly to USD 1,550 per MWh due to the cost of large batteries required to manage wind intermittency (SEforALL Africa Hub, 2017). [7]

### 3. Renewable energy

The Government of Mozambique and FUNAE conducted a study on solar, hydro, biomass, wind, geothermal, and maritime resources in the country between 2011 and 2013. This led to the publication of the Renewable Energy Atlas of Mozambique, currently the key reference document for technical potentials of renewable energy in the country. The Atlas (website not functioning at the time of writing) may be accessed at: <http://www.atlasrenovaveis.co.mz/en> [1]

Mozambique has a total renewable potential of ~23,000 GW. Solar potential is the most abundant resource at 23,000 GW, followed by hydro (19 GW), wind (5 GW), biomass (2 GW), and geothermal (0.1 GW). Of this total resource, approximately 7.5 GW of priority projects have been identified in the Atlas, comprising 5.6 GW of hydro, 1.1 GW of Wind, 0.6 GW of solar, 0.13 GW of biomass, and 20 MW of geothermal. [1]

Development of renewable resources has been hindered in the last two decades by the country's dependency on fossil fuels, 19% of which total capacity is based on fossil fuels. Substantial offshore gas reserves discovered in 2011 further reveal that such fuels are likely to remain a driving economic consideration moving forward. [6]

#### Bio-energy

According to the Renewable Energy Atlas, Mozambique has potential to generate over 2 GW of electricity from biomass. Of this, a 128 MW pipeline of priority biomass projects would be viable for development in the short term. The following sectors and market segments offer potential for biogas or biomass technologies:

- Forestry: residues from conventional logging or dedicated plantations (1,006 MW)
- Industry and agriculture: agro-industrial waste from farms, wood and plant waste from manufacturing industries (N/A)
- Pulp industry: "black liquor" from wood-firing processes for use in cogeneration plants (280 MW)
- Sugar industry: residual bagasse from the sugarcane crushing process for use in cogeneration plants; sugar cane foliage (831 MW)
- Municipal solid waste: incineration or deposition in landfills for the production of biogas (63 MW)
- Other: small and medium-sized livestock holdings, vegetable oils extracted for coconut or jatropha. [1]

Use of biomass electricity has the potential to generate the most jobs because Mozambique's small and medium sized enterprises can be involved in all stages of the supply and production chain. Bagasse wastes from the sugar industry, copra wastes from the coconut industry and the other sources could enable Mozambique to quickly build up a power industry based on clean, indigenous biomass fuels. [3]

#### Wind

Measurements of wind power potential are conducted throughout the country. Mozambique has limited wind resources. Average wind speeds reach over 7 m/s in Maputo and Gaza. The Renewable Energy Atlas identified a total wind potential of 4.5 GW, of which 1,100 MW may have potential for grid connection. Out of these, about 230 MW are considered high potential. [1]

Pilot studies are being conducted for wind projects, with only a single 300 kW turbine installed to date in Inhambane Province. [6]

### **Solar**

Mozambique has significant and virtually unexploited solar potential. Global horizontal irradiation varies between 1,785 and 2,206 kWh/m<sup>2</sup>/year. In total, Mozambique has a potential of more than 2.7 GW that could be easily developed. This potential offers many possibilities for grid-connected and rural electrification projects. The Renewable Energy Atlas identified 189 locations for grid-connected power plants, close to existing substations, with a total capacity of 599 MW. The provinces of Maputo and Tete have the highest potential for grid-connected solar projects, essentially due to the favourable grid infrastructure. There is approximately 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 programmes (e.g. World Bank, Belgian Development Agency (BTC), UNIDO, Energising Development) focused on the installation of SHS on rural institutions, micro-enterprises, and households. Current installed capacity in the country is estimated to be 2.2 MW. Since the rural population is highly dispersed, the majority of these projects are off-grid, stand-alone systems and decentralised mini-grids. When selecting locations for PV systems, priority 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. A factor for that may also be that consumers may prefer to wait for arrival of FUNAE funded projects compared to private projects, given their cost disadvantage. The Government's renewable strategy also includes targets for the installation of 100,000 solar water heaters and 5,000 solar refrigerators up to 2025. [1]

### **Hydro**

Mozambique's hydroelectric potential is among the highest in Africa, estimated at 19,000 MW. The country is home to one of the largest hydro dams on the continent, the Cahora Bassa Dam, which has an installed capacity of 2,075 MW and produces electricity for Mozambique, South Africa, Zimbabwe, Botswana and the wider Southern African Power Pool (SAPP). Mozambique itself only procures up to 500 MW from the dam, transported mostly via South Africa. With the majority of power used by neighbouring countries, and the Government of Mozambique as the dam's majority owner (92.5%), the dam is an important source of foreign revenue in the Mozambican economy. [1]

Two large scale projects are planned for the short to medium term: the expansion of the Cahora Bassa Dam (1,245 MW) and the development of the Mphanda Nkuwa Dam (1,500 MW). The Renewable Energy Atlas identified a total of 1,446 potential hydro projects with an accumulated potential of 19 GW. 351 priority projects totalling 5.6 GW were identified, the majority being in Tete, Manica, Niassa, Zambezia and Nampula provinces. According to the Atlas, about 100 sites could be developed in the near term. [1]

As electricity demand across the South African Power Pool (SAPP) grows, developing Mozambique's hydropower potential, and the necessary transmission links to neighbouring countries, will be one of the keys to keeping costs and carbon emissions low. [3]

#### **4. Energy efficiency**

Thus far, in its electricity strategies, Mozambique has done little to seriously promote energy efficiency. [3]

## 5. Governmental framework

Mozambique has been implementing energy sector reforms for over two decades. Policies and strategies have been adopted for the development of new and renewable energy and for biofuels, including multiple blending targets. The implementation of hydropower projects along the expanded grid network close to load centres will promote the connection of renewables-based electricity and increase the electricity access rate. The country's Renewable Energy Strategy 2011 – 2025 outlines the objective to develop 125 MW of small hydro-power as well as a 100 MW up to 2025. While the strategy additionally mentions the objective to utilize solar PV for off-grid electrification, no concrete national electrification plan is currently in place. [1]

Relevant governmental stakeholders are:

### **Ministério dos Recursos Minerais e Energia (MIREME)**

The Ministry of Mineral Resources and Energy is responsible for national energy planning, policy formulation and overseeing the operation and development of the energy sector. MIREME is represented through the Provincial Directorates of Mineral Resources and Energy (DIPREME) in all provinces. [1]

The Ministry of Energy oversees the power sector, while the National Electricity Council (CNELEC) acts as the regulator, however, its scope is under revision with the aim of broadening and strengthening its role. The National Fund for Rural Electrification (FUNAE) is charged with implementing off-grid projects. [5]

### **Government agencies**

The management of traditional fuels that are forest-based is under the Ministry of Agriculture and Rural Development (Ministério da Agricultura - MINAG).

Ministry for the Coordination of Environmental Affairs, MICOA, (Ministério para a Coordenação da Acção Ambiental,) has legislative power regarding the environment, and one of its key functions is to coordinate with line ministries on environmental issues.

MICOA is responsible for Environmental Impact Assessment approvals, Kyoto Protocol reporting and any future Clean Development Mechanism (CMD) application, all of which are relevant to the energy sector and require strong links to both MINAG and ME. [3]

### **Ministry of Land, Environment and Rural Development (MITADER)**

MITADER was created pursuant to Presidential Decree 1/2015, of 16 January; according to the principles, objectives and tasks defined by the Government, it is responsible for governing, planning, coordinating, controlling and ensuring the implementation of policies in the fields of Geomatics and for the management of Land, Forest and Wild Fauna, Environment, Conservation Areas and Rural Development.

The duties and powers of MITADER are as provided in Presidential Decree 13/2015 of 16 March. Its duties comprise the following:

- Land planning for the country's sustainable development;
- Drawing up of proposals for integrated and sustainable development strategies and policies relating to land, environment, conservation areas, forests, wild fauna and rural development;
- Administration and management of land, forests and wild fauna and the national network of conservation areas;
- Planning, promotion and coordination of integrated and sustainable rural development;

- Promoting the development of knowledge in the fields of land, the environment, rural development and related areas;
- Ensuring, maintaining and developing cooperation in the fields of land, environment, forests, wild fauna and rural development;
- Definition and implementation of education, awareness raising and disclosure strategies;
- Intra sectorial coordination and sustainable use of available resources for the benefit of sustainable development.

In the energy field, Quinta da Energia Project was created to provide local autonomy in terms of energy and promote the manufacturing industry at rural level. MIREME and MITADER will coordinate this project (Seventine, 2015). The project envisages the development of biomass plants under a concession regime, to ensure the supply of energy locally and nationwide, with the particularity of generating agriculture jobs and being independent from the national grid (off-grid regime). The established target is to achieve 194 MW at national level, covering 35 districts. The budget is of 5 billion Metical (MITADER, 2015; Seventine, 2015). [7]

### **Energy Regulatory Authority (ARENE)**

ARENE replaced the National Electricity Council – CNELEC

National Electricity Council (CNELEC) was created essentially as a body with an advisory role and other regulatory duties, pursuant to Law 21/97, of 1 October, also known as Electricity Law, as amended by Law 15/2011 of 10 August. In addition to its advisory role, CNELEC was responsible for issuing opinions on the technical merit and quality of proposals submitted in reply to any tender for the concession of activities in the electricity sector.

In May 2017, the National Parliament approved a law extinguishing CNELEC and created ARENE - Energy Regulatory Authority. In August 2017, the President of the Republic enacted the law establishing ARENE, which was in the meantime published in the Official Gazette as Law 11/2017 of 8 September.

ARENE is a public-law legal person, with legal personality and management, decision-making, assets and budget autonomy, supervised by the Minister responsible for the energy area.

Its scope of activity comprises supervision, regulation, representation, control and sanctioning powers, under the terms established by law, in the following fields:

- Production, transmission, distribution and marketing of electricity generated by any energy source, as well as operation of the system and the market;
- Production, storage, distribution, marketing and transport of liquid fuels;
- Distribution, transport, storage and marketing of natural gas at pressures of up to and including 16 bar;
- Production, transport, storage, distribution and marketing of other forms of energy;
- ARENE's scope of activity does not comprise atomic energy.

ARENE's duties as provided in the new law are as follows:

- Protect the rights and interests of consumers, particularly end clients, who are vulnerable to price fluctuation and the quality of the services, promoting their education and information;
- Prevent behaviours against competition and abusive or discriminatory practices, ensuring transparency in market relations between operators, in accordance with the relevant law;
- Protect the interests of the different players in the energy sector, according to the law and respective contracts;
- Ensure the existence of conditions capable of providing the economic and financial balance of activities pursued under a public service, provided they are adequately and efficiently managed;

- Contribute to a growing improvement of economic, quality, technical and environmental conditions of regulated sectors, encouraging the adoption of practices promoting energy efficiency and adequate standards of service quality;
- Promote efficient energy technologies;
- Contribute to the existence of conditions enabling an efficient use of energy resources;
- Exercise functions of conciliation, mediation and amicable settlement in conflicts arising between concessionaires and licensed entities or between concessionaires and licensed entities and their clients, whenever requested, in relation to specifically defined matters;
- Promote national energy security, aimed at a balanced and sustainable development of the country. [7]

### **Fundo de Energia (FUNAE)**

FUNAE was established in 1997 as a public institution. Its objectives are to develop, produce and use different forms of low-cost power and promote the conservation and rational, sustainable management of power resources. Since its establishment, FUNAE has implemented numerous projects using renewable energy technologies to electrify schools, clinics and communities. FUNAE focuses primarily on the deployment of renewable energy, and has in past years been funded by international development institutions (60%) and the national budget (40%). [1]

FUNAE's responsibilities include:

- providing financial assistance or financial guarantees and loans to enterprises whose objectives include the production, distribution and conservation of power in its various forms, as well as the dissemination of production techniques
- offering financial assistance for the installation of power production or distribution systems, and installing such systems
- acquiring equipment and machinery used in the production and distribution of power, and financing or supplying financial guarantees for the purchase such equipment, with a particular focus on new and renewable power sources
- promoting the installation of distribution networks for petroleum products in rural areas, and installing such networks
- providing consulting services and technical assistance
- publishing and funding studies and investigative papers on technologies for the production, distribution and conservation of power products or renewable power
- promoting the development of biomass production and planting forests for this purpose
- providing financial assistance for sourcing transportation of petroleum products for the supply of rural Areas [1]

While FUNAE has reached nearly 5 million beneficiaries through the implementation of more than 1,200 projects, it has been observed to have at times operated in conflict with its own objectives. On one hand, while it is mandated to increase private sector investment in the off-grid sector, it is also mandated to support rural electrification at highly subsidized costs.

It has been noted that some of FUNAE's activities have:

- negatively impacted willingness to pay for energy services among rural communities;
- crowded out commercial energy businesses;
- allowed for a loss of trust in solar technologies, due to mismanaged expectations during the implementation of the Strategy for the Development of New and Renewable Energies (EDENR);
- potentially distorting the market landscape by incentivizing "tenderpreneurs" as opposed to sustainable businesses, and;



- precluding the softening of import restrictions and duties on solar PV, as a result of its solar PV production facility in Bebeluane Industrial park. [1]

### **Electricidade de Moçambique (EdM)**

Electricidade de Moçambique is a vertically-integrated, government-owned electricity utility responsible for generating and transmitting electricity, and distributing it through the national grid. Founded in 1977, EdM buys most of its power from HCB. EdM currently owns hydro/gas and diesel capacity, as well as the national power grid excluding lines owned by HCB and MOTRACO. The Electricity Act passed in 1997 allowed for private participation in the electricity sector under a concession system, as well as maintaining a special position and responsibilities for EdM. EdM's tariff structure doesn't allow for full cost recovery and the utility is thus dependant on Government budget, donor contributions, and debt from financial markets. EdM is also financially constrained due to a significant amount of debt relative to its earnings. In 2013, EdM's current ratio was very close to 1 and the debt service coverage ratio below 1. Although EdM is signing Power Purchase Agreements (PPAs) with Independent Power Producers (IPPs), it is not currently required to follow a pre-agreed least cost generation expansion plan. [1]

In the generation side, EDM has 20% of the country's capacity, however, it receives all power produced by Independent Power Producers (IPP) and by the 2.1GW Cahora Bassa Hydro (HCB). HCB power generation is mainly exported to South Africa, through the South African public utility Eskom's transmission grid. [5]

### **Hidroeléctrica de Cahora Bassa (HCB)**

HCB is the operator of the Cahora Bassa Dam that was built in 1969 by the Portuguese administration. It is the largest power producer in the country with an installed capacity of 2,075 MW. The Mozambican government has increased its stake over the decades, and currently owns 92.5% of the company. The remaining 7.5% is owned by the Portuguese government. [1]

### **Centro de Promoção de Investimentos (Investment Promotion Centre, CPI)**

The centre offers a range of services designed to help domestic and foreign investors gain access to the incentives offered by the government for the establishment of their businesses. Its mandate is to attract and retain substantial direct domestic and foreign investment. The aim is to boost economic growth and wealth creation, including the promotion of public-private partnerships for economic and infrastructure development. At the time of writing, no sector specific exemptions or fiscal incentives exist for renewable energy investment in Mozambique. However, for sectors that are considered to be of public interest, such as electricity and energy, the CPI can evaluate investment proposals to facilitate the acquisition of incentives provided for in the Investments Law and the Tax Benefit Code. Such incentives include exemption from customs duties and VAT for the importation of capital goods, a reduction of the Corporate Income Tax for infrastructure investments by 80% for the first five years, by 70% for years 6 to 10, and by 25% for years 11 to 15. However, market participants note that even when incentives are granted, they are not always uniformly applied. [1]

### **Associação Moçambique de Energias Renováveis (RECP)**

RECP, in conjunction with Associação Lusófona Energias Renováveis (ALER) is currently supporting the setting up of a national Renewable Energy Association with main mission to promote business development, local capacity building and exchange information. It is expected in the course of 2017, the association will be officially launched. The latest information can be found on: [www.amer.org.mz](http://www.amer.org.mz). [??]

**Empresa Nacional de Hidrocarbonetos de Mocambique (ENH)**

Control of the country's upstream oil industry rests with the parastatal upstream oil company, ENH which has exclusive rights to explore for and develop petroleum in Mozambique, and is permitted to exercise these rights in association with foreign investors.

The main players in the upstream industry include: Enron Oil and Gas Resources Inc, Energy Africa, Sasol Petroleum International, Leopardus Resources Limited, Zarara Petroleum Resources, TotalFinaElf SA, Trefoil Ltd, and Lonrho de Provuma Petroleum. BP, Elf and Western are involved in geophysical surveys of offshore areas. [3]

The downstream oil industry relies on imports, mostly from South Africa. Distribution and marketing of fuel products and lubricants is carried out by the state owned oil company Petromoc. Other companies include BP, Caltex. [3]

## 6. Regulatory framework

The regulatory framework is comprehensive and encompasses the following statutes:

Ministerial Law No. 20/97, which is the Organic Act for the DNEE, establishing its duties, areas of activity, levels of administration and structure, including the services to be rendered by the various departments defined in the structure.

The Electricity Law (No. 21/97), defines the general policy for the organization of the electrical energy sector and the administration of the supply of electrical energy. It also prescribes the general legal framework for electrical energy generation, transmission, distribution and sale within the country; and controls the exportation and importation of energy from outside of the national territory, and the granting of concessions for such activities. [3]

### Electricity Act 1997

In 1997, Mozambique reformed the electricity market by adopting the Electricity Act, which was introduced with the aim of regulating electricity production, transmission, distribution and commercialization. The act established the principle that all activities should be carried out under concessions and created the advisory body CNELEC (later replaced by ARENE) as well as FUNAE. In theory, the Electricity Act opened up all areas of electricity production, distribution and sales to private operators through concession contracts, issued by the Ministry of Mineral Resources and Energy, and PPAs set with EdM. However, the involvement of private sector operators has been limited so far, apart from two recently commissioned gas power IPPs and one utility scale solar PV project.

As mentioned earlier, IPPs that intend to generate power require a concession granted by the Ministry. Being granted such a concession is subject to public procurement procedures. Concessions are limited to 50 years for hydropower projects and 25 years for all other technologies. The concessionaire is required to pay annual concession fees based on its gross revenues. In addition to entering into a concession contract, the project company will need to enter into a power purchase agreement (PPA) for the sale of its capacity and energy with EdM. No standardized PPA exists. Currently concerns of conflicting clauses of the Electricity Act and the PPP law raises the question whether generation projects must be selected via a competitive tender process or if direct PPA negotiation is allowed.[1]

### Energy Policy 1998

The Energy Policy is one of the major initiatives governing the sector today. It presents a clear statement on the importance of providing energy to households and productive sectors. The aims of the policy include building capacity and improving management in the electricity sector, thereby increasing exports and efficiency. It outlines the following vision for the sector:

- Guarantee a reliable supply of energy, at the lowest possible cost, in order to meet present demand and future levels based on economic development trajectories
- Increase the energy options available for household consumption
- Secure better efficiency in energy utilisation
- Promote the development of environmentally friendly conversion technologies, namely hydro, solar, wind and biomass
- Promote competitive, dynamic and more efficient entrepreneurs

[1]

### **Energy Strategy (2009)**

The Energy Strategy (EE), approved pursuant to Resolution 10/2009, of 4 June replaces the former Energy Strategy (approved by Resolution 24/2000, of 3 October). The Strategy takes into consideration the developments occurred in previous years, such as: the involvement of the private sector in energy production and transmission activities; development of the distribution and use of natural gas; preparation of electricity master plans; creation of the Ministry of Energy; emergence of new action fields, such as the production and use of biofuels and new and renewable energy.

Other relevant events at the time leading to the adoption of the EE, as mentioned therein, included a change in the global oil market, marked by consecutive increases in price by more than 500%, the emergence of new economies such as Brazil, Russia, India and China, global warming, the scarcity of fossil fuels and the financial market crisis.

All these events altered the energy background and drove a change in the former Energy Strategy. Energy is now treated as a raw material that must be valued to its maximum extent at national level, before considering exports.

The EE highlights the need to keep on and accelerate electrification efforts, giving priority to the expansion of the National Transmission Grid and alternative energies in rural areas, based on low cost solutions, strengthening the cooperation between EDM and FUNAE, whilst introducing investment packages a percentage share to finance electrical equipment and goods intended to foster the productive and efficient energy use (e.g. highly efficient energy-saving light bulbs). The EE further mentions the need to create mechanisms capable of stabilising prices and safeguarding the State's financial health, in the event of sudden changes in prices, and the relevance of taxation so as to create incentives to modernisation, energy efficiency and rationalisation, and technological research and development.

In relation to the sub-sector of renewable energy, the EE stresses that "it must play an increasingly relevant role in the national energy balance, in order to reduce the country's dependence on fossil fuels and allow moving towards a more decentralised energy mix that makes greater use of endogenous resources, for which an inventory of resources and technological development are deemed crucial".

Notwithstanding the adoption of biofuels, the concepts of productive and efficient energy use, and the reduction of energy waste, the strategy still does not advocate renewable energy as a key vector in Mozambique's energy policy. The approach to new and renewable energy is not made in a direct and detailed way, instead, it is referred to only occasionally throughout the law, without developing ways to achieve the goals proposed in relation to the use of this type of energy. [7]

### **New and Renewable Energy Development Policy (2009)**

The New and Renewable Energy Development Policy (PDENR), as approved by Resolution 62/2009 of 14 October, focuses on the importance of using available renewable resources to meet energy needs and sustainable development in Mozambique, seeking to boost access to modern forms of energy and create an investment platform in this field. In addition to assuming that a large part of the Mozambican people depends on wood biomass as well as on human and animal capacity as main energy sources to meet their basic energy needs, the PDENR recognises that Mozambique does not make use of its natural potential in new and renewable energy, and it further stresses the need to improve the access of the more needy population to such energy. According to PDENR, new and renewable energies include, though they are not limited to, human and animal energy, biomass, hydropower, solar radiation, wind, thermal waters and ocean waters.

The objectives of the PDENR are the following:

- Promoting the supply of quality new and renewable energy services at affordable prices, particularly in rural areas;
- Promoting the use of new and renewable energy sources;

- Strengthening energy security at local and national levels;
- Reducing negative environmental impacts at local and global levels;
- Boosting technological development in the sub-sector of new and renewable energy;
- Creation of a competitive new and renewable energy market;
- Contributing to income generation and job creation, fighting poverty at local and national levels;
- Contributing to the achievement of the Millennium Development Goals (MDG).

The document further stresses the intention of promoting the participation of the private renewable energy sector, namely via private or public-private partnerships.

Despite the merely programmatic nature of this policy, key Government measures include the creation of an incentives framework (at political, tax and financial levels) to promote investment, development and use of renewable energy systems, technologies and services. [???]

### **New and Renewable Energy Development Strategy for the 2011-2025 period (2011)**

The New and Renewable Energy Strategy (EDENR) was adopted in 2011, in accordance with the directives of the former Ministry of Energy (currently MIREME), following internal discussion (among relevant institutions), consultation of a large number of players, and practical considerations and experiences of some regions. EDENR recognises the need to develop the use of renewable energy resources and establishes as key strategic goals the following:

- Improve access to better energy services based on renewable sources;
- Develop technology for the use and conversion of renewable energy sources;
- Promote and boost public and private investment in renewable resources. Adding to the above, in this strategy, the Mozambican Government further undertakes the following targets:
  - Reduce poverty and contribute to the achievement of the MDG;
  - Rural development;
  - Increase access to high quality energy services at affordable prices;
  - Reduce the environmental damage associated with the consumption of wood biomass and fossil fuels;
  - Contribute to generate income and create jobs;
  - Energy security.

EDENR further establishes sector goals, divided into off-grid renewable energy objectives, and grid-connected renewable energy objectives. Off-grid renewable energy objectives are aimed at non electrified areas and intend to facilitate the development of several activities, fostering rural development and fighting poverty, ensuring access to higher quality and safer energy sources. Grid-connected renewable energy objectives aim at developing national renewable energy resources for electricity production to the grid, meeting demand, diversifying the energy mix and protecting the environment.

EDENR defined as strategic renewable sources for Stand-alone Energy Systems (SIE), solar energy, wind energy, small and very small hydropower and the promotion of other small and very small-scale renewable energy sources. In terms of the Local Power Grid (REL), the strategic energy sources are wind energy, large and medium-sized hydropower, cogeneration from biomass, ocean energy and geothermal energy.

The subject of biomass is also mentioned in this strategy, which recognises that it is the primary energy source of Mozambican households, that its use is a threat to the conservation of forest cover and has led to significant forest devastation around urban areas and along road and railway corridors. Accordingly, EDENR presents renewable energy sources or electricity as viable options for the slowdown/contention of deforestation processes.

This strategy also addresses possible mechanisms to promote the use of renewable resources, such as tariffs for grid access or feedin tariff, which it identifies as a regulatory tool favouring investment

in the field of new and renewable energy, whether grid-connected or off-grid, and the implementation of tax incentives and benefits.

Although EDENR defined the strategies to achieve the objectives relating to the development of new and renewable energy, it should be noted that tax and other financial incentives were not yet established, thus hindering projects implementation. [7]

### **The National Energy Strategy (2014 – 2023)**

Mozambique's Energy Strategy was designed for a ten-year period (2014 – 2023) and it provides a vision and path to respond to the challenges and opportunities in the power sector. The main goals are to reinforce Mozambique's position as an important regional energy producer, to support social development and poverty alleviation, and to promote general economic growth. The strategy for instance comprises the following:

- Regulation – Establishment of an energy authority as the regulator for the entire energy sector, which will include liquid fuel, natural gas (downstream) and renewable energy.
- Energy efficiency – To promote habits of reasonable and responsible consumption of energy and to create a legal framework that guarantees these behaviors both in the efficient production and consumption of energy.
- Feed-in Tariff – To be approved by the government, the tariff for renewable energy is for projects in which the generation cost is equivalent to the contract cost of natural gas power stations, with an extra incentive on the bidding process and an environmental tax. Special attention will be made so that there are no increases to the EdM operational and maintenance costs, which need to be retained.
- The new tariff methodology settlement – Due to the large-scale energy projects in Mozambique, the investments made are significant. Therefore, tariff methodology settlement is an important tool used to help 'bail out' the investor in this sector, especially in operations on the local market. The new tariff needs to take the operation and maintenance cost into account.
- Rural and Peri-Urban Electrification – The main challenges are extending grid access, improving the quality of the energy, and improving the capacity of the administrative posts to promote the productive use of energy and to generate more income. The goal is to mobilize USD 200 million every year over the next seven years to expand and improve energy access in the rural and peri-urban areas, achieving 44% universal access by 2021 and 50% grid based access by 2023.

The Government of Mozambique also plans to launch a transmission and distribution grid rehabilitation program for the entire national territory to increase energy quality and efficiency in urban areas. There are also plans to further strengthen the institutional capacity of FUNAE to increase its role in the process of rural electrification. [1]

### **Proposed feed-in tariff (FIT)**

On 17 October 2014, Decree 58/2014 was approved creating Mozambique's feed-in tariff for renewable energy. Further regulation is still pending to implement the price premium. Decree 58/2014 creates Mozambique's feed-in tariff, which applies to biomass, wind, small hydro and solar projects from 10 kW to 10 MW. Prices vary according to technology and capacity.

According to this Decree, all projects must sell electricity to the state-owned utility Electricidade de Moçambique. Tariffs proposed can be found at:

<http://global-climatescope.org/en/policies/#/policy/4631> however are already outdated as they are in MT and in the meantime a devaluation of 50% has taken place versus major currencies. It is therefore expected that anyone developing an on-grid system will have to negotiate on a bilateral basis with EdM.

Additional laws and regulations of relevance to the sector include the Regulations to License Electric Installations (2007), and the Concession Decree (2000).

In 2015 Mozambique received a USD 0.74m grant from the African Development Bank's Sustainable Energy Fund for Africa (SEFA) to enhance the enabling environment for private investments in renewable energy. The assignment is currently underway, with the objectives of supporting the implementation of the country's feed-in tariff regime for small/medium renewable energy projects through the provision of standardized power purchase agreements, guidelines for grid connectivity and investor guidelines for prospective developers. The grant will additionally lay the foundations for a mini-grid regulatory framework, with special focus on designing a tariff structure and corresponding technical and environmental regulations, as well as providing capacity-building and awareness-raising activities for national and local representatives.

Currently, RECP is supporting MIREME in dealing with minigrid concessions through legal technical assistance, which will feed into a reform study planned to be undertaken by the African Development Bank in the course of 2017. [1]

Although the decree is available, injection of power into the grid cannot happen yet as some regulation is still to be approved. As of May 2017, the FiT mechanism was under revision. Biofuels are viewed as an important sector for development within the country. In 2009, a national policy and strategy for biofuels was released, which seeks to develop the biofuels sector. In 2011, the blending mandate and tax schedule for biofuels was released. [5]

### **Biofuels Policy and Strategy (2009)**

The Biofuels Policy Strategy, approved by Resolution 22/2009 of 21 May to promote biofuels, envisages the promotion of biofuels through the creation of an appropriate platform, based on two key principles: (i) "Promotion and use of agro energy resources to obtain energy security and a sustainable social and economic development, while contributing to the reduction of Greenhouse Gases that aggravate global warming, by selecting and adopting more adequate production methods and technologies in agriculture and industry"; and (ii) "the need to face the instability, unpredictability and volatility of fuel prices on the international market, and reduce the country's dependence on imported fossil fuel and the burden of imports on the national economy". This policy helped to lay down strategies for the development of biofuels (especially ethanol and biodiesel) as a form of using the country's natural resources and fight poverty, diversifying the national energy market and seeking less polluting energy sources when compared to traditional fossil fuels.

This led to the approval of the Regulation on Fossil Biofuels, pursuant to Decree 58/2011 of 11 November, which establishes the regime governing the production, processing, marketing and distribution of biofuels and respective blends. This regulation provided that the production, processing, storage and distribution activities to introduce biofuels blends in the national market will be subject to licences to be issued by the relevant Ministry (currently MIREME), if production is lower than 12,000,000 litres per year or by the Council of Ministers, if it exceeds this figure. Moreover, such licensing must be accompanied by an investment plan showing the technical, economic, financial and environmental viability of the project.

These requirements will not be applied to production below 5,000 litres per year or for personal use. As regards raw materials for the production of biofuels, it is established that the same must be supervised by the Ministry responsible for Agriculture (currently, MASA - Ministry of Agriculture and Food Safety).

The promotion of biofuels in Mozambique is also associated to PETROMOC, a publicly-owned company subject to MIREME's supervision, which was appointed by the Government to implement biofuels' projects in Mozambique, and is presently directly involved in various projects in this field. [7]

**Energy debates**

One of the main questions relates to the adoption of a single-buyer model with wholesale competition. This includes re-structuring of EDM through vertical separation into hydro generation, transmission, and distribution businesses; which is complemented by the horizontal separation of distribution through concessions to EDM, local authorities and private participants.

Mozambique has put in place a fairly modern legislative framework for the energy sector in general and the power sector in particular. But some aspects are still unclear, in particular the contribution the energy sector is to make a contribution to poverty reduction.

While the legislative framework is largely in place, implementation and enforcement appear to lag behind considerably. Other issues may arise from the implementation of the ambitious reform of the energy sector. [3]



## 7. Access to finance

The basic Investment law was approved in 1993 and its complementary legislation and amendments followed after that. The main investment laws are the following:

- The Investment Law No 3/93
- The Regulation of the Investment Law under the Decree Law No 43/2009
- The Fiscal Benefit Code under Law n° 4/2009
- The Public and Private Partnership Law No 15/2011

[1]

Most relevant incentives and investment restrictions may be as follows:

- Corporate Income Tax (IRPC) reduction: 80% reduction for the first 5 years, 60% reduction for years 6-10 and 25% reduction for years 11-15.
- Accelerated depreciation: 50% on new immovable assets, rehabilitation of machinery and machinery and equipment used in the industrial sector.
- Tax deduction for modernisation and introduction of new technology: tax deduction of up to 15% of taxable income, which can be carried over for five years, for the amount invested in specialised equipment.
- VAT exemption: certain sectors and investments are eligible for VAT (and import duty) exemptions on equipment, machinery and their ancillary goods for the first five years of project implementation, including large infrastructure projects and projects in rural areas and specific zones.
- Exchange controls apply for movements of funds in/out of the country, i.e. registration with Central Bank is required.
- In case of loan agreements of an entity incorporated in Mozambique with a foreign registered entity, approval of loan and loan terms by Central Bank is required. Repayment and interested payments do also require Central Bank approval.
- Land in Mozambique is the property of the state and cannot be sold, transferred, mortgaged or charged – developers need to acquire right to use the land.
- The Public-Private Partnership Law No 15/2011 requires quota of no less than 5% and no more than 20% to Mozambican singular or collective entities and the state or public Company.

[1]

### **Financing grid access:**

The Ministry of Mineral Resources and Energy (MIREME) has made electricity access a priority. The draft Energy Strategy 2014–2023 sets out an ambitious target of 50% grid connection by 2023. Currently, EdM is only connecting half the number of households per year required to meet this target.

Even with government and donor support, the financing gap to meet EdM's investment needs (\$2.2b from 2016 to 2019 ) is too large.

Grid expansion puts a drain EdM's resources. Given the highly dispersed nature of much of Mozambique's rural population, the distribution costs of providing the grid to all are prohibitive.

The cost of a grid connection: \$500 - \$2000

Even in urban areas, EDM has found that heavily subsidised grid-connection fees of \$120 and \$70, for 'ordinary' and 'social' customers respectively, are not always affordable and act as a barrier to new grid-connections.

As per a 2015 World Bank Policy Note, the power sector in Mozambique faces three key challenges:

- to provide reliable and efficient electricity supply;
- need to expand its generation and transmission capacity to meet current and future demand;
- to provide access to electricity to the vast majority of the population. [8]

## 8. Opportunities and barriers for Dutch companies

### Opportunities

76% of people in Mozambique do not have access to grid based electricity, representing a total off grid electricity market of nearly 22 million people. Despite political ambitions to electrify the country by 2030, this may be overly ambitious and the market for off grid electricity is expected to be around for the foreseeable future. On top of this, the solar irradiation is very high. According to one interviewed expert the willingness to pay in rural areas is very high, up to 1 euro per KWh. These factors combined make Mozambique a very interesting country for offering solar home systems via PAYGO modalities or by setting up mini grids.

Besides the potential in decentralized energy generation through PV, there is still a large potential of hydro power in Mozambique. Even though already a significant amount of power is generated through hydro power there is still a large remaining potential.

Despite relatively low average wind speeds there is still quite a bit of low hanging fruit related to wind power development. Some Dutch parties are already exploring this opportunity.

Mozambique has around 70 mini grids which are currently predominantly diesel powered. Diesel is still relatively affordable at less than 1 USD per litre. Subsidies however are slowly being removed which is improving the business case for replacing diesel powered generators in mini grids with solar PV.

Another interesting technology is waste to energy. A lot of agro waste is available in Mozambique but at this moment it is hardly utilized.

Not many companies are active yet in Mozambique, which would result in a first mover advantage for companies that are able to successfully set up and sustain a renewable energy business in Mozambique. One Dutch company who has successfully managed to do so is Solar Works!.

At this moment regulation in Mozambique regarding renewable energy is limited. Even though this presents its own challenges it can also turn out to be an advantage if companies smartly make use of this status quo.

Another advantage is that many development partners are active in Mozambique which have embraced the energy access agenda. This means that a lot of (financial) support is available for renewable energy entrepreneurs. One project that could be of interest to Dutch renewable energy entrepreneurs is the Brilho project. This project aims to increase domestic and business energy access through private sector innovation and investment, and government support, through supply of dispersed off-grid energy solutions and improved cook stoves.

### Challenges

Recently DFID published<sup>1</sup> the energy compact for Mozambique. The main barriers identified in this research are the following:

1. Policy framework:
  - a. No off grid policy in place
  - b. Weak coordination between government institutions

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<sup>1</sup> [http://www.aler-renovaveis.org/contents/files/dfid\\_2017\\_nov\\_energy-africa-compact-for-mozambique.pdf](http://www.aler-renovaveis.org/contents/files/dfid_2017_nov_energy-africa-compact-for-mozambique.pdf)

- c. Unclear division of roles and responsibilities among GoM institutions (e.g. MIREME, MITADER, EDM, FUNAE).
- 2. Supply chain financing
  - a. Local access to corporate finance is difficult
  - b. Import of FOREX is cumbersome
  - c. Difficulties in exporting of capital
- 3. Fiscal and import regulation
  - a. High level of VAT and import duties apply
  - b. Duties often not applied uniformly
  - c. Application/licensing procedures for new companies/branches not uniformly applied
- 4. Quality standards
  - a. There are no quality standards being in force at the moment
  - b. Potential for influx of inferior quality, undermining market for quality products
- 5. Mobile payment mechanisms
  - a. Lack of financial literacy and knowledge among potential consumers
  - b. Low distribution of Mobile money agents in rural areas
- 6. Awareness
  - a. Limited awareness about solar use, maintenance and quality among potential customers
  - b. There is limited awareness among GoM institutions on solar and the legal, fiscal and financial impediments that exist.

Besides the obstacles raised above several experts were interviewed that raised some additional challenges/points of attention when setting up a renewable energy business in Mozambique.

Recently a lot of fossil energy resources were discovered in Mozambique. Developing these resources could help to address the existing budget issues in Mozambique. This also means that less priority is given to decentralized renewable energy developments. One of the interviewed experts however indicated that this has also created another movement that stresses the importance of sustainability and the necessity of developing renewable energy resources. This could help the government in realising the importance of renewable energy and the associated economic potential.

Some experts also indicated that the socialist history of Mozambique creates some distrust towards private sector involvement in the development of the energy sector which is not stimulating for the business environment.

The state fund, FUNAE, is formally responsible for ensuring that electricity is also provided in areas that are currently not connected to the grid. Funae's activities however rely on government funding and are not executed in a financially sustainable manner. This subsidized electrification does not help parties that would like to provide electricity access in those areas on a commercial basis as people are accustomed to heavily subsidized electricity.

The government would like to make electricity available to all people in Mozambique, as this is not done in a cost reflective manner this would require significant public funding, which is currently difficult considering the ongoing debt crisis in Mozambique.

Borrowing money is still very expensive in Mozambique. Additionally the local currency has been volatile. Finally also capital restrictions have been in place, fortunately they have recently been relaxed.

This year the municipal elections will take place, next year the national elections will take place. As a result, it has become more difficult to get either local or national commitment for activities. Finally the debt crisis in Mozambique makes the financial climate very uncertain.

Other serious challenges are the lack of purchasing power in Mozambique. The market distortion from the donor driven energy access programmes furthermore created a mind-set that energy should be provided either free of charge or very cheaply. To add insult to injury, solar panels of very poor quality were distributed in the past, which has left behind a negative perception of solar PV.

The original feed in tariffs were promising, but as the currency has weakened those rates are no longer available and need to be renegotiated in order to make new projects profitable.

Even though a lot of donor funding is available, the coordination of activities in Mozambique regarding energy access is suboptimal. This is reducing the effectiveness of available funding.

Other entry barriers for Dutch companies are the Portuguese language and cultural differences. According to one expert planning is not always done very well and significant patience is required to operate in Mozambique. Furthermore, according to one of the interviewed experts, it is not easy to attract staff members that possess the required skillset.

## **9. Dutch renewable energy companies active in Mozambique**

Advance consulting\*

Solar Works!\*

Companies marked with \* took part in an interview related to taking part in a green trade mission

## 10. Relevant Dutch support schemes

### **Subsidies & Programmes run by the Netherlands Enterprise Agency (RVO)**

This chapter provides a selection of the programmes run by the Netherlands Enterprise Agency (RVO). For a full overview: <http://www.rvo.nl/subsidies-regelingen> (in Dutch)

For country specific information see:

<https://www.rvo.nl/onderwerpen/internationaal-ondernemen/landenoverzicht/tanzania>

### **Dutch international governmental network**

The Dutch government has an extensive network of international offices. This network helps companies by advising them, making contacts for and opening doors. They are present on site, know local players, networks and the market, and know how to deal with language and culture barriers.

They can help Dutch entrepreneurs finding their way abroad when doing business internationally. They can help to find reliable, foreign business partners. They also can make a business partner scan.

<https://www.rvo.nl/onderwerpen/internationaal-ondernemen/netwerken-en-contacten/buitenlandnetwerk>

### **Dutch Good Growth Fund (DGGF)**

The Dutch Ministry of Foreign Affairs provides finance and insurance through the Dutch Good Growth Fund (DGGF) programme, facilitating development related trade and investment in over 60 countries. The fund consists of 3 parts:

#### Investing

The DGGF provides Dutch SMEs doing business in developing countries and emerging markets with customised financing. Do you want to invest in a DGGF countries, but have trouble getting the necessary financing? The DGGF facility Investing Dutch SMEs offers guarantees and direct financing with a repayment obligation, such as loans and equity investments in projects.

#### Local SMEs

Do you manage an investment fund that aims to improve the access of local SMEs to finance? Read more about the DGGF facility Investment funds local SMEs.

#### Exporting

If you need help exporting capital goods to one or more of the DGGF countries, the DGGF facility Exporting Dutch SMEs provides export credit insurance and export financing.

More information: Find information about the qualifications, procedures and transactions on [english.dggf.nl](http://english.dggf.nl).

The Dutch Good Growth Fund is a programme of the Dutch Ministry of Foreign Affairs. It is administered by the Netherlands Enterprise Agency (RVO.nl), Atradius Dutch State Business (for Dutch SMEs) and a consortium of PwC and Triple Jump (for local SMEs).

### **Dutch Trade and Investment Fund (DTIF)**

The Dutch Trade and Investment Fund (DTIF) consists of two components: Investment and Exports. The fund was established in 2016 and replaces the Facility Emerging Markets (FOM) and Finance for International Business (FIB) financing instruments.

### For whom?

Dutch companies wanting to invest in or export to foreign markets can apply for DTIF. The fund was established to stimulate the globalisation of Dutch companies.

### Budget

DTIF can offer up to € 15 million in financial support for each project. The total budget is € 102 million.

### For which countries?

DTIF is available to all countries, with the exception of those which are eligible for DGGF finance and countries under sanction by the United Nations Security Council or the European Union. These applications will be assessed with extra scrutiny. The sanctions policy of the Security Council and/or European Union will be maintained in all cases.

### DTIF Investment

DTIF Investment offers support through loans, guarantees and direct or indirect shares with a repayment obligation. The Netherlands Enterprise Agency (RVO.nl) serves as the fund manager for this facility.

### DTIF Exports

Interested in exporting capital goods to one or more DTIF countries? The DTIF Exports facility can help by offering export credit insurance and funding. Atradius Dutch State Business serves as fund manager for this resource.

### Differences between DTIF and DGGF

DTIF is closely linked to the Dutch Good Growth Fund (DGGF). However, the two funds differ in terms of their target countries. DGGF is mainly focused on developing countries, whereas DTIF targets other foreign markets.

DTIF is open to all Dutch companies, whereas DGGF exclusively services businesses in the SME sector. DTIF does not offer funding for local SMEs, while DGGF does.

### **Energising Development Partnership Programme (EnDev)**

The Energising Development Partnership Programme (EnDev) gives households, social institutions and SMEs in developing countries permanent access to modern energy technologies and energy services. The projects take place in 24 countries in Africa, Latin America and Asia.

### What does EnDev do?

EnDev supports the development of markets for modern energy facilities, especially in rural areas. For example, the development of renewable energy to cook, for lighting and for mobile phones. Part of the EnDev programme is the training and coaching of manufacturers and retailers of for example energy-efficient cookstoves and small solar energy systems. The programme also supports the construction of electricity connections via mini-grids and better network coverage. And EnDev stimulates the production of biogas digesters for household purposes.

### Outcome-oriented

The EnDev program focuses on supply and demand. On the demand side, financial products can be developed that allow poor households to buy energy products. On the supply side, projects concern the quality and availability of these energy products.

The programme EnDev has no subsidy component. It publishes Specific Calls for Proposals in the form of Result Based Financing (RBF). The calls can be found on the website [www.endev.info](http://www.endev.info).



### Background

EnDev is a partnership between the Netherlands, Germany, Norway, Australia, the United Kingdom and Switzerland. The programme is coordinated by the German Gesellschaft für Internationale Zusammenarbeit (GIZ) and the Netherlands Enterprise Agency (RVO.nl). RVO.nl does this on behalf of the Dutch Ministry of Foreign Affairs.

More information can be found at [www.endev.info](http://www.endev.info).

### **Starters International Business (SIB)**

Exporting goods and services abroad offers your business more opportunities. It can lead to greater sales and serve as a solution to the challenge of increased competition in the domestic market. With its Starters International Business (SIB) programme, the Ministry of Foreign Affairs can help you move into foreign markets.

### Vouchers

Export allows you to effectively spread your risks. Buy how do you start? What are your company's strengths? Which markets can offer opportunities and how can you successfully seize them?

Three different SIB vouchers can help you with your plans to take your business abroad:

- Individual coaching voucher (in Dutch) to hire a consultant / coach to look at your opportunities abroad and to work towards a concrete plan of action.
- Collective activity voucher (in Dutch) to participate in an outbound trade delegation or a joint trade fair presentation.
- Knowledge acquisition voucher to hire an international lawyer or tax consultant.

### **DHI**

Subsidy scheme for demonstration projects, feasibility studies and investment preparation studies (DHI)

The DHI scheme supports Dutch enterprises that want to invest in or execute a project in emerging markets and in developing countries.

The DHI scheme is a tender programme. Enterprises can submit a tender during the tender periods. The 1st tender for 2018 closed on 29 March at 3 p.m. The 2nd tender in 2018 opens on 9 August and closes on 21 September, 3 p.m. (Dutch time).

### 3 modules

The DHI scheme consists of 3 modules:

- Demonstration projects: presentation of a technology, capital goods or service in one of the DHI countries.
- Feasibility studies: assessment of the profitability of a foreign investment in a product or service.
- Investment preparation studies: assessment of the technical and commercial profitability of an investment in a company in one of the DHI countries.

### For whom?

DHI focuses on SMEs in the Kingdom of the Netherlands with international ambitions and an interest in emerging markets and developing countries. The SME test tells you whether you are an SME entrepreneur.

### Countries

The DHI scheme is open to projects in all countries, with the exception of the European part of the Kingdom of the Netherlands and possibly countries that are subject to international sanctions.

More information (in Dutch) can be found on the Dutch RVO website.

### **Clean Cooking Programme**

The Netherlands Enterprise Agency participates in the Clean Cooking Programme, which supports key stakeholder organisations in the cooking energy sector in Kenya, Ghana, Uganda, Ethiopia and Bangladesh. This programme is not a subsidy programme.

#### Developing markets for clean cooking

Every year there are more than 4 million deadly accidents in developing countries because of cooking in traditional ovens or on open fires. The commitment of international organisations and local governments, companies and NGOs can help the development of commercial markets for energy-efficient cookstoves with lower emissions or for smoke-free ovens. In this way, these ovens will become widely available to people in developing countries.

#### Connecting people and networks

The Global Alliance for Clean Cookstoves plays an important role in building international networks. Nationally, this work is done by National Alliances for Clean Cookstoves. The Netherlands Enterprise Agency supports the growth of these key stakeholder organisations.

## 11. Relevant international donors

The following international donors are active in Africa and are relevant for energy related projects in African countries. The overview below is a shortlist for more details we refer to the websites mentioned in the text.

### **The World Bank**

The World Bank is a vital source of financial and technical assistance to developing countries around the world.

The Bank is made up of two unique development institutions owned by 184 member countries:

- the International Bank for Reconstruction and Development (IBRD)
- the International Development Association (IDA)

Each institution plays a different but supportive role in the Bank's mission of global poverty reduction and the improvement of living standards. The IBRD focuses on middle income and creditworthy poor countries, while IDA focuses on the poorest countries in the world.

Together they provide low-interest loans, interest-free credit and grants to developing countries for education, health, infrastructure, communications and many other purposes.

Target group: consultants, businesses, government, industries.

More information: <http://www.worldbank.org/>

### **International Finance Corporation (IFC)**

IFC is a sister organization of the World Bank and member of the World Bank Group. IFC is the largest global development institution focused exclusively on the private sector in developing countries. The Bank Group has set two goals for the world to achieve by 2030: end extreme poverty and promote shared prosperity in every country.

The IFC applies their financial resources, technical expertise and global experience to help their clients and partners to overcome financial, operational, and other challenges.

IFC is also a leading mobilizer of third-party resources for projects.

More information:

[https://www.ifc.org/wps/wcm/connect/corp\\_ext\\_content/ifc\\_external\\_corporate\\_site/home](https://www.ifc.org/wps/wcm/connect/corp_ext_content/ifc_external_corporate_site/home)

### **Energy Sector Management Assistance Program(ESMAP)**

ESMAP is a partnership between the World Bank Group (WBG) and 18 partners to help low and middle-income countries reduce poverty and boost growth, through environmentally sustainable energy solutions. ESMAP's analytical and advisory services are fully integrated within the WBG's country financing and policy dialogue in the energy sector. Through the WBG, ESMAP works to accelerate the energy transition required to achieve Sustainable Development Goal 7 (SDG7) to ensure access to affordable, reliable, sustainable and modern energy for all. It helps to shape WBG strategies and programs to achieve WBG Climate Change Action Plan targets: 28% of WBG financing with climate co-benefits; scale up 20 GW in renewable energy generation and integrate an additional 10 GW of variable renewable energy sources into grids over 5 years; mobilize \$25 billion in commercial funds for clean energy; invest at least \$1 billion to promote energy efficiency and resilient buildings by 2020; and, increase support to policy actions for sector reform, including for fossil fuel subsidies.

More information: <https://www.esmap.org/>

### **African Development Bank (AfDB)**

The African Development Bank group (ADB) is a multilateral development bank. The Bank group's primary objective is to promote sustainable economic growth in order to reduce poverty in Africa. It achieves this objective by financing a broad range of development projects and programs through:

- loans;
- equity investments;
- technical assistance.

The Bank prioritizes national and multinational projects and programs that promote regional economic cooperation and integration. The Bank group consists of:

- African Development Bank (ADB);
- African Development Fund (ADF);
- Nigerian Trustfund (NTF).

Target group: Small and medium-sized enterprises (SMEs).

More information: <https://www.afdb.org/en/>

Sustainable Energy Fund for Africa: Project Preparation Grants and Seed/Growth Capital. It is an equity/grant. See also: <https://goo.gl/D71MEh>

### **The European Union (EU)**

The EU invests in countries and regions within Europe (internal programs), but also in countries outside Europe (external programs). In addition, the EU also spends orders and services for its own use.

#### External programs

The European Commission spends part of the EU budget on aid programs in countries outside the EU. [https://ec.europa.eu/europeaid/home\\_en](https://ec.europa.eu/europeaid/home_en)

The responsibility for the implementation of external aid programs and the procurement of contracts lies with the Directorate-General (DG) for International Cooperation and Development (DG DEVCO) . [https://ec.europa.eu/europeaid/general\\_en](https://ec.europa.eu/europeaid/general_en)

DG DEVCO also does this for programs from, among others, the Directorate-General for Neighbourhood and Accession Negotiations (DG NEAR).

On the website of DG DEVCO you will find information on how you can qualify for:

- Financial support from the EU budget for relief activities.
- Assignments in the framework of the European aid programs.

You will also find practical information about procedures, conditions, contracts and more.

### **European Investment Fund (EIF)**

The EIF's activity is centred upon two areas, venture capital and guarantees:

- EIF's venture capital instruments consist of equity investments in venture capital funds and business incubators that support SMEs, particularly those that are early stage and technology-oriented;
- EIF's guarantee instruments consist of providing guarantees to financial institutions that cover credits to SMEs.

Through the leverage effect of its venture capital and guarantee instruments, the EIF is able to contribute to the development of SMEs in the EU Member States and the candidate countries. Both instruments implemented by the EIF for SMEs are complementary to the Global Loans provided by the European Investment Bank to financial intermediaries in support of SME financing. EIF's instruments are implemented on commercial terms.

SMEs in search of finance are requested to contact an EIF intermediary in their country or region for information on eligibility criteria and application procedures.

Target group: Small and medium-sized enterprises (SMEs) in the European Union and the candidate countries

More information: [www.eif.org](http://www.eif.org)

### **Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH(GIZ)**

GIZ is a provider of international cooperation services for sustainable development and international education work. GIZ has over 50 years of experience in a wide variety of areas, including economic development and employment, energy and the environment, and peace and security.

GIZ works for the German Government, European Union institutions, the United Nations, the private sector and governments of other countries. The German Federal Ministry for Economic Cooperation and Development (BMZ) is the main commissioning party.

The registered offices of GIZ are in Bonn and Eschborn. In 2016 GIZ had a business volume of around EUR 2.4 billion and 19,506 employees in 120 countries. Almost 70 percent of them is national personnel working in the field.

More information: <https://www.giz.de/en/html/index.html>

## Annex 1 References

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## Annex 2 Legislation

Source [5]

### Mozambique Feed-in Tariff

On 17 October 2014, Decree 58/2014 was approved creating Mozambique's feed-in tariff for renewable energy. Further regulation is still pending to implement the price premium. The mechanism was under review in 1Q 2017.

Decree 58/2014 creates Mozambique's feed-in tariff, which applies to biomass, wind, small hydro and solar projects from 10kW to 10MW. Prices vary according to technology and capacity.

All projects must sell electricity to the state-owned utility Electricidade de Moçambique.

Reference prices:

- Biomass
  - Capacity up to 0.5MW - MZN 5.7/kWh (USD 0.18/kWh)
  - Capacity up to 1MW - MZN 5.4/kWh (USD 0.17/kWh)
  - Capacity up to 5MW - MZN 4.4/kWh (USD 0.14/kWh)
  - Capacity up to 10MW - MZN 4.1/kWh (USD 0.13/kWh)
- Small hydro
  - Capacity up to 10kW - MZN 4.8/kWh (USD 0.15/kWh)
  - Capacity up to 1MW - MZN 3.4/kWh (USD 0.11/kWh)
  - Capacity up to 5MW – MZN 2.7/kWh (USD 0.09/kWh)
  - Capacity up to 10MW – MZN 2.3/kWh (0.07/kWh)
- Solar
  - Capacity up to 10kW - MZN 13.0/kWh (USD 0.41/kWh)
  - Capacity up to 1MW - MZN 10.7/kWh (USD 0.34/kWh)
  - Capacity up to 5MW – MZN 8.4/kWh (USD 0.27/kWh)
  - Capacity up to 10MW – MZN 7.9/kWh (USD 0.25/kWh)
- Wind
  - Capacity up to 10kW - MZN 8.0/kWh (USD 0.26/kWh)
  - Capacity up to 1MW - MZN 5.6/kWh (USD 0.18/kWh)
  - Capacity up to 5MW – MZN 4.7/kWh (USD 0.15/kWh)
  - Capacity up to 10MW – MZN 4.1/kWh (USD 0.13/kWh)

In 2015 Mozambique received a USD 0.74m grant from the African Development Bank's Sustainable Energy Fund for Africa (SEFA) to enhance the enabling environment for private investments in the renewable energy sector. A general procurement notice was put out by the Mozambican government in November 2015 for a project utilising this grant, the primary objective of which was the implementation of the FiT Regime.

Although the decree is available, injection of power into the grid cannot happen yet as some regulation is still to be approved. As of May 2017, the FiT mechanism was under revision. Mozambique is also reviewing the scope of the National Electricity Council (CNELEC), power market regulator, in order to broaden and strengthen its role. It might help FiT mechanism to gain more space in Mozambique power market, however, this mechanism still has a long road ahead to be fully in force, since it's highly dependent on EDM, offtaker of all power contracts which is under considerable financial strain.

### **Mozambique Renewable Energy Targets**

Renewable energy targets are contained in Mozambique's renewable energy strategy of 2011, which aims to introduce clean energy technologies over a 15-year period.

To expand on its generation mix, the government is looking to explore different technologies for power generation and take advantage of its renewable energy resources.

The main goals of the policy is to:

- Increase electricity access through renewable energy;
- Promote and accelerate investment in renewable energy;
- Establish laws on feed-in tariffs to increase the usage of renewables.

The plan calls for the establishment of laws to implement feed-in tariffs and create renewable energy-specific funding mechanisms through tax benefits and other exemptions to encourage investment in the sector.

The plan lays out the following targets:

Wind:

- Carry out mapping to identify areas which can utilise wind energy;
- Install up to 10,000 turbines for off-grid generation;
- Install 100MW for on-grid generation.

PV:

- Establish production lines to provide for domestic markets;
- Utilise off-grid generation and establish mini-grids using PV.

Small Hydro:

- Carry out mapping to identify areas in which small hydro can be used;
- Install approximately 125MW for off-grid and on-grid generation.

### **Mozambique Biofuels Strategy and Blending Mandate**

In 2009 the Mozambican government introduced a long-term implementation strategy for the use of biofuels and followed it with a blending mandate. It will be implemented in three phases over 12 years.

In 2011, the Ministry of Energy passed the laws governing the blending ratios and standards for biofuels (Regulamento de Biocombustíveis e suas Misturas) under Decree no. 58/2011. The blending ratios are phased in as follows:

Ethanol

2012-15: 10%

2016-20: 15%

2021 onward: 20%

Diesel

2012-15: 3%

2016-20: 7.5%

2021 onward: 10%



### **Mozambique Rural Electrification Fund**

The national energy fund's mandate is to support off-grid electrification through sustainable and low cost power. As part of the 15-year strategy, the fund intends to provide solar power to 2.1m people in rural areas.

The fund is set up to provide financial aid, guarantees and loans for projects in rural areas which are aligned with Fundo de Energia's (FUNAE) objectives. These include:

- Supply financial assistance to install power production and distribution equipment;
- Assist enterprises whose objective is to generate power and disseminate knowledge;
- Promote the use of biomass through sustainable farming;
- Acquire equipment and machinery for power production and distribution.

The fund receives its capital from:

- Donations and loans from international governments and NGOs;
- Public funding allocated by parliament;
- Levies on the sale of electricity by Electricidade de Mocambique.

Since its creation, FUNAE has successfully funded and implemented off-grid systems around Mozambique, which have reportedly provided some form of energy access to approximately 5 million Mozambicans.

As of 2016, FUNAE's role has shifted from a fund to an implementation agency, with the aim of promoting private sector investment in off-grid generation.

### **Mozambique Import Duty Exemptions**

For a period of five years, companies entering Mozambique can claim VAT and import duty exemptions for projects undertaken in certain sectors and locations.

The following sectors and investments are eligible for import duty (and VAT) exemptions on equipment, machinery and their ancillary goods classified under Class K for the first five years of project implementation:

- large scale infrastructure projects exceeding \$347m;
- rapid development zones, industrial free zones and special economic zones;
- basic infrastructure construction;
- commercial and industrial projects in rural areas;
- manufacturing and assembly plants;
- science and technology parks.

### **Mozambique Tax Incentives**

Companies who invest in essential public infrastructure projects are eligible for a host of tax benefits with regards to their income earned, accelerated depreciation and VAT exemptions.

The benefits available to investors are as follows:

- Corporate Income Tax (IRPC) reduction: 80% reduction for the first 5 years, 60% reduction for years 6-10 and 25% reduction for years 11-15.
- Accelerated depreciation: 50% on new immovable assets, rehabilitation of machinery and machinery and equipment used in the industrial sector.
- Tax deduction for modernisation and introduction of new technology: tax deduction of up to 15% of taxable income, which can be carried over for five years, for the amount invested in specialised equipment.
- VAT exemption: certain sectors and investments are eligible for VAT (and import duty) exemptions on equipment, machinery and their ancillary goods for the first five years of project implementation,

including large infrastructure projects and projects in rural areas and specific zones (see Import Duty Exemption policy record).

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