Madagascar

Africa

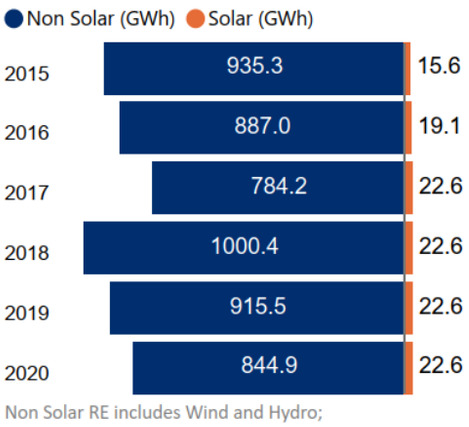
Ease of doing Solar classification

Progressive

Electricity Consumption in kWh/capita (2020)	Average PVout in kWh/ kWp/day (2020)	Cumulative Solar Capacity in MW (2021)
76.6	**4.8**	**33.0**

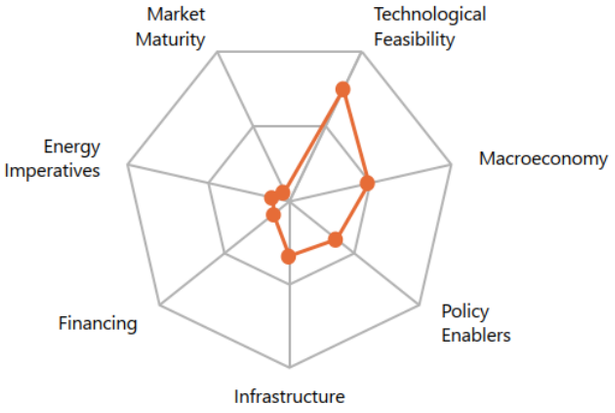
Getting Electricity Score (2020)	NDC Target by 2030 in $MtCO_2e$(base year 2000)	Human Development Index (2021)
24.1	**30.0**	**0.5**

Renewable Energy Generation by Source

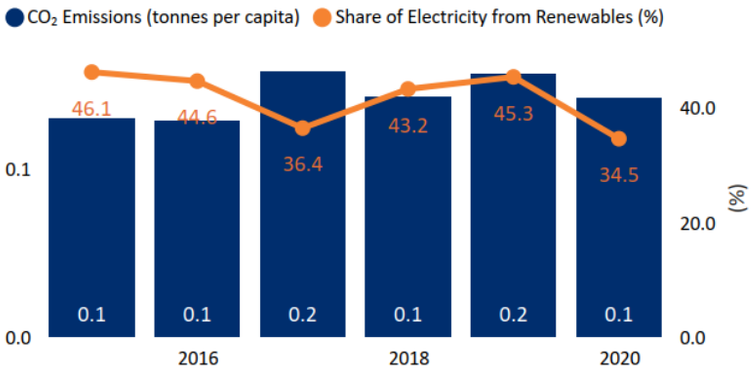


Non Solar RE includes Wind and Hydro;

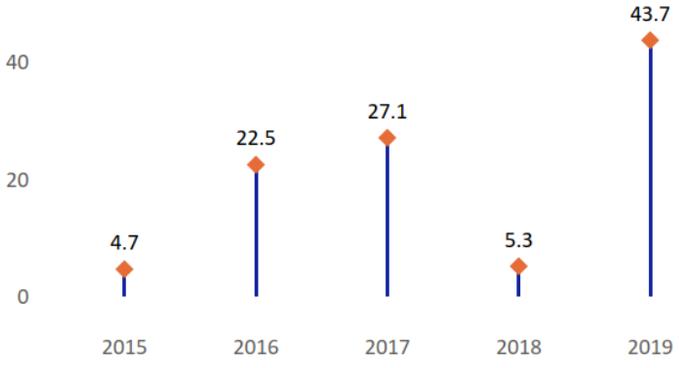
Performance against 7 Drivers



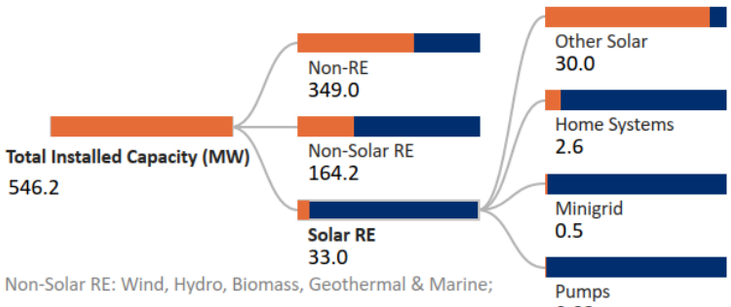
CO_2 Emissions vs Electricity share from Renewables



International Finance received for Clean Energy (Million US Dollars)



Installed Capacity by Source (2019)



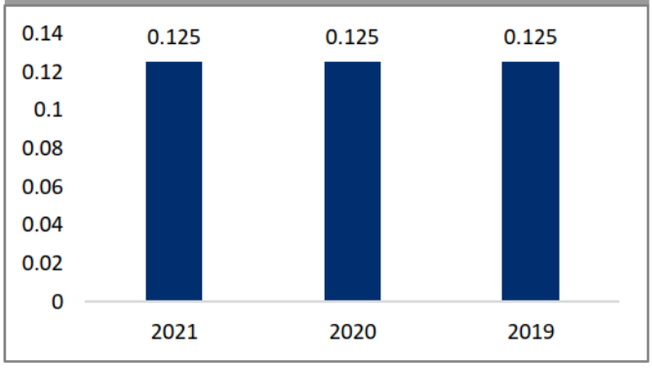
Non-Solar RE: Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE: Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar: Utility Scale Solar, Rooftop etc.;
Data not available for other Solar RE segments;

Support for Renewables (2020)

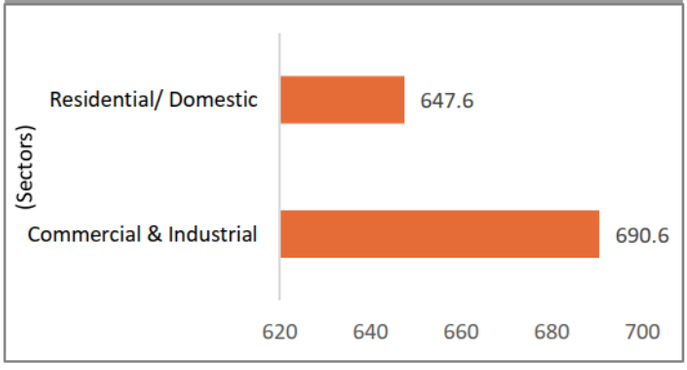
Feed-in-Tariffs for renewable energy supply to the grid?	Net metering/Gross metering policies and regulations?
Yes	**Yes**
Renewable Energy Certificates?	**Renewable Purchase Obligation?**
No	**No**

Peak Demand/Load in GW (2020)	Cheapest Source of Power (2021)	Generation Cost for Hydro Power in USD/kWh (2021)
6.7	Hydro	0.04

Average Solar Tariff in USD/kWh



Electricity Consumption in GWh (2020)



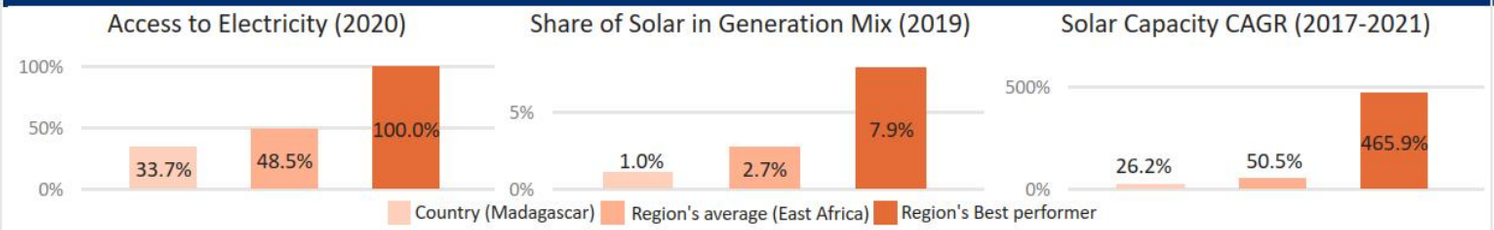
Financial Support Mechanisms (2021)	
Duty waivers to solar developers for importing/procuring material from foreign land	Yes
Tax waivers for manufacturers of raw materials (modules, off grid appliances, etc.)	No
Credit facilitation for solar energy from financial institutions (FIs)	Yes
Viability Gap Funding (VGF) i.e. Grant to support RE projects that are economically justified but fall short of financial viability	Yes
Accelerated Depreciation benefit for Industrial/commercial users of Solar Power	No

Policies/Schemes for Solar Segments (2021)

Rooftop Solar	Solar Mini Grids	Standalone solar systems	Utility scale solar	Solar Parks	Floating Solar	Solar heating and cooling system	Battery waste manage ment	Green Hydrogen
Yes	Yes	Yes	No	Yes	No	Yes	No	No

Emerging Technologies/Innovative Models (2021)	
Hybrid technologies - combination of two or more technologies to achieve efficient systems (Example: wind + solar PV hybrid systems, solar + storage systems)	No
Emerging technologies - the next generation technologies (Example: Artificial Intelligence, Machine learning, Internet of Things, etc.)	No
E-mobility/Electric vehicles	Yes

Country's regional performance and characteristics



Areas of Strength: Macroeconomy; Technological Feasibility

Areas of Improvement: Energy Imperatives; Market Maturity

Key Insights

Drivers	Insights
Macro-economy	•Madagascar is a low-income country with a GDP per capita (PPP) of USD 1,608 in 2021. [1, 2] •GDP (Real) grew at an annual rate of 3.5% in 2021 and it is estimated to increase by 5.1% in 2022. [3] •The current account deficit increased to 5.5% of GDP in 2021 from 5.1% levels in 2020. [4] •The budget deficit in the country widened to 5.4% in 2021 from 4.0% levels in 2020. [4]
Policy enablers	•Madagascar aims to achieve 85% of the total energy production from RE by 2030. [16] •Madagascar targets to increase the share of solar to 25% of the energy mix by 2023. [16] •National Sustainable Energy Fund (FNED) contributes to funding rural and suburban electricity infrastructure development projects based on RE and energy efficiency. [6] •The Rural Electrification Agency (ADER) is responsible for promoting access to electricity for the rural population primarily through RE sources. [7]
Technological Feasibility	•Madagascar receives high levels of solar irradiation of 5.3 kWh/m^2/day and a specific yield of 4.8 kWh/kWp/day indicating strong technical feasibility for solar in the country. [8] •The country typically receives 12 hours of sunlight per day. [16] •Madagascar receives an average of 2,690 hours of sunlight per year. It is sunny 61.4% of daylight hours and 38.6% of daylight hours are likely cloudy or with shade, haze, or low sun intensity. [9] •The UN Environment program is currently active and working on the introduction of electric two and three-wheelers. [10]
Market Maturity	•33.7% population in Madagascar is having access to electricity since 2020. [11] •The Ministry of Water, Energy, and Hydrocarbons (MEEH) develops and implements policies for the provision of adequate and reliable power supply in Madagascar. [7] •The Electricity Regulatory Authority (ORE) is the regulatory body of the electricity sector. [7] •JIRAMA (Jiro sy rano Malagasy) is the vertically integrated state-owned water and electricity operator. [5] •The average duration or term of Power Purchase Agreements (PPAs) for Solar PV Projects is 15 to 25 years. [16]
Infrastructure	•The Madagascan electrical system has 3 major HV interconnected grids (RI): Antananarivo-Antsirabe (RIA), Toamasina (RIT), and Fianarantsoa (RIF) operated by JIRAMA. [6] •Transmission grid coverage in Madagascar is very limited. The network is comprised mainly of 5 kV, 20 kV, 35 kV, 63 kV, 132 kV and 138 kV transmission lines. [7, 16] •The Power Transmission Network Reinforcement and Interconnection Project in Madagascar (PRIRTEM-II) entails the construction of a 135 km, 220 kV interconnection line between Antananarivo and Antsirabe. [12] •The country's average Transmission and Distribution loss levels are 4% and 10% respectively in 2021. [16]
Financing	•The AfDB approved a USD 43 Mn loan to finance the second phase of the power transmission project (PRIRTEM-II) in Madagascar. The financing comprises of a loan of USD 28.6 Mn from the African Development Fund (ADF), and a loan of USD 14.3 Mn from TSF, the Bank's financing mechanism for fragile and transition countries. [13] •In 2016, the World Bank approved an International Development Association (IDA) loan worth USD 65 Mn to help the Madagascan Government improve its electricity sector operations. [7]
Energy Imperatives	•Of the total electricity generation of 18,36,382 MU, solar electricity generation contributed 38,340 MU in 2021. [16] •The total installed capacity of Solar PV witnessed a CAGR of 26.2% between 2017-2021 reaching 33 MW in 2021 from 13 MW levels in 2017. [15] •In 2020, the per capita electricity consumption stood at 0.08 MWh, which is significantly lower in comparison to the global average of 3.31 MWh. [16] •The average solar tariff in Madagascar is 0.125 USD/kWh in 2021. [16]