INTERNATIONAL SOLAR ALLIANCE

Knowledge provider

EY Building a better working world

Ease of Doing Solar 2021

In ISA Member Countries

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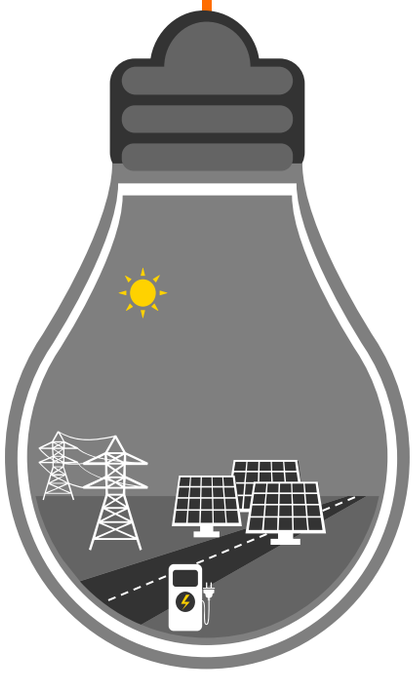


Foreword

The future of our electricity ecosystem is decarbonised, decentralised, digitised and democratised. Changing markets and strong sustainability targets are disrupting the energy landscape and Solar has big hands in each of the aspects.

Solar energy is a globally acknowledged key remedy to the imminent climate crisis. With more than two decades of evolution and prosperity, Solar is now mature enough to have a big hand in climate change mitigation. Further, with evolving initiatives like the One Sun One World One Grid (OSOWOG), the Green Grids Initiative (GGI) and technologies like Storage and Green Hydrogen, the development of Solar ecosystem will be further fast tracked as such initiatives will resolve the intermittency and supply-demand mismatches associated with Solar. However, a shared challenge for the world today is to attract investments that can build large shares of Solar and deliver a massive scale-up of sustainable and clean power to underpin widespread and rapid electrification.

To draw interest from the Investors worldwide, utilize the Solar potential and bring in the best technologies in the countries, Governments must take key decisions pertaining to support policy preparedness¸ financial robustness and market readiness to enable an Investor-friendly market. To address these key decisions, the ISA has taken up the crucial activity to track, recognize and support the progress of Solar ecosystem across the ISA member countries through an annual publication, *"Ease of Doing Solar (EoDS)"*. Starting in 2019, with a pilot version of EoDS report comprising of 4 countries, a full scale edition was launched in 2020, EoDS 2020 for 80 countries. This year, for EoDS 2021, a few more members have joined the ISA family taking the coverage up to 98 countries.

The ISA, with an assistance from Ernst & Young LLP (EY), has conceptualized the EoDS 2021 framework for evaluating countries across seven key indicators (macroeconomy, policy enablers, technical feasibility, market maturity, infrastructure, financing ecosystem and energy imperatives) and has come up with a report that can be used by Governments and Investors to identify key challenges and drivers. The 2021 edition has been prepared through a structured procedure and extensive data research and it envisages to highlight and help the countries improve their strengths and address the challenges. The report intents to provide a compendium to the Solar ecosystem stakeholders on current progress, best practices, future opportunities, planned initiatives, technical aspects etc. associated with the solar power business in the ISA member countries.

Going forward, strong mechanisms will be undertaken to ensure quality and bring out actionable insights for the member countries. Through EoDS, the ISA is focused to create a growth-oriented collaborative ecosystem for the member countries.

We hereby present this report to the Honourable Members of the Fourth Assembly of the ISA for their kind consideration. My heartiest congratulation to the ISA Secretariat for bringing out this document.

Dr Ajay Mathur

Director General

The International Solar Alliance

Glossary

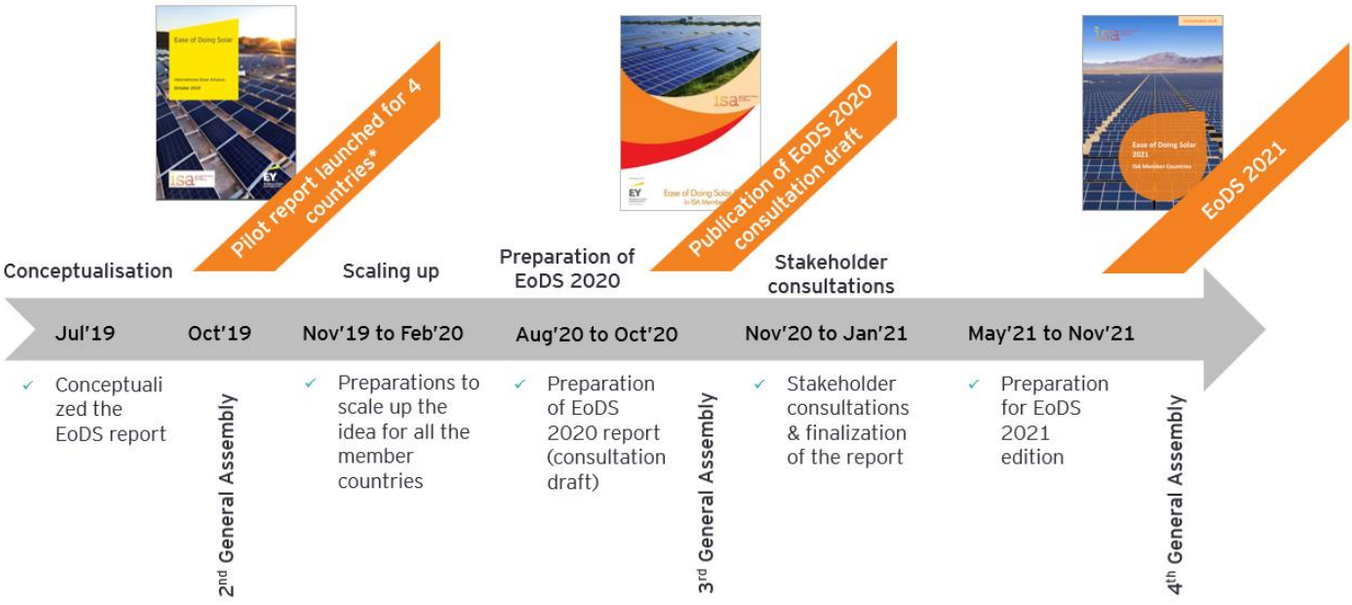
Abbreviation	Full Form
BU	Billion Unit
1 BU	1 Terawatt-hour
Ckt km	Circuit Kilometer
COP	Conference of the Parties
CUF	Capacity Utilisation Factor
EoDS	Ease of Doing Solar
EU	European Union
FDI	Foreign Direct Investment
FY	Financial Year
GDP	Gross Domestic Product
GHG	Green house gases
GHI	Global Horizontal Irradiance
GW	Gigawatt
GWh	Gigawatt-hour
IPP	Independent Power Producer
km	Kilometer
kV	Kilo Volt
kW	Kilowatt
kWh	Kilowatt-hour
Mn.	Million
MU	Million Unit
1 MU	1 Gigawatt-hour
MVA	Million Volt Ampere
MW	Megawatt
MWh	Megawatt-hour
NPA	Non-performing asset
PV	Photovoltaic
RE	Renewable Energy
sq.	Square
SEIN	Sistema Eléctrico Interconectado Nacional
SHS	Solar Home Systems
TWh	Terawatt-hour
T&D	Transmission & Distribution
UNFCCC	United Nations Framework Convention on Climate Change
US$/ USD	United States Dollar
VAT	Value Added Tax
NFP	National Focal Points

Executive summary

1. Overview

The International Solar Alliance (ISA) aims to provide a dedicated platform – the annual Ease of Doing Solar report- through which the global community (including Governments, bilateral and multilateral organizations, corporates, industry, and other stakeholders) can contribute to help achieve the common goal of increasing the use and improving the quality of solar energy in meeting energy needs in a safe, convenient, affordable, equitable and sustainable manner.

To bring in the best solar technologies in the country, Governments must navigate a complex maze of policy preparedness, technical feasibility and financial robustness. Investors, globally, would be attracted to a transparent and infrastructure ready regime supported by an investor friendly market. Starting in 2019, with a pilot version of EoDS report comprising of only 4 countries, a full-scale edition was launched in 2020, for 80 countries. This year, for EoDS 2021, a few more members have joined the ISA family taking the coverage to 98 countries. The objective of Ease of Doing Solar (EoDS) is to track the policy, regulatory, technology and market eco-system in the ISA member countries and to also recognize and report the progress from previous year. The report provides current progress and best practices as a guide for Governments, Investors and reference for Financing Institutions investing in solar.



With assistance from Ernst & Young LLP (EY), the ISA has conceptualized a framework for evaluating member countries on seven key drivers along with a qualitative analysis of the different drivers to serve as a ready reckoner to understand the policies, regulations and their effectiveness among member countries. Governments can use learnings, from other nations, to build a robust solar ecosystem in their home countries.

The EoDS 2021 edition of the report has a refined evaluation framework, based on stakeholder inputs, and a more robust data modelling. The 2021 edition has been successful in enhancing country level participation that has added more value to the study. Initiatives are being taken to further strengthen stakeholder participation in future editions of EoDS.

The assessment has been carried out, for each of the ISA member countries, across seven key drivers: **macroeconomy, policy enablers, technological feasibility, power market maturity, infrastructure, financing, and energy imperatives**. To study and quantify performance of the ISA member countries across these Drivers, various parameters and indicators have been selected under each driver to demonstrate the Ease of Doing Solar. These seven key drivers form the bedrock of the EoDS evaluation with weightages assigned to individual drivers, parameters and indicators for a quantitative evaluation of the overall EoDS scores for the countries.

The countries have been classified across four segments, as below, basis the quantification of the total scores derived as a sum of scores of individual drivers.

Achiever	Countries with highly conducive technical potential for Solar with favourable commercial and regulatory conditions. The market potential for Solar is immense and the country is perceived as most attractive for investments in Solar
Influencer	Countries with moderately favourable technical potential, commercial and regulatory conditions for Solar. The market potential for Solar is satisfactory and the country is perceived as moderately attractive for investments in Solar
Progressive	Countries with less favourable technical potential and evolving commercial and regulatory conditions for Solar. The market for Solar is at initial stages of development of a favourable ecosystem in terms of commercial feasibility and investments for Solar
Potential	Countries with untapped solar potential and at nascent stage for development of favourable ecosystem in terms of commercial, market and regulatory conditions for Solar industry

The EoDS model is a Relative Ranking model and the country classifications are dependent on the sample set considered. Since the sample set in EoDS 2021 (member countries) has changed significantly from EoDS 2020, the classifications presented in the following section is also bound to change basis the relative rankings.

2. Overview of the results

Owing to strong solar potential, sustainability targets, enabling policy ecosystem, mature markets, and robust power infrastructure, a set of 17 countries have been identified as **Achievers**. The next set of classification, **Influencer,** has 34 countries followed by **Progressive** (27 countries) and **Potential** (20 countries).

The results are presented below with **the countries arranged in alphabetical order under each classification:**

Achiever

Argentina	Australia	Brazil	Chile	Denmark
El Salvador	France	Germany	Greece	India
Italy	Japan	Morocco	Netherlands	Oman
Saudi Arabia	United Arab Emirates			

Influencer

Algeria	Barbados	Bolivia	Botswana	Burkina Faso
Cabo Verde	Costa Rica	Dominican Republic	Egypt	Fiji
Ghana	Jamaica	Luxembourg	Malawi	Maldives
Mauritius	Mozambique	Nicaragua	Nigeria	Palau
Peru	Rwanda	Senegal	Seychelles	Sri Lanka
Suriname	Sweden	Tanzania	Tonga	Trinidad and Tobago
Uganda	United Kingdom	Zambia	Zimbabwe	

Progressive

Bangladesh	Belize	Benin	Cambodia	Côte d'Ivoire
Djibouti	Dominica	Ethiopia	Gambia	Grenada
Guyana	Haiti	Kiribati	Madagascar	Mali
Myanmar	Namibia	Nauru	Niger	Paraguay
Saint Kitts and Nevis	Saint Lucia	Saint Vincent and the Grenadines	Samoa	Tuvalu
Venezuela	Yemen			

Potential

Burundi	Cameroon	Chad	Comoros	Cuba
Democratic Republic of Congo	Equatorial Guinea	Eritrea	Gabon	Guinea
Guinea - Bissau	Liberia	Marshall Islands	Papua New Guinea	Sao Tome and Principe
Somalia	South Sudan	Sudan	Togolese Republic	Vanuatu

3. Regional highlights

Key insights from the assessment of the ISA member countries, across the 4 geographical regions, highlighting the strengths and areas of improvements in each region have been presented below:

Africa (43 Member countries)

- Africa region has **1 Achiever, 17 Influencer, 9 Progressive and 16 Potential countries** in EoDS 2021 report.
- Owing to higher levels of solar irradiation in the region, countries in Africa are bestowed with large solar potential and technological feasibility. Current low levels of access to electricity in some countries present a significant opportunity for off-grid solar technologies.
- Lead performers in the region have set robust long-term targets up to 2030 and have been undertaking activities towards achieving these goals.
- Most Progressive and Potential countries have had a reasonably better macroeconomic environment but need improvement in areas like infrastructure development and financing mechanisms.
- Aspects related to financing, policies and setting long term sustainability targets need more focus and offer scope for improvement to develop an effective solar ecosystem in the region.

Asia & Pacific (22 Member countries)

- Asia & Pacific region has **6 Achiever, 5 Influencer, 8 Progressive and 3 Potential countries** in EoDS 2021 report.
- Along with high levels of solar irradiation, enabling macroeconomic and financing aspects are driving the growth of Solar adoption in the region.
- Leading countries in the region have long-term vision related to infrastructure growth ably matching Solar growth and supportive investment ecosystem.
- Progressive and Potential countries of this region are still at an initial stage of developing conducive policy environment and developing a robust power infrastructure to make Solar more viable.

Europe (9 Member countries)

- Europe region has **6 Achiever and 3 Influencer countries** in EoDS 2021 report
- The countries in the region perform exceptionally well in Policy enablers, Market maturity and Macroeconomy related aspects, however, the technological feasibility scores (related to natural potential of Solar) are lower than countries from other regions.
- Countries that could compensate for the low technological feasibility scores by better performance in other drivers have been ranked as Achievers.

Latin America & Caribbean (24 Member countries)

- Latin America & Caribbean region has **4 Achievers, 9 Influencer, 10 Progressive and 1 Potential countries** in EoDS 2021 report.
- Similar to Africa, Latin America & Caribbean region has also been bestowed with high Solar irradiation. Besides, most countries have performed well on market maturity and macroeconomy related aspects.
- Leading performers in the region have set strong long-term Solar targets up to 2050 and have been undertaking key steps towards these goals. Leaders in this region also encourage private participation and have long-term visions related to infrastructure growth and associated investment plans.
- For the Progressive and Potential countries, policy enablers and infrastructure development have been identified as key areas of improvement. Supportive policies like feed-in-tariff, net metering, etc. Is also needed to encourage participation in the sector.

Note: Results from the assessment of countries across the drivers have been presented in the Appendix 1 of the document

4. Driver-wise highlights

Key insights, from the assessment of member countries, across seven drivers have been presented below:

Macroeconomy

- Robust GDP Growth rate, low country risks and investments (including foreign direct investments) have been key differentiators among countries evaluated on macroeconomy.
- Other key differentiators include Investor protection initiatives and the extent of political stability in the individual countries.
- Most Achiever and Influencer countries have initiated structural reforms to strengthen economic competitiveness and establishing more favourable environments to promote investments.
- Most Progressive countries have a strong FDI growth trend along with a rising GDP growth trend though the size of the GDP is comparatively lower.
- The Potential countries have low GDP size with the better ranked ones having a comparatively higher GDP growth rate.

Policy enablers

- Robust policy mechanisms to support renewables, sustainability targets and financial incentives are scoring aspects on policy enablers.
- In addition, countries scoring high have created favourable downstream policy framework for renewable purchase obligations (RPO), Renewable Energy Certificates (REC), emission reduction targets and tax incentives for solar developers.
- Most Influencer countries may not have demonstrated significant actions on policy front but have mandated clear policies to promote clean energy primarily through private participation.
- Progressive countries are in the initial phases of renewable specific policy formulation but have acknowledged the role of renewable energy in the country's developmental agenda.
- The Potential countries have been focussing on introducing favourable policies to promote renewable energy with limited on ground implementation.

Technological feasibility

- High levels of Global Horizontal Irradiance (GHI) and normative capacity utilisation factors (CUF) are the key differentiators in Technological Feasibility across the four evaluation segments.
- Countries in Africa and Middle East are bestowed with naturally high levels of solar irradiation and hence have scored comparatively higher in Technological Feasibility .
- Existence of energy storage projects and other additive technologies have also helped in improving technological feasibility scores for the leading countries.
- Another key differentiating criterion has been the extent of use of renewable to enhance electricity access in countries that are still not hundred percent electrified.

Note: Results from the assessment of countries across the drivers have been presented in the Appendix 2 of the document

Market maturity

- Countries with high levels of access to electricity, presence of a structured and mature power market along with a robust share of operational solar projects have scored high in Market Maturity.
- Another key differentiating factor has been the adoption of competitive bidding process for awarding power projects.
- Most Influencer countries have already achieved a significant level of/achieved full electricity access and have a strong focus on opening the power market through private participation.
- The Potential and the Progressive countries are differentiated, primarily, with the levels of electricity access and the extent of initiatives to transition towards a comparatively mature power market in future.

Infrastructure

- Looking into the intermittency and other operational challenges related to solar integration with the grid, the need for robust infrastructure is indispensable.
- The Achiever countries have taken a planned approach towards strengthening the national grid infrastructure with a focus on integrating solar.
- Leading countries have also encouraged private participation in not only solar infrastructure development but also in strengthening private participation to fast-track infrastructure development.
- Leading countries also have robust mechanisms in place to ensure reliability and operational transparency in the electricity distribution sector.
- Most Influencer countries have taken concrete steps towards developing a long-term infrastructure development plan with renewables at its core.
- Progressive and Potential countries are in different stages of building and operating a robust, high voltage integrated transmission grid to support better integration of solar in the long run.
- Other key differentiators in Infrastructure include capacity building initiatives to improve the quality of human resource as solar market development needs skilled professionals across the entire value chain.

Financing

- Low cost of financing, better accessibility to financial instruments and presence of quality banking system are the key reasons for countries which perform better on financing. Extent of private credit, by domestic banks, is also an enabling differentiator.
- Most Achievers have set up specialized institutions to develop targeted incentives for the industry such as climate funds, tax incentives, grants, financial programs and cooperation plans to encourage capital flows in the sector.
- Most Influencer countries present a stable financial outlook and a strong financial ecosystem which is moving towards the levels of Achievers.
- The Potential countries are having certain levels of financial institutional setup especially for power sector financing thought it is primarily focusing on government financing or from Developmental Financing Institutions (DFIs).
- There is significant dependence on financing from DFIs in most Potential countries. The institutional mechanism for project financing is still in the evolution stage.

Note: Results from the assessment of countries across the drivers have been presented in the Appendix 2 of the document

Energy imperatives

- The existing per capita electricity consumption, historical growth in electricity demand and current solar installed capacities are the key differentiating parameters under energy imperatives. The Achiever countries have scored maximum on this criterion.
- Leading performers in the region have high Electricity - GDP elasticity indicating that the economies are effective in extracting value (by generating goods and services) from the electricity it consumes.
- Influencer countries have demonstrated strong growth in electrical demand and solar installed capacities. In addition to the high-income economies, a few developing countries have also performed relatively better in energy imperatives owing to their aggressive solar deployment in recent years, mostly in off-grid solar primarily on account of rapid electrification.
- The Progressive countries have a strong potential of off-grid as well as on-grid solar but the same is yet to be explored. Owing to low electrifications levels, the demand growth is not strong but is expected to grow once electrification starts even using off-grid solar plants.
- Most Potential countries have had a good demand growth but score low in solar deployment over the years.

6. Way forward

Future editions of EoDS will aim towards further strengthening stakeholder consultations through regional and country level engagements which are quintessential in further reinforcing the EoDS framework and methodology.

Also, in the upcoming editions, greater emphasis will be given to online dashboards for better visualisation and user interaction which will enable the ISA in moving from a paper-based report to interactive analysis. Transition towards EoDS Digital report is expected to further facilitate proactive participation from member countries for seamless and efficient data collection. It will also provide a more dynamic experience for member countries by adopting features such as real time data sharing to faster response on the draft analysis and reporting.

Inclusion of new KPIs, better ranking nomenclature, improving shareability and publication in other languages are some other additional initiatives to enhance the results and outreach of Ease of Doing Solar.

Note: Results from the assessment of countries across the drivers have been presented in the Appendix 2 of the document

Approach and methodology

1. Overview

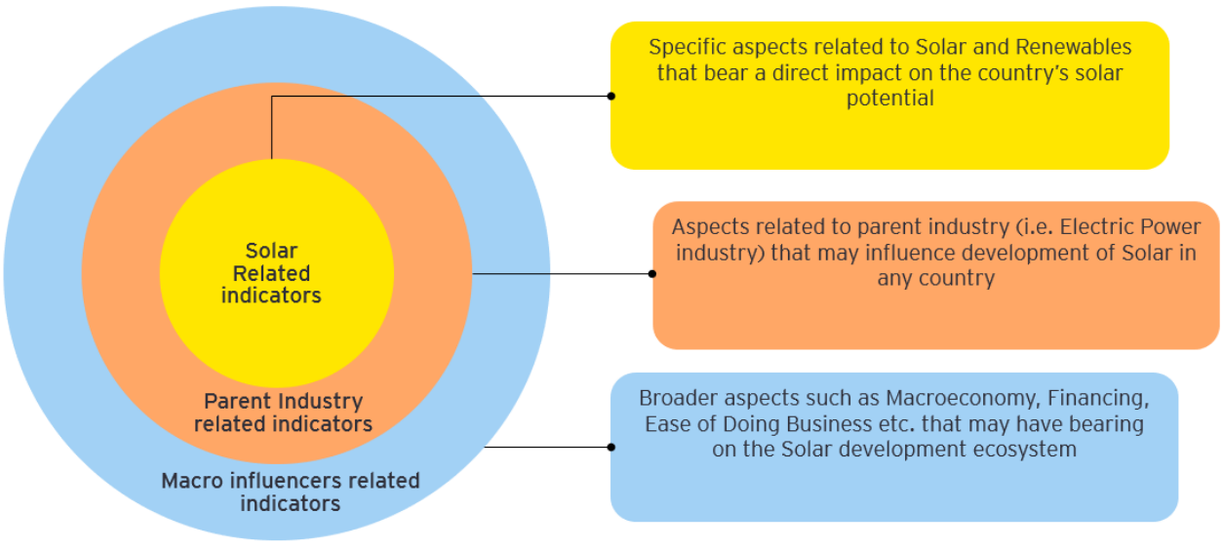
1.1. Framework for Ease of Doing Solar Report

A. Guiding Principles & Scoring methodology

How is it done?	Key outcomes
Review of past similar studies to assess various methodologies	Defining the Guiding Principles (Drivers, Parameters & KPIs)
Parameters (KRA) and KPIs identification & selection and formulation of rationales	
Sources-based classification of KPIs	
Criticality assessment for quantitative analysis	Rationales and scores
Regional Consultations and Capacity building interactions to enhance Approach & Methodology	

B. Scoring Model & Data Research

How is it done?	Key outcomes
Secondary data collection (Database based)	Validated Data set
Primary data collection and validation (Country-focused) – Consultations & Questionnaire preparation	
Identify and address data gaps and key roadblocks for each country	Approach to treat data gaps
Assigning weights for quantitative analysis	Weights for the KRAs and KPIs
Consolidation of Indicators across Solar, Parent Industry (Power Sector) and Macro Influencer	Scoring Model
Model development	



Overall Data Research for building the EoDS Model is based on the above classification of indicators used in the analysis. The analysis includes Solar industry related indicators which carries a **significant cumulative weightage** followed by Parent industry indicators and then Macro Influencers related indicators. This approach enables a comprehensive analysis of solar industry while also taking into consideration the impact of key external factors.

C. Data sensitization and verification

How is it done?	Key outcomes
Validation of data by country-level stakeholders	Overall scores and analysis
Preparation of Country specific reports and Consultation draft	Facilitate consultations and feedbacks from countries
Country-level analysis and recommendations	**Finalized Ease of Doing Solar 2021 Report**
Country-level consultations and incorporation of feedbacks	
Region-specific workshops	Dissemination of findings and insights
Capacity building workshops for the ISA	Knowledge sharing on learnings and methodologies

1.2. What is new in EoDS 2021?

The ISA and EY teams organised a Capacity Building workshop for EoDS 2020 and Regional consultations with National Focal Points (NFPs) to facilitate valuable inputs and suggestions from the stakeholders and the focal points. The sessions facilitated better stakeholder participation and recommendations that have been appropriately used to enhance EoDS 2021. The interactions have helped update some key inputs that added value to the EoDS 2021 edition. The 2021 edition focuses on developing a more robust and comprehensive framework supported by effective data validation. Further, the consultation with the NFPs had given a better understanding of the vision behind EoDS and clearly communicated the objectives and support needed. All the suggestions from the stakeholders on additional Key Performance Indicators, efficient data collection mechanisms and making the EoDS more robust have been accommodated in the 2021 study.

1.3. Classification based on overall scores

Like the 2020 edition, EoDS 2021 have also classified the countries across four segments – Achiever, Influencer, Progressive and Potential, basis the quantification of the total scores across the drivers. Ranking framework may evolve from "Classifications" to "Absolute ranking" over the years as the EoDS concept matures and be used as a guiding tool for benchmarking by stakeholders. The EoDS 2021 edition follows a more refined ranking framework and the classifications are defined as below,

Achiever

Countries with highly conducive technical potential for Solar with favourable commercial and regulatory conditions. The market potential for Solar is immense and the country is perceived as most attractive for investments in Solar

Influencer

Countries with moderately favourable technical potential and commercial and regulatory conditions for Solar. The market potential for Solar is satisfactory and the country is perceived as moderately attractive for investments in Solar

Progressive

Countries with less favourable technical potential and regulatory conditions for Solar. The market for Solar is at initial stages of development of a favourable ecosystem in terms of commercial feasibility and investments for Solar

Potential

Countries with untapped solar potential and at nascent stage for development of favourable ecosystem in terms of commercial, market and regulatory conditions for Solar industry

2. Guiding Principles

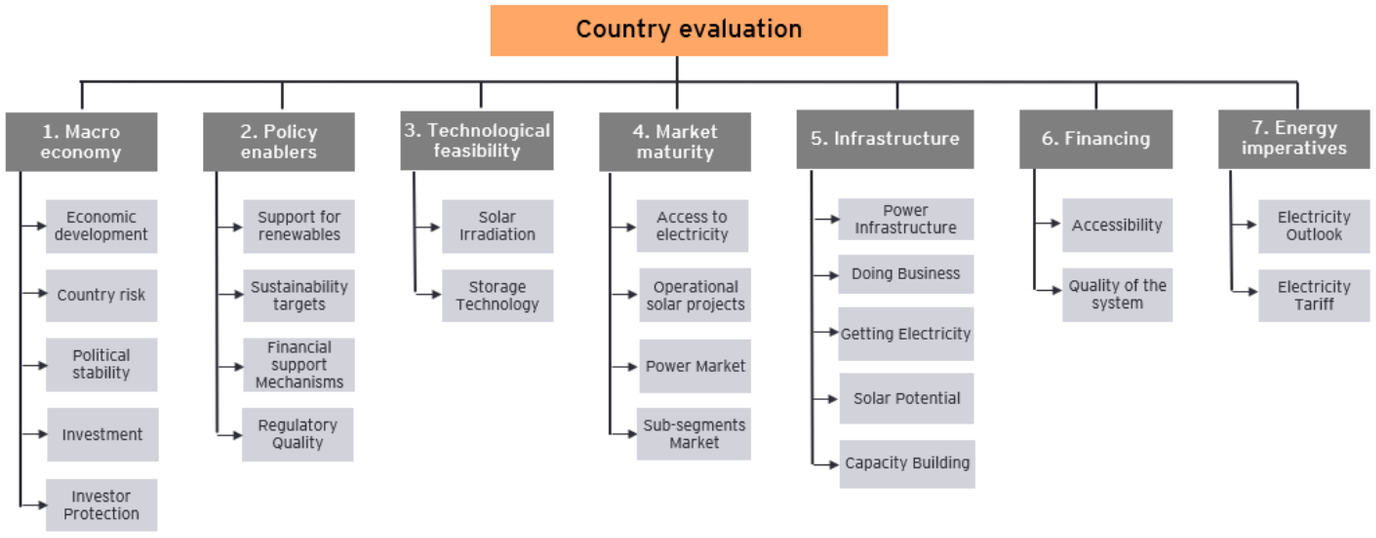
2. Guiding Principles for the EoDS Report

Key focus areas of 2021 edition are to develop a more robust and comprehensive framework for country evaluations and enable the reader of the report with deeper insights to the solar ecosystem in respective countries. The EoDS report will have country-specific snapshots and analysis that assess a country's preparedness in attracting and sustaining investments in solar space. The analysis is being planned to encompass multiple Solar segments: Grid connected Solar, Solar for Agriculture, Solar Mini-Grids, Solar Rooftop and Off-Grid Solar Products and Services.

The Principles – Drivers, Parameters and Indicators have been developed based on the review of similar studies like 1). Ease of Doing Business by the World Bank; 2). State Investment Promotion Agency Framework by Invest India; 3). Global Investment Competitiveness Report; 4). Renewable Energy Country Attractiveness Index by EY; 5). Regulatory Indicators for Sustainable Energy (RISE) and the review of multiple analysis from 1). International Energy Agency (IEA); 2). International Renewable Energy Agency (IRENA); 3). Lighting Global; 4). GOGLA; 5). World Bank and others. The basic skeleton of the evaluation is similar to the previous editions of EoDS report.

The assessment shall be carried out, for each of the study country, across seven key drivers: **Macroeconomy, Policy enablers, Technical feasibility, Power market maturity, Infrastructure, Financing, and Energy Imperatives**. These seven key drivers form the foundation of the EoDS evaluation model with weightages assigned to the drivers, parameters and indicators for a quantitative evaluation of the overall EoDS scores for the countries. Around **64 indicators** have been used to develop the analysis of these parameters and drivers. Each of these indicators demonstrate the Ease of Doing Solar in the countries. Data shall be collected from primary and credible secondary sources.

A model has been built based on the data and weightages which will help develop the index for the countries.



Guiding Principles – Drivers & Evaluation Parameters considered for EoDS study

3. Understanding the drivers

3. Understanding the Drivers

Drivers	Description	Parameters
Macroeconomy	Macroeconomic parameters shall be evaluated to understand the economic strength, in terms of size of the economy, growth prospects and maturity. The macroeconomic driver also helps the stakeholders assess the market and associated risks at a macro-level. Strong macroeconomic indicators, for a country, signify business opportunities for the investors/ developers and translates to an optimistic view of the future of solar sector in the country.	• Economic development • Country risk • Political stability • FDI inflow • Investor protection
Policy enablers	Effective policies and quality of regulatory ecosystem act as key enablers for growth in any sector. This is an important driver for the governments and investors to understand the roadblocks limiting the growth of solar segment in the country. Government initiatives, such as fiscal incentives and subsidies for solar energy deployment, not only helps in attracting new investments in the sector but also minimises the risks associated with such projects.	• Support for renewables • Sustainability targets • Financial support • Regulatory quality
Technological feasibility	Analysis of various technical aspects is of utmost importance in order to determine the feasibility and cost-effectiveness of a solar project. Indicators such as solar irradiation in the region and capacity utilisation factor impact the viability of solar Projects.	• Solar irradiation levels • Storage technology
Market maturity	Market maturity is a critical driver for the investors and project developers to have a better understanding of the overall electricity market in the country. A mature market ensures minimum risks and high certainty of returns to the investors, but also offers high degree of competition. On the other hand, a less mature market may offer huge opportunities for the new entrants, but with a higher risk quotient.	• Access to electricity • Institutional structure • Operational solar projects • Power market • Open Access • Subsegments Market •

Drivers	Description	Parameters
Infrastructure	Adequate infrastructure is essential to support the development of solar projects. Availability of adequate transmission & distribution infrastructure/ network, efficiency of power utilities and capacity building activities are essential components of infrastructure that translates to the success of solar industry in the country.	• Power Infrastructure • T&D Infrastructure • Prospective Investments • Doing Business • Utility Efficiency • Solar potential • Capacity building • Domestic Capability
Financing	Analysis of domestic banking ecosystem is essential to understand business viability and risks in a country. Strong financial ecosystem and innovative financial products are important factors for large scale solar deployment. While availability of appropriate financing models is essential to attract private investments, low cost of financing is also critical for the commercial viability of the projects and off-grid products deployment.	• Accessibility to financing • Quality of the ecosystem
Energy imperatives	This parameter evaluates the total electricity landscape in terms of consumption, tariffs and installed capacities. The current status of off-grid solar products is also analysed, which can help investors identify the country's potential for off-grid installations	• Electricity Outlook • Solar tariffs • Electricity tariffs • Alternate sources • Sub-segments

In the EoDS 2021 study, few additional parameters have been included in the model beyond those considered in EoDS 2020. Parameters related to Investments in the country, Operational solar projects, Getting Electricity, etc. have been added. Also, new indicators like Electricity-GDP elasticity, Human development index, Inflation, Renewable Energy Certificates, Renewable Purchase Obligation, Average Solar Direct Normal Irradiation, Diffuse Horizontal Irradiation, etc. have been added to assess and understand the countries better.

4. Determining weightages for drivers

4. Determining Weightages for Drivers

EoDS study focuses on screening, prioritizing, classifying the countries based on a finite set of criteria. Criteria weights play a very significant role in the EoDS model which usually provide the information about the relative importance of the considered criteria. It helps in arriving at the overall classification and scores. The weightages for the attributes – Drivers, Parameters and Indicators of the EoDS 2021 were primarily determined based on the learnings from previous edition feedbacks, analysis of similar studies and consultations with the stakeholders and domain experts.

Learnings from similar studies

- Multiple similar studies and their mechanisms for weightage determination have been analysed to understand existing methodologies in the system
- State Rooftop Solar Attractiveness Index: Basis the importance/ ranks given by different stakeholders, the weightages to the parameters were decided
- EoDB by World Bank uses a direct method: Weighing all topics equally and, within each topic, giving equal weight to each component

Ease of Doing Business

Parameters	Weightage
Starting a business	9.09%
Dealing with construction permits	9.09%
Getting electricity	9.09%
Registering property	9.09%
Getting credit	9.09%
Protecting minority investors	9.09%
Paying taxes	9.09%
Trading across borders	9.09%
Enforcing contracts	9.09%
Resolving insolvency	9.09%
Labour market regulation	9.09%
Total	100%

SARAL - State Rooftop Solar Attractiveness Index

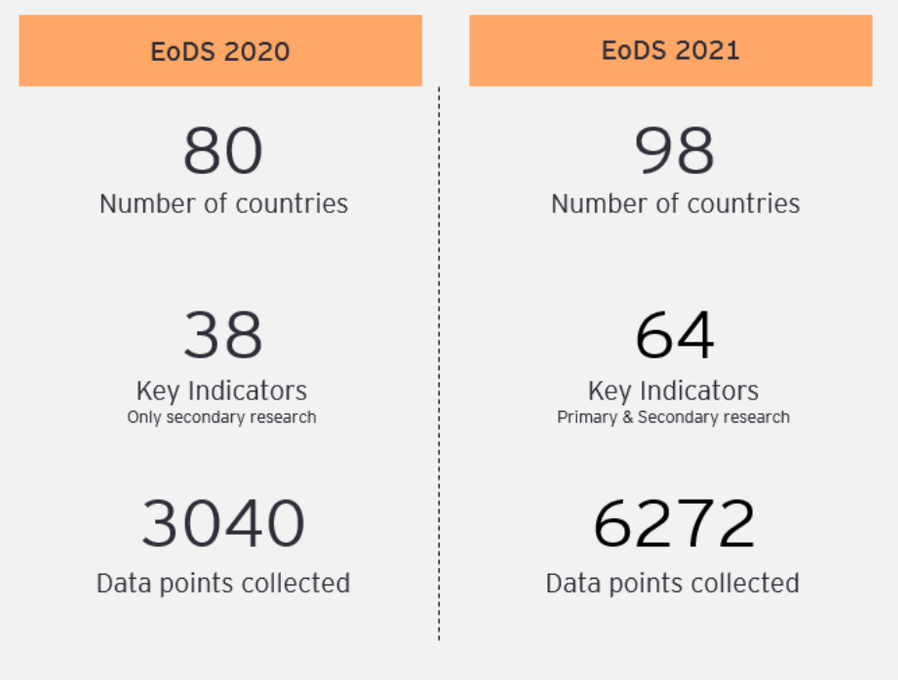
Parameters	Weightage	Sub-parameters	Weightage
Robustness of Policy framework	20%	Level of policy support	33.3%
		Billing Mechanism	33.3%
		Covenants	33.3%
Effectiveness of policy support/ implementation	26.3%	Ease of application	60%
		Power offtake attractiveness	10%
		Impact of Policy	10%
		State of affair of DISCOMs	20%
Investment climate	16.8%	Driver for rooftop solar uptake	33.3%
		Maturity of the Market	33.3
		Ease of financing	33.3%
Consumer experience	26.3%	Pre-installation consideration	30%
		During installation	40%
		Post-installation experience/costs	30%
Business ecosystem	10.6%	Business enablers	37.5%
		Fiscal and Regulatory Environment	37.5
		Economic outlook	25.0%
Total	100%		100%

Based on the feedback received during stakeholder consultations, Solar specific variables have been given more weightages in the EoDS 2021 study. Variables like natural technical feasibility is playing a stronger role as compared to the 2020 edition.

5. Data research

5.1. Data Research

The EoDS study captures the indicators across three major segments - the solar related indicators, Parent Industry related indicators, and Macro Influencers related indicators. Below three segments of indicator classification ensure that the indicators are selected and assessed to cover all the aspects that has an impact on the solar industry of a country. Solar related indicators have been given significant weightage in the EoDS analysis, around 54% followed by Parent industry (22%) and then the Macro Influencers (24%).



The EoDS 2021 framework incorporates the KPIs comprising both the Primary and Secondary data research. Around 6,000 data points have been collected for the 2021 study which is more than double the number of data points in 2020. Data for this study has been collected from primary and credible secondary sources from World Bank, IMF, UN Foundation, IEA, IRENA. The primary data research was carried out by developing and circulating the questionnaire among the National Focal Points (NFPs) of the member countries. The EoDS 2021 edition focused on engaging key stakeholders to devise valuable inputs from the NFPs to facilitate better data collection and to receive suggestions / recommendations to further enhance the model.

5.2. Data Research – Secondary

- Database-based research have been carried out for major set of Indicators. Competent databases from World Bank, IMF, UN Foundation, IEA, IRENA, etc. have been exercised
- Country-focused research has been carried out to address data gaps for a small set of countries and to develop insights on Member countries

5.2. Data Research – Primary

- The primary data collection exercise has been introduced to the National Focal Points (NFPs) across Africa, Latin America, Europe and Asia-Pacific regions through the regional consultations/ NFP workshops
- Regional consultations were organized to sensitize the NFPs about EoDS and the importance and process for primary research questionnaire
- A questionnaire has been developed and circulated among the NFPs of the member countries. A part of the questionnaire is appended below:

S.No.	Key Indicators	Response	UoM	Source of Information (if applicable)	Year of Information	Remarks
8	Are there provisions for Collective self-consumption/ Group-Captive consumption?		Yes/No			
	Is there a mechanism of competitive bidding for setting up large scale RE generation projects (for projects >10MW) e.g. through auctions for PPA's?		Yes/No			
9	**Is there a mechanism of Solar discounted tariff bidding for procurement of Power from Grid Connected Solar PV Power Projects?**		Yes/No			
10	**What is the growth rate (CAGR) of electricity consumption in last five years?**		%			
11	**What is the Peak demand that has been met during 2019?**		MW			
	What is the share of the following consumer segments in the overall electricity consumption?					
	Commercial & Industrial		%			
	Agricultural		%			
12	Residential		%			
13	**How much is the share of solar in the generation mix for the year 2019?**		%			
14	**What is the average duration/ term of Power Purchase Agreements for Solar PV Projects?**		Years			

Procedure:

- Questionnaires have been prepared in English, French and Spanish languages to facilitate prompt data collection from primary sources i.e. NFPs.
- Questionnaire has about 47 questions. Responses are being sought as Qualitative information (E.g: Yes/ No) and Data-based information for around 25 and 22 Indicators respectively
- The research is based on data for the year 2020. However, in instances where data is not available for 2020, earlier years' data may be used by the NFPs.
- Coordination support from the ISA's Country Coordinators System in following up with the Primary sources with appropriate guidance and resolve their clarifications
- The Data is being collected for the year 2020. However, in instances where data is available for earlier years but not for 2020, the older data has been considered with rational assumptions and projections.

Country reports

S.no.	ISA member countries	Region	Page number
1	Algeria	North Africa	34
2	Argentina	Latin America	36
3	Australia	Pacific	38
4	Bangladesh	Asia	40
5	Barbados	Caribbean	42
6	Belize	Latin America	44
7	Benin	West Africa	46
8	Bolivia	Latin America	48
9	Botswana	South Africa	50
10	Brazil	Latin America	52
11	Burkina Faso	West Africa	54
12	Burundi	East Africa	56
13	Cambodia	Asia	58
14	Cameroon	Central Africa	60
15	Cabo Verde	West Africa	62
16	Chad	Central Africa	64
17	Chile	Latin America	66
18	Comoros	East Africa	68
19	Costa Rica	Latin America	70
20	Côte d'Ivoire	West Africa	72
21	Cuba	Caribbean	74
22	Democratic Republic of Congo	Central Africa	76
23	Denmark	Europe	78
24	Djibouti	East Africa	80
25	Dominica	Caribbean	82
26	Dominican Republic	Caribbean	84
27	Egypt	Middle East	86
28	El Salvador	Latin America	88
29	Equatorial Guinea	Central Africa	90
30	Eritrea	East Africa	92
31	Ethiopia	East Africa	94
32	Fiji	Pacific	96
33	France	Europe	98

What to look for in each section of the country report?

Country snapshot

This section primarily covers country's as-is scenario with respect to the power sector indicators such as annual electricity consumption, installed solar capacity, Average Solar Pvout, Ease of doing business score, and CO_2 emissions.

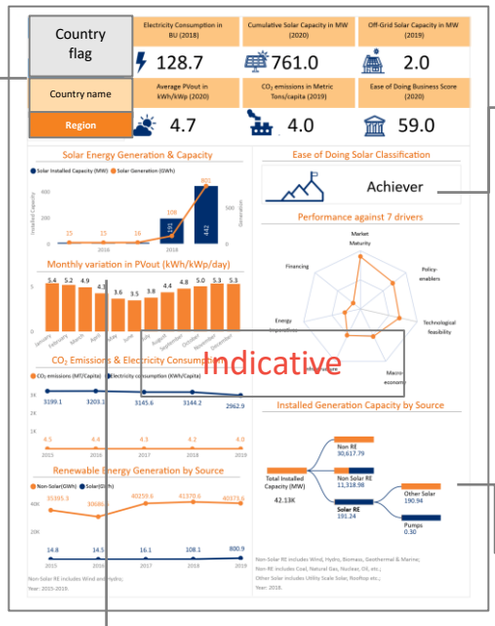
Power trends

This section depicts overall power sector trends of the country through yearly trends in cumulative solar installed capacity/ generation, monthly variation in Pvout and Per Capita CO_2 Emissions & Electricity Consumption and RE generation by source. Solar on-grid/ off-grid trends have been presented based on data availability.

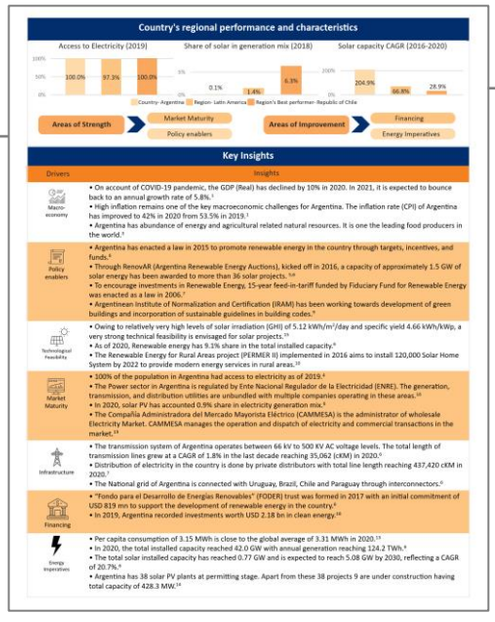
Qualitative assessment

This section provides a crisp qualitative assessment of the country across seven drivers. References for the remarks under this section are provided in the Appendix of this report.

Page 1



Page 2



EoDS performance

This section indicate overall classification of the country (i.e. Achiever, Influencer, Progressive and Potential). It also shows countries performance across seven drivers as detailed out in the approach and methodology section of this report.

Installed capacity drill down

This section depicts electricity mix of the country (in capacity terms) along with the drill down on capacity of solar sub-segment such as solar mini-grid, solar home systems etc.

Country's regional performance and characteristics

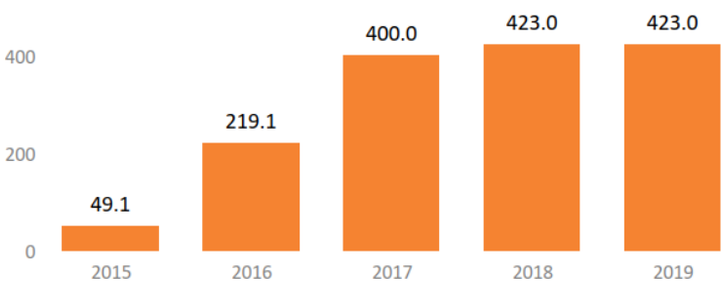
This section provides insights developed from the overall assessment of the member countries across seven drivers. Relative strengths(in the bottom left of top section) and challenges (in bottom right of top section) have been identified for the country based on performance comparison within the country across seven drivers. The section also provides a comparative analysis on access to electricity, Growth in Solar installations and Share of Solar in generation mix. The country is compared with the region and also the best performer in the region.

Note: Extensive list of sources are provided in the Appendix -3 of the report.

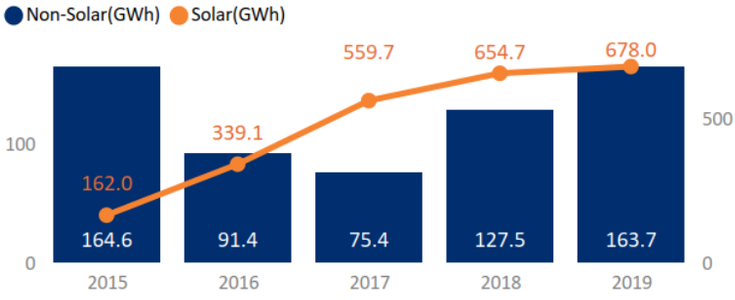
Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
58.1	423.0	423.0

Algeria	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
Africa	5.1	3.9	48.6

Cumulative Solar Installed Capacity (MW)

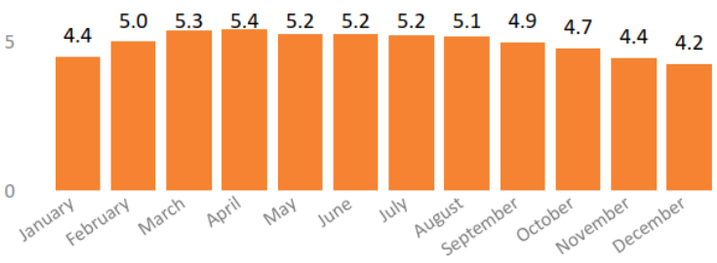


Renewable Energy Generation by Source

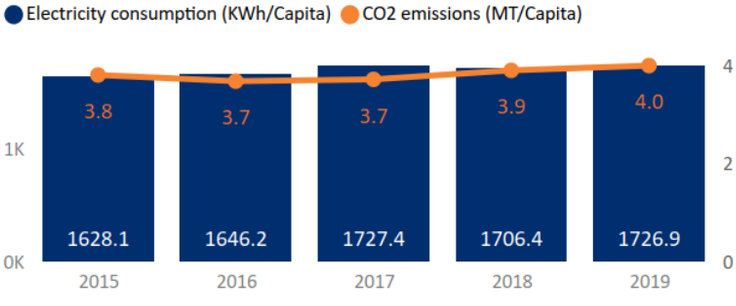


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



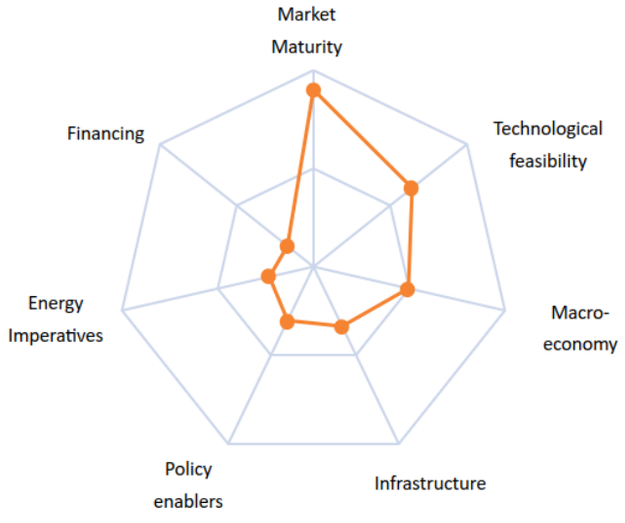
CO2 Emissions & Electricity Consumption



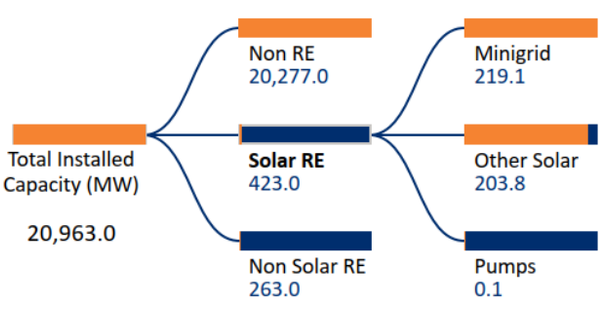
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

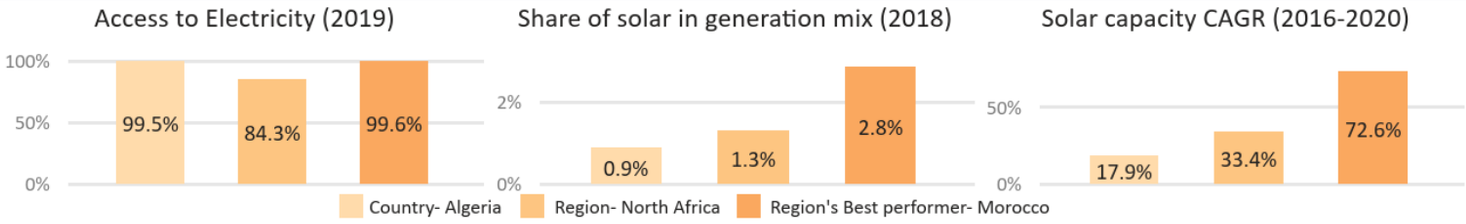


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

Areas of Improvement → Financing, Energy Imperatives

Key Insights

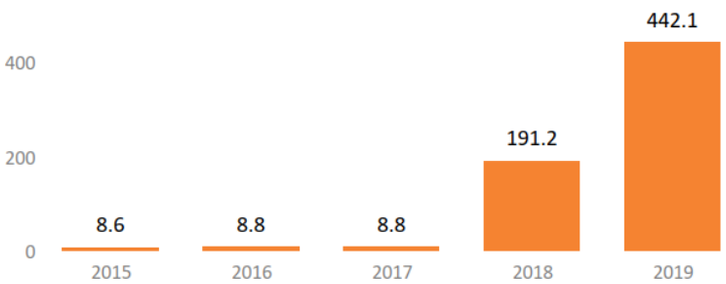
Drivers	Insights
Macro-economy	• Algeria is a Lower-middle-income economy with a GDP per capita (PPP) at USD 11,432 in 2021.[1,2] • The GDP (Real) growth rate is expected to be at 2.9% in 2021 which showed a degrowth of -6% in 2020.[1] • The hydrocarbon industry, which is a dominant industry, accounted for 20% of GDP, 41% of fiscal revenues and 94% of export earnings in 2019.[3]
Policy enablers	• The Ministry of Energy Transition and Renewable Energies has been created in 2020 to manage and carry out the energy transition plan.[4] • Under the second phase (2021-2030) of the Renewable Energy Development program, the country plans to add 10.57 GW of Solar PV.[5] • National Fund for Energy Management for Renewable Energies and Cogeneration provides mechanism of guaranteed purchase tariffs (Feed-in Tariff).[5] • The investment code of Algeria provides exemption on VAT, custom duties and land tax for promotion of investment in Renewable Energy Projects.[5]
Technological Feasibility	• Owing to relatively very high levels of average solar irradiation of 5.92 kWh/m^2/day and specific yield of 5.12 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Algeria.[7] • The country depends on Natural Gas for producing over 90% of its electricity. Renewables accounted for about 7.3% electricity production in 2018.[8] • Most of the available land belongs to the State and is made available to private investors for projects. The Intermediation and Land Regulation National Agency (ANIREF) has the role of identifying available land for infrastructure projects.[5]
Market Maturity	• 100% population in Algeria had access to electricity as of 2019 and is one of the most electrified countries of Africa.[14] • Sonelgaz is managing electricity transmission and distribution sector through its subsidiaries.[9] • The Electricity and Gas Regulation Commission (CREG) is the primary energy regulatory authority and responsible for supervising and formulating policies and tariff setting for the power sector.[10]
Infrastructure	• Algeria's transmission and distribution grids are well developed in the north, with interconnections to Morocco and Tunisia.[13] • The overall length of the electricity transmission network to be realized over the 2018-2028 period is of 29,682 km, of which 22,526 km have already been decided.[19] • By 2028, the total length of the electricity transmission network will reach 52,207 km, including 21,647 km in 220 kV and 9,827 km in 400 kV, thereby managing a capacity of 107,660 MVA.[19] • Algeria aims to develop a RE training and knowledge capitalization program , targeting to train and employ local engineers in field of engineering and project management.[5]
Financing	• Foreign investments in Algerian companies will no longer be capped at 49% for non-strategic sectors after the 49-51 rule was abolished by the Government in 2020.[12] • Algeria's public debt is primarily domestic since authorities decided against borrowing externally.[20]
Energy Imperatives	• Per capita consumption of 1.72 MWh is relatively lower in comparison to the global average of 3.35 MWh in 2019.[16] • The commercial and industrial sector accounts for 41% of electricity consumption, while the residential accounts for 42.5%.[8] • The total solar installed capacity reached 423 MW in 2019.[11] • The planned 4,000 MW Tafouk 1 solar project is providing momentum to meet Algeria's renewable target. • CREG plans to increase share of solar in the installed capacity to 15% by 2028 from less than 1% in 2018.[17]

Argentina

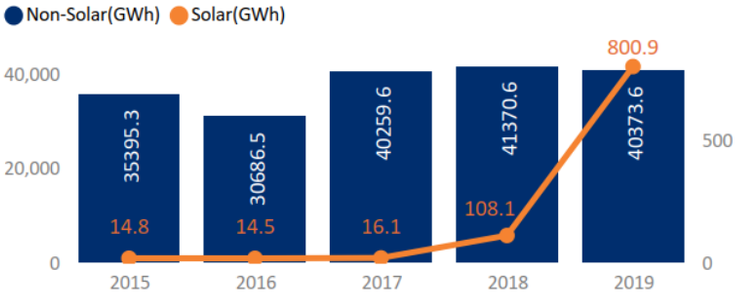
Latin America & Caribbean

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
128.7	761.0	2.0
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.7	4.0	59.0

Cumulative Solar Installed Capacity (MW)

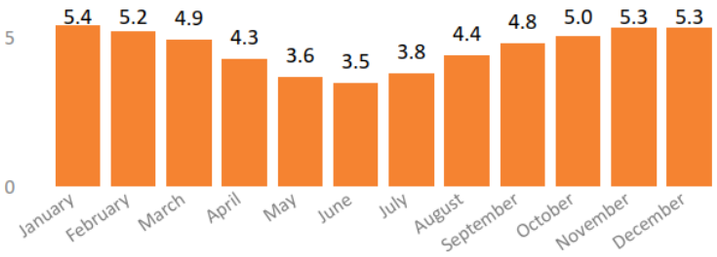


Renewable Energy Generation by Source

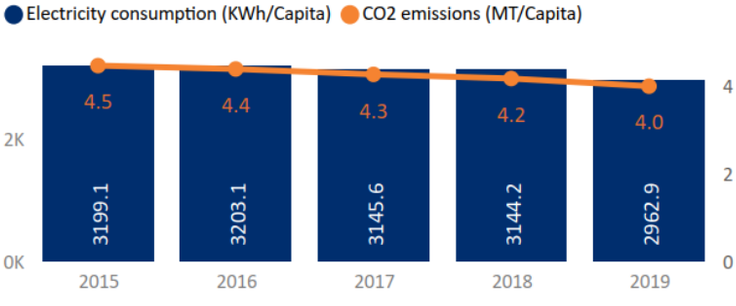


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



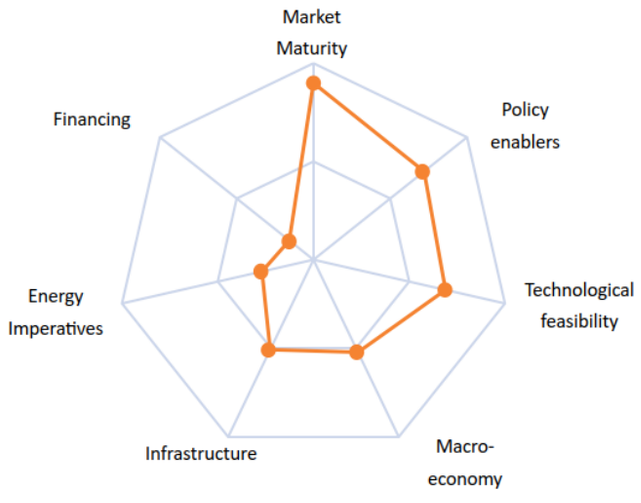
CO2 Emissions & Electricity Consumption



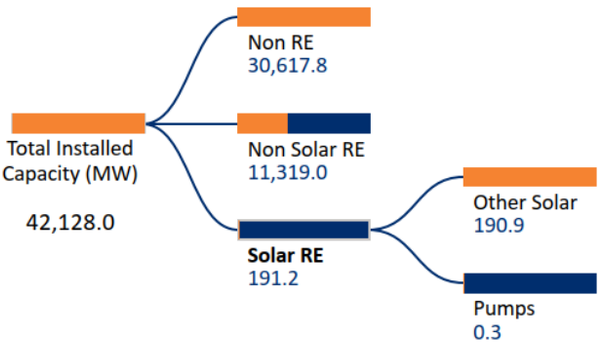
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers

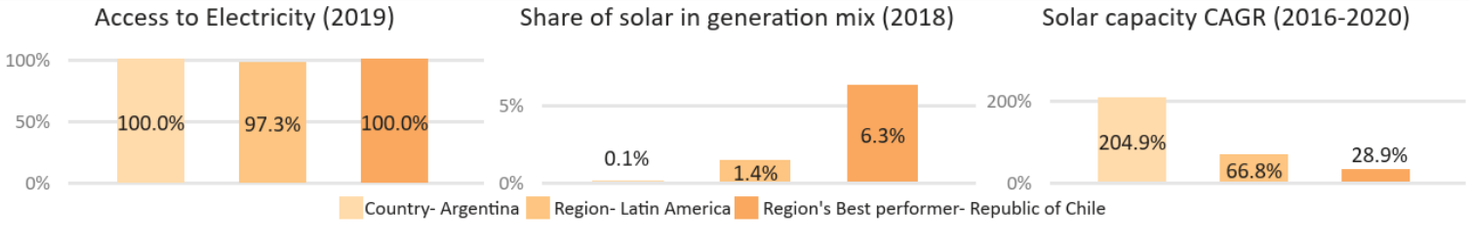


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Policy enablers

Areas of Improvement → Financing, Energy Imperatives

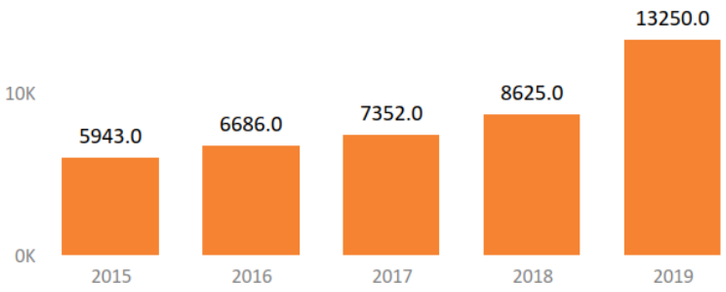
Key Insights

Drivers	Insights
Macro-economy	• On account of COVID-19 pandemic, the GDP (Real) has declined by 10% in 2020. In 2021, it is expected to bounce back to an annual growth rate of 5.8%.[1] • High inflation remains one of the key macroeconomic challenges for Argentina. The inflation rate (CPI) of Argentina has improved to 42% in 2020 from 53.5% in 2019.[1] • Argentina has abundance of energy and agricultural related natural resources. It is one the leading food producers in the world.[3]
Policy enablers	• Argentina has enacted a law in 2015 to promote renewable energy in the country through targets, incentives, and funds.[6] • Through RenovAR (Argentina Renewable Energy Auctions), kicked off in 2016, a capacity of approximately 1.5 GW of solar energy has been awarded to more than 36 solar projects. [5,6] • To encourage investments in Renewable Energy, 15-year feed-in-tariff funded by Fiduciary Fund for Renewable Energy was enacted as a law in 2006.[7] • Argentinean Institute of Normalization and Certification (IRAM) has been working towards development of green buildings and incorporation of sustainable guidelines in building codes.[9]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.12 kWh/m^2/day and specific yield 4.66 kWh/kWp, a very strong technical feasibility is envisaged for solar projects.[15] • As of 2020, Renewable energy has 9.1% share in the total installed capacity.[6] • The Renewable Energy for Rural Areas project (PERMER II) implemented in 2016 aims to install 120,000 Solar Home System by 2022 to provide modern energy services in rural areas.[10]
Market Maturity	• 100% of the population in Argentina had access to electricity as of 2019.[4] • The Power sector in Argentina is regulated by Ente Nacional Regulador de la Electricidad (ENRE). The generation, transmission, and distribution utilities are unbundled with multiple companies operating in these areas.[16] • In 2020, solar PV has accounted 0.9% share in electricity generation mix.[6] • The Compañía Administradora del Mercado Mayorista Eléctrico (CAMMESA) is the administrator of wholesale Electricity Market. CAMMESA manages the operation and dispatch of electricity and commercial transactions in the market.[19]
Infrastructure	• The transmission system of Argentina operates between 66 kV to 500 KV AC voltage levels. The total length of transmission lines grew at a CAGR of 1.8% in the last decade reaching 35,062 (cKM) in 2020.[6] • Distribution of electricity in the country is done by private distributors with total line length reaching 437,420 cKM in 2020.[7] • The National grid of Argentina is connected with Uruguay, Brazil, Chile and Paraguay through interconnectors.[6]
Financing	• "Fondo para el Desarrollo de Energías Renovables" (FODER) trust was formed in 2017 with an initial commitment of USD 819 mn to support the development of renewable energy in the country.[6] • In 2019, Argentina recorded investments worth USD 2.18 bn in clean energy.[18]
Energy Imperatives	• Per capita consumption of 3.15 MWh is close to the global average of 3.31 MWh in 2020.[13] • In 2020, the total installed capacity reached 42.0 GW with annual generation reaching 124.2 TWh.[6] • The total solar installed capacity has reached 0.77 GW and is expected to reach 5.08 GW by 2030, reflecting a CAGR of 20.7%.[6] • Argentina has 38 solar PV plants at permitting stage. Apart from these 38 projects 9 are under construction having total capacity of 428.3 MW.[14]

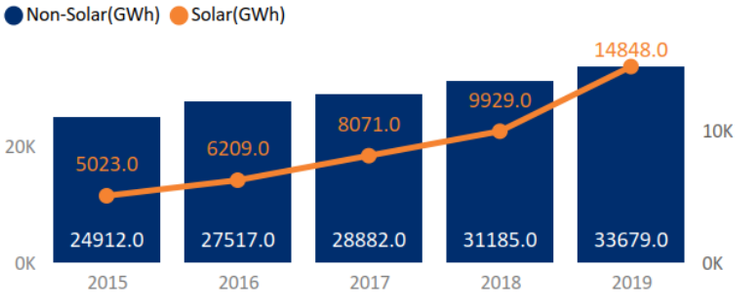
Electricity Consumption in BU (2018)	Cumulative Solar Capacity in GW (2020)	Off-Grid Solar Capacity in MW (2019)
213.3	17.3	NA

Commonwealth of Australia	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
Asia & Pacific	5.0	16.3	81.2

Cumulative Solar Installed Capacity (MW)

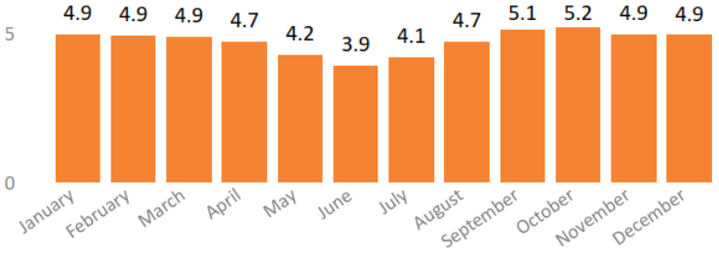


Renewable Energy Generation by Source

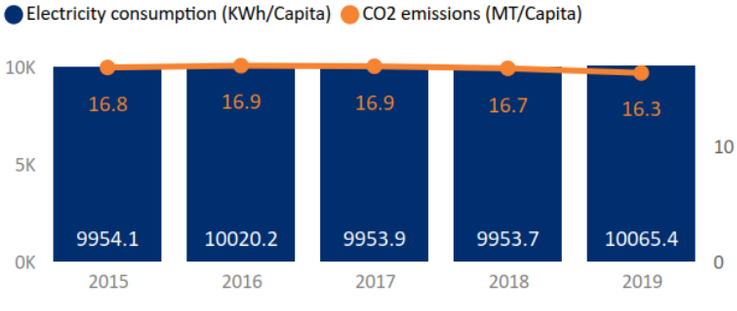


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



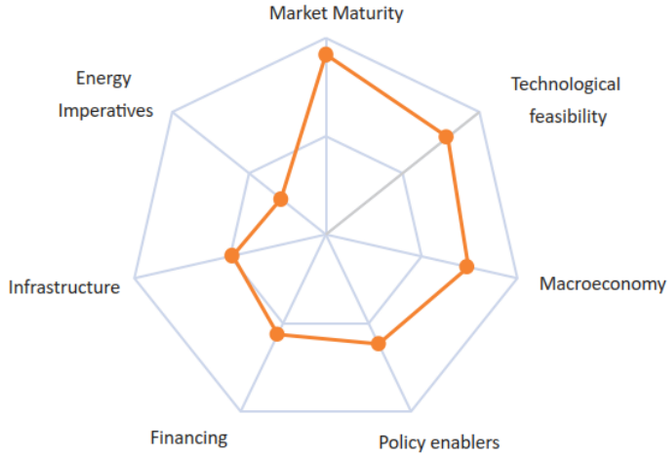
CO2 Emissions & Electricity Consumption



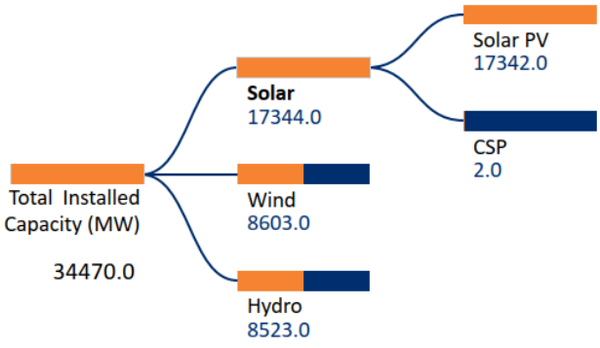
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers

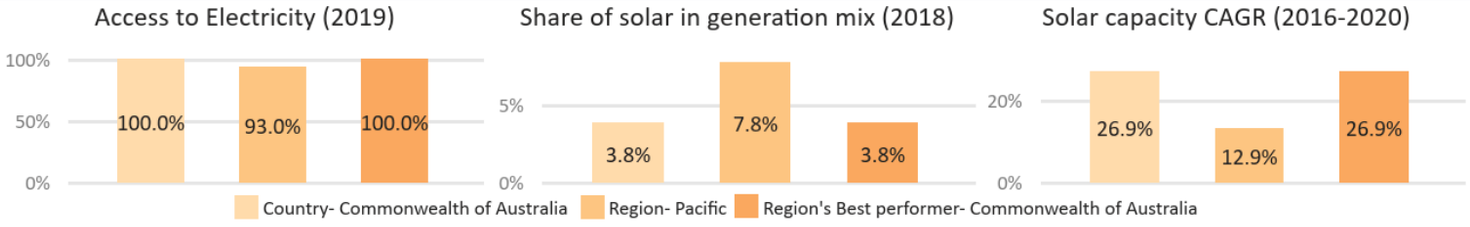


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

Areas of Improvement → Energy Imperatives, Infrastructure

Key Insights

Drivers	Insights
Macro-economy	• GDP (Real) grew at an annual rate of 1.9% in 2019 and declined by -2.4% in 2020.[1] • In 2020 the major contributors to the GDP were Service sector, Industry and Agriculture contributing 66.04%, 25.69% and 1.89 % respectively.[2] • As of 2021, General government gross debt to GDP is 39.74% which was 40.55% in 2020.[3]
Policy enablers	• As of 2020, Feed-in tariffs are set according to the policies of each state and territory. A mix of regulated and unregulated feed-in tariff rates apply and are generally only available for small scale systems up to 100 kW. [9] • The Australian Government supports the manufacturers (of modules, off grid appliances, Solar Home Systems) for developing clean energy products and investing in new ways of using energy and raw materials under the AUD1.3 Bn Modern Manufacturing Initiative.[9]
Technological Feasibility	• Australia receives an average of 4 to 11 hours of daily sunshine which indicates a good technical feasibility for Solar.[9] • Australia receives relatively very high levels of solar irradiation of 5.76 kWh/m^2/day and specific yield of 4.95 kWh/kWp. As such, a very strong technical feasibility is envisaged for solar projects.[4] • As of July 2021, 2,897,835 small-scale solar power systems have been installed across Australia which indicates a vibrant ecosystem for Solar in the country.[5]
Market Maturity	• Australian Power sector and the Spot power market is regulated by the Australian Energy Market Operator (AEMO).[9] • Business models such as Pay-as-you-go and Cash-based system are available in the Off-Grid Solar Products market in the country.[9] • As of 2020, small number of Floating Solar PV projects are in Operational status in the country.[9]
Infrastructure	• The expected investment in Solar PV industry (between 2021 - 2025) for utility scale solar is estimated at USD 3,304 Mn.[9] • The overall capacity of the Transmission Infrastructure in Australia was 9,176 MVA as of 2020 and the expected investment in the T&D Infrastructure (between 2020-2021) is estimated to be USD 5,525 Mn USD. [9] • World's biggest clean energy project to power Singapore from Australia has been announced. The USD 22 Bn infrastructure project will send Australian sunshine (solar power) more than 5,000 km to Singapore, via high-voltage undersea cables. [6] • The Transmission and Distribution system in the country is very efficient with as low as 5% T&D losses as of 2020. [9,5]
Financing	• Australian Renewable Energy Agency (ARENA) provides grant funding for research, development and deployment of renewable energy technologies, while Clean Energy Finance Corporation (CEFC) invests in both forms of capital i.e. debt and equity.[9]
Energy Imperatives	• As of 2020, cumulative solar PV Capacity for the country is 17342 MW and 13250 MW in 2019.[7] • The expected growth rate (CAGR) for electricity consumption is estimated at 0.33 % in the period 2020 to 2023. [9] • Since 1990, 100% of the population in Australia had access to electricity.[8] • Solar and wind are the cheapest source of Power generation and the associated cost ranges between 0.033-0.050 USD/ kWh. [9]

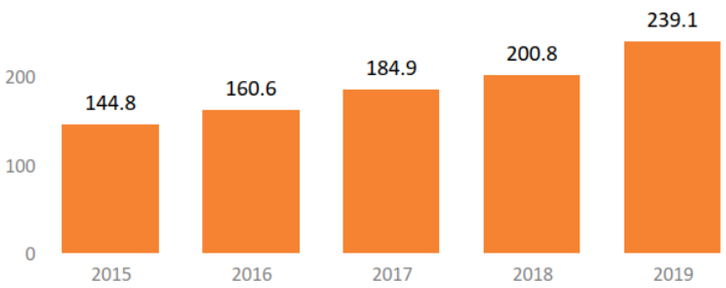
Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
70.4	276.4	173.0

Bangladesh

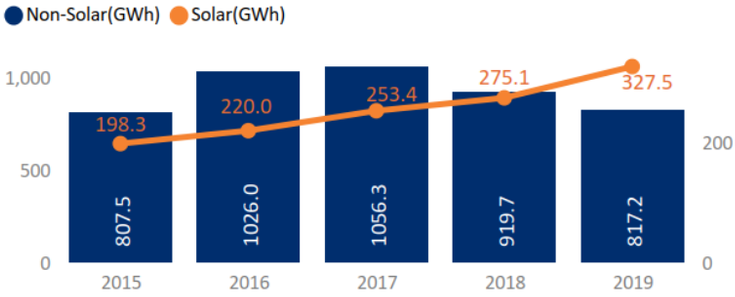
Asia & Pacific

Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
3.9	0.6	45.0

Cumulative Solar Installed Capacity (MW)

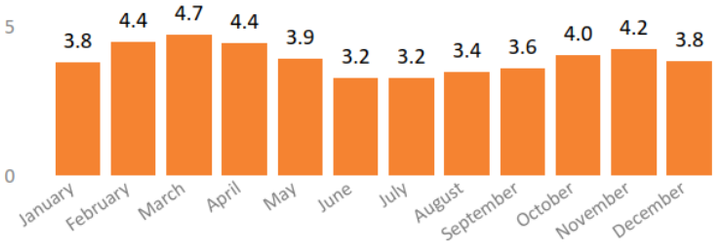


Renewable Energy Generation by Source

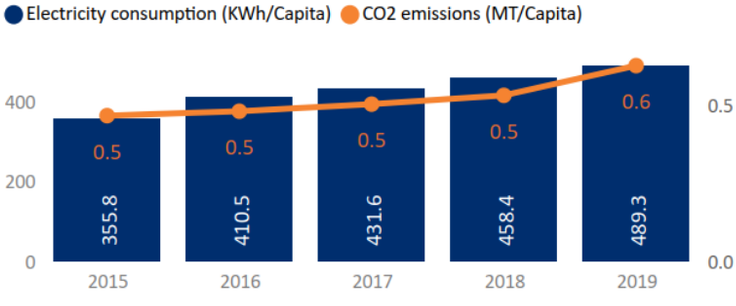


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



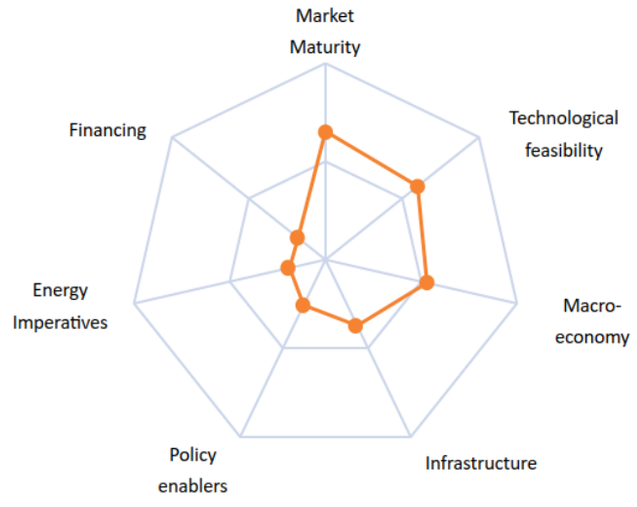
CO2 Emissions & Electricity Consumption



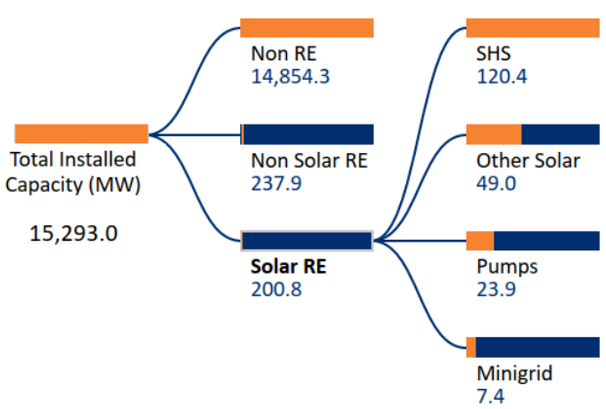
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers

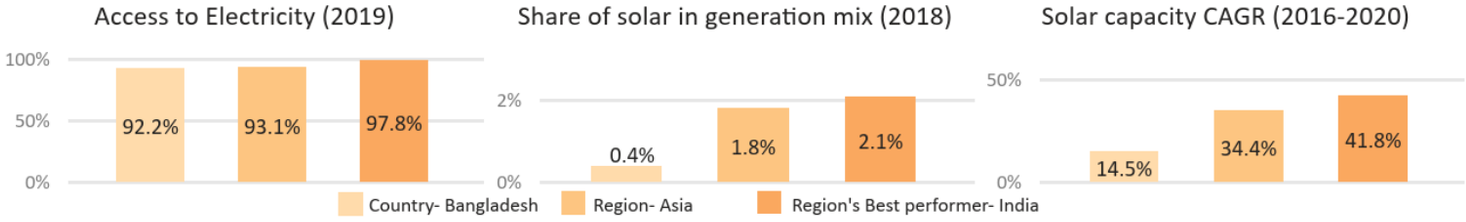


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

Areas of Improvement → Financing, Energy Imperatives

Key Insights

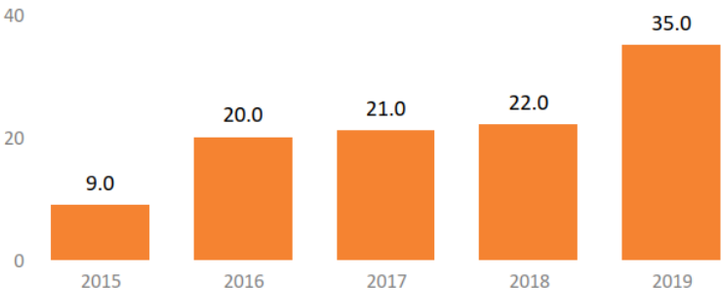
Drivers	Insights
Macro-economy	• Bangladesh demonstrated a resilient economy despite global slowdown on account of Covid-19. GDP (Real) has grown at an annual rate of 8.2% in 2019 and by 3.8% in 2020.[1] • The general Government gross debt remained relatively low in 2019 and 2020 - at 35.7% and 38.9% of GDP respectively.[2] • Service sector is a key contributor to the GDP. In 2020, Agriculture represented 12.7%, Industry represented 29.6% and Services accounted for 52.8% of GDP respectively.[2]
Policy enablers	• Bangladesh Solar Home Systems (SHS) Program is the largest national program in the world for off-grid electrification. In 2019, SHSs supplied electricity to nearly 8 million people.[3] • Bangladesh's renewable energy target aims to increase its renewable energy share to 10% (of total installed capacity) by 2021.[4] • The Government's renewable energy efforts are focused primarily on grid-connected solar power, with a target of 1,740 MW of solar generation capacity for Bangladesh by 2021.[4]
Technological Feasibility	• Bangladesh receives an average of 7 to 10 hours of daily sunshine and 300 days of sunshine per year.[5] • Bangladesh receives relatively very high levels of solar irradiation of 4.60 kWh/m²/day and specific yield of 3.89 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in country.[6] • By 2021, Bangladesh aims to reduce its dependence on fossil fuels through increased use of renewable energy.[4]
Market Maturity	• Bangladesh achieved 97% access to electricity as of 2020.[3] • Bangladesh Power Development Board (BPDP) is the sole electricity buyer in Bangladesh's power system. It buys power from the generators and sells it to urban distribution companies and the Bangladesh Rural Electrification Board (BREB).[7] • The Power Grid Company of Bangladesh (PGCB) is the National transmission utility, owning and managing the transmission line network including 132 kV, 230 kV and 400 kV substations.[8,9] • In terms of fuel mix, 57.4% of installed capacity is powered by natural gas, followed by diesel and oil (32.39%), imported power (6.12%), coal (2.76%), and renewables including hydro and solar (less than 2.00%).[9]
Infrastructure	• Bangladesh's national grid covers the entire country and operates at 132 kV, 230 kV and 400 kV. The transmission system is connected to the national grid of India through 400 kV lines at Bheramara.[9] • The Bangladesh Rural Electrification Board (BREB) increased grid connections by 280% from 9.4 million in 2015 to 26.5 million by 2019.[3]
Financing	• In 2016, the Bangladesh Bank set a mandatory 5% credit quota for direct green finance out of the total loan disbursement of all banks and FIs.[10] • Under the South Asia Subregional Economic Cooperation framework (SASEC), the Asian Development Bank (ADB) financed the first two high-voltage direct current interconnections at Bheramara with India.[9]
Energy Imperatives	• As of September 2020, the installed power generating capacity was 23,548 MW (including 2,108 MW of captive power and 627 MW of renewable resources).[9] • 92.2 % of the population in Bangladesh had access to electricity as of 2019.[11] • As of 2020, cumulative solar off-Grid Capacity for the country is 148.04 MW and 164.83 MW in 2019.[12] • Bangladesh aims to increase renewable energy capacity by 3.1 GW by 2021 with 1.6 GW contribution expected from Solar PV.[13]

Barbados

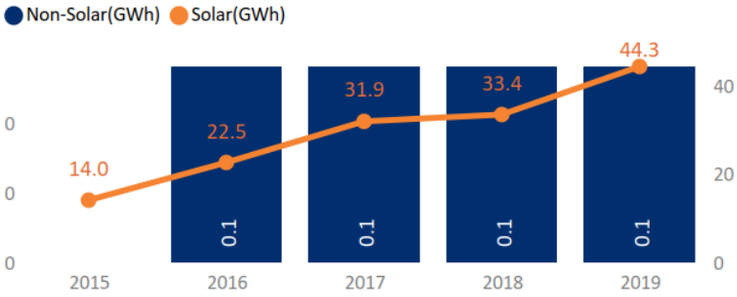
Latin America & Caribbean

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
942.6	50.0	NA
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.7	4.1	57.9

Cumulative Solar Installed Capacity (MW)

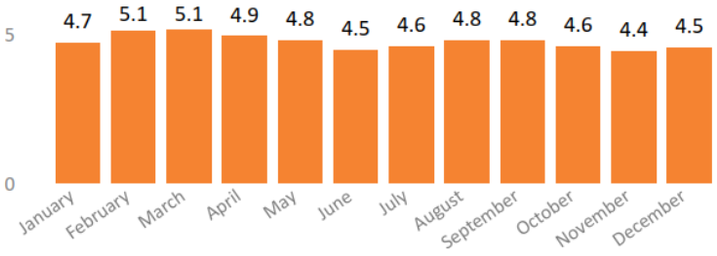


Renewable Energy Generation by Source

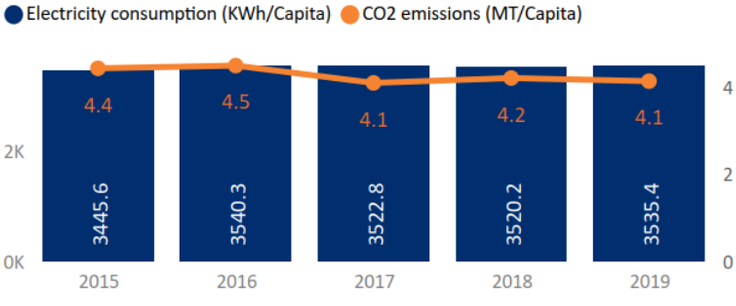


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



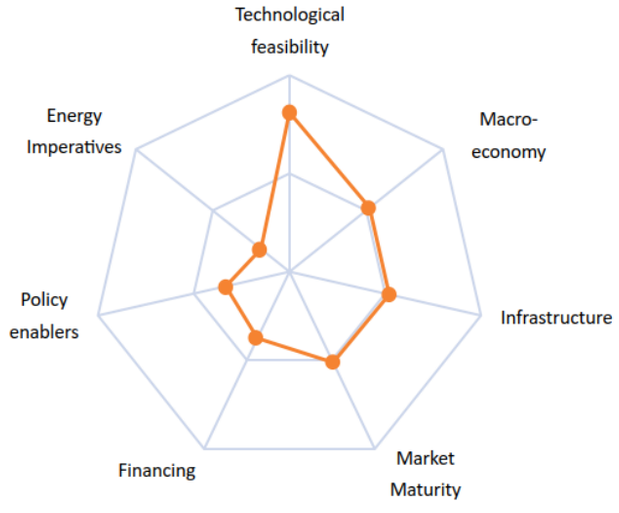
CO2 Emissions & Electricity Consumption



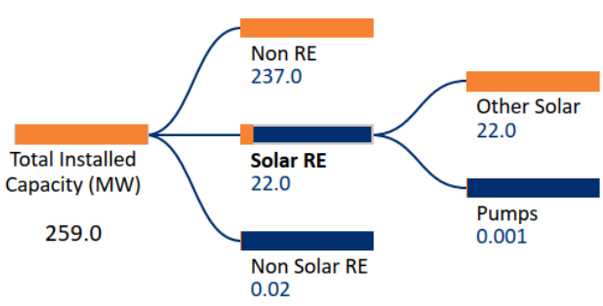
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



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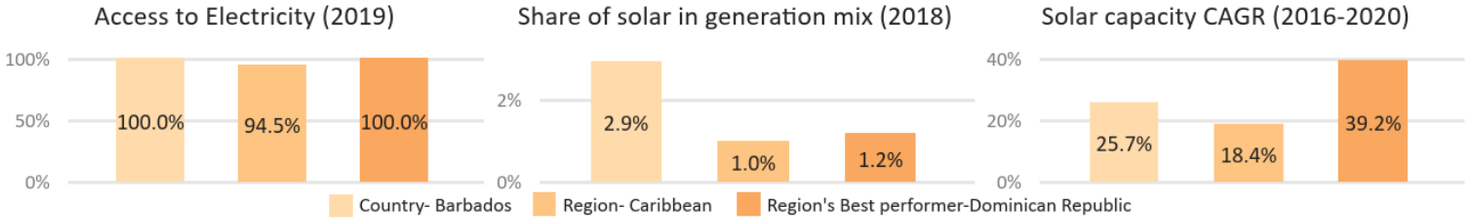
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Energy Imperatives, Policy enablers

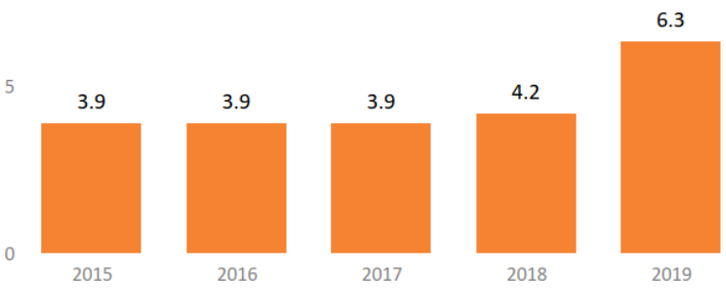
Key Insights

Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, the GDP (Real) has declined at a rate of -17.6% in 2020. In 2021, it is expected to bounce back to grow at 4.1%.[1] • Barbados is a high-income country with a GDP per capita (PPP) of USD 13,552 as of 2020. [4,1] • The inflation rate (CPI) of Barbados has improved to 2.9% in 2020 from 4.1% in 2019.[1] • Barbados is an island nation with its economy mainly dependent on tourism followed by financial services and construction sector.[3]
Policy enablers	• Barbados has set a SDG target to have 29% of the total power demand through renewable energy sources by 2029.[5] • The Energy Conservation and Renewable Energy Unit (ECREU) has been set up with a mandate to enhance country's economic growth and environment sustainability through innovative RE technologies.[7] • The Barbados National Energy Policy 2019-30 aims to transform the country from petroleum dependent economy to 100% renewable energy and carbon neutral island state by 2030.[10] • To encourage the growth of RE in the country various incentives like reduction in income and corporation tax, reduction or exemption of import duties and VAT on input, net metering and tax credits have been introduced.[9]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.77 kWh/m^2/day and specific yield of 4.72 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Country.[11] • Barbados depends significantly on imported fossil fuels for electricity generation, making it vulnerable to fluctuations in price of crude oil.[6] • As of 2020, RE accounted for 7.7% share in the total electricity generated.[12] • Solar PV has accounted 4.7% share in generation mix in 2020.[12,16]
Market Maturity	• 100% population has access to electricity as of 2019.[4] • The Power sector in Barbados is regulated by the Fair Trading Commission. The Barbados Light and Power Company (BL&P) manages generation, transmission, and distribution businesses in the country.[13] • In 2015, Barbados published revised interconnection standards regarding invertors for new distributed photovoltaic (PV) systems.[15]
Infrastructure	• The transmission system of Barbados operates on 24.9 kV or 69 kV voltage levels with total length of transmission lines at 150.2 km and 2,800 km of overhead distribution lines.[13] • The country has been facing land acquisition issues for development of renewable energy.[13]
Financing	• In 2019, the IADB has financed USD 30 million loan and EU provided a grant of 13 mn Euros to Barbados for its Energy Smart Fund 2 to achieve its objective of 100% fossil fuel free economy by 2030.[20] • Under the Barbados National Energy Policy 2019-30 policy, the government will develop international financing and assistance program to support development of renewable energy in the country.[19] • The Enterprise Growth Fund, backed by IADB, provides loan to RE projects with an objective to reduce country's dependence on fossil fuels.[21]
Energy Imperatives	• Per capita consumption of 3.53 MWh is similar to the global average of 3.35 MWh in 2019.[18] • The total solar installed capacity has reached 50 MW in 2020 and is expected to reach 310 MW by 2030.[14] • The residential sector accounts for 33% in the electricity consumption followed by small commercial and public sector having 21% and 16% share respectively.[14,12] • Due to the COVID-19 pandemic, the gross generation had reduced from 1013.12 GWh in 2019 to 930.90 GWh in 2020.[12]

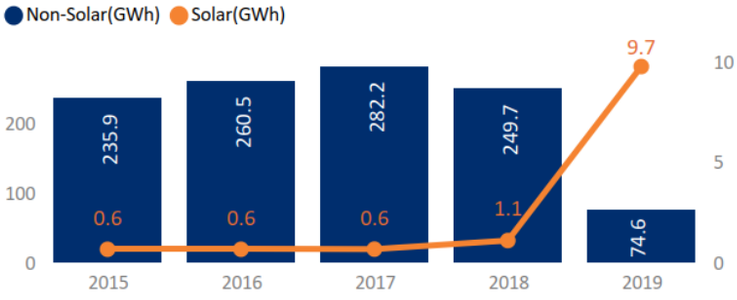
Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
779.2	6.6	0.6

Belize	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
Latin America & Caribbean	4.1	1.6	55.5

Cumulative Solar Installed Capacity (MW)

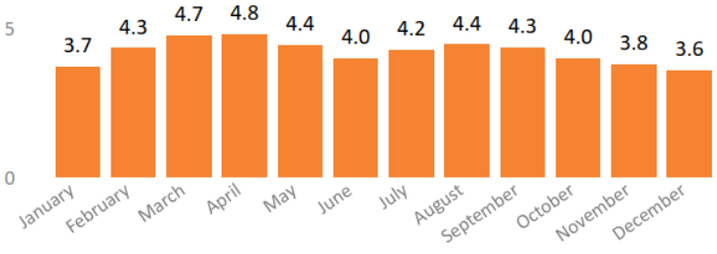


Renewable Energy Generation by Source

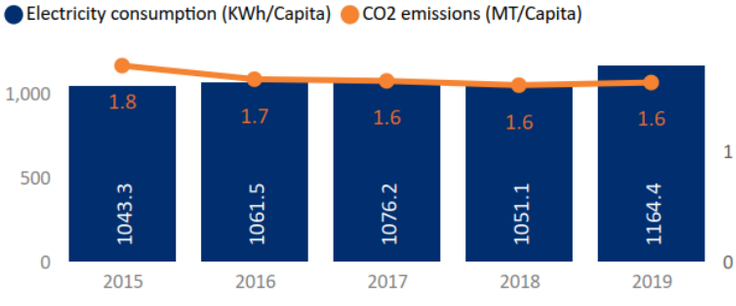


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



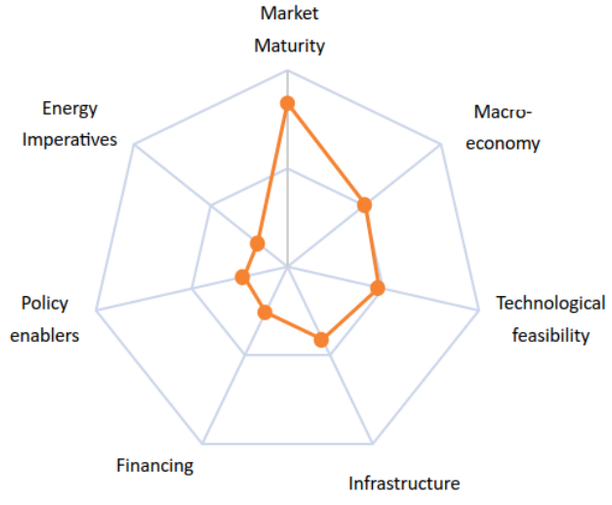
CO2 Emissions & Electricity Consumption



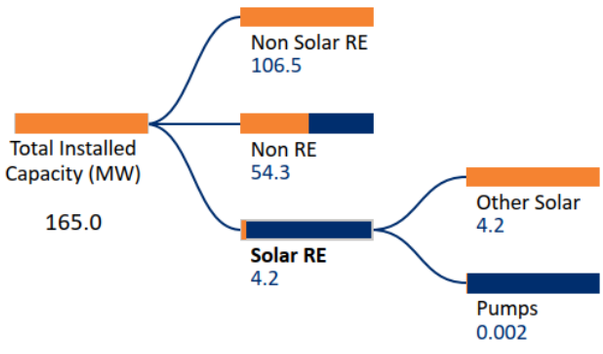
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers



Installed Generation Capacity by Source



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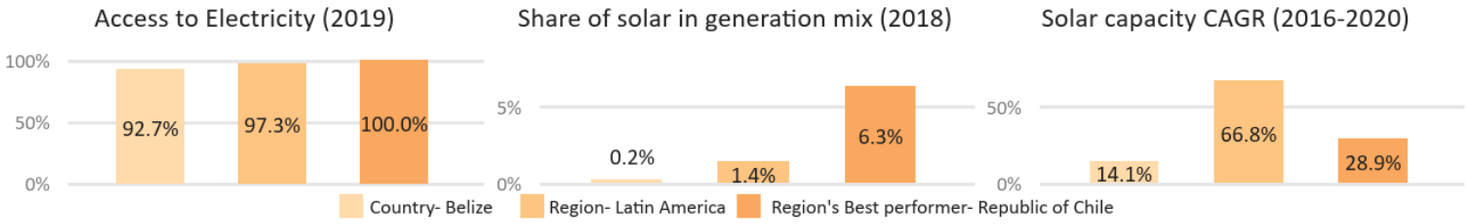
Country's regional performance and characteristics



Areas of Strength → Market Maturity, Macroeconomy

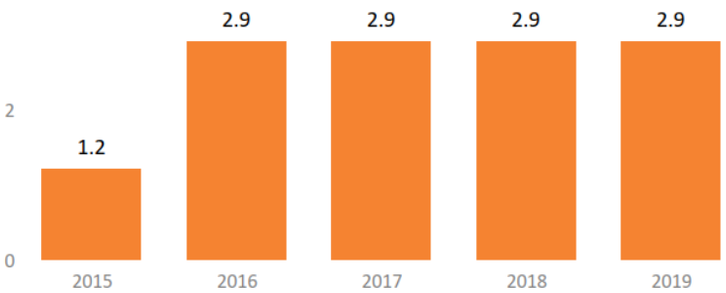
Areas of Improvement → Energy Imperatives, Policy enablers

Key Insights

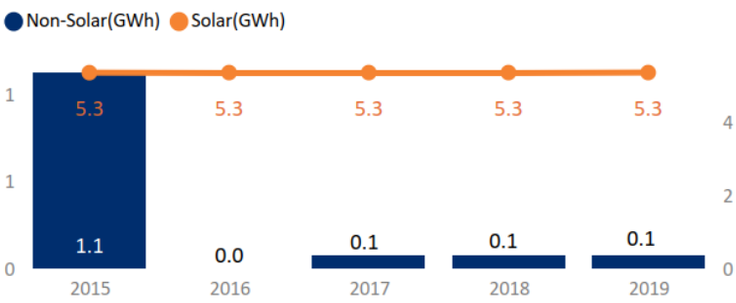
Drivers	Insights
Macro-economy	• On account of COVID-19 pandemic, the GDP (Real) declined by 14.1% in 2020. In 2021, it is expected to bounce back to an annual growth rate of 1.9%.[1] • Belize is an upper middle-income country with a GDP per capita (PPP) at USD 6,406 in 2020. [4,1]
Policy enablers	• The country has set an ambitious target to achieve 75% share of renewable energy in the generation mix by 2030.[10] • To encourage the development of Renewable Energy, the country aims to implement interconnection policy and regulatory frameworks by 2022.[10] • Various incentives such as tax exemptions, tax credits, auctions have already been implemented to attract renewable energy investments in the country.[9]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.05 kWh/m^2/day and specific yield of 4.10 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[5] • In 2018, 33.1% of the country's power demand was met through renewable energy sources out of which solar PV contributed only 1.3% of the total generation mix.[3] • The total potential of renewable energy in the country is 186 MW with solar estimated at 40 MW.[8]
Market Maturity	• 93% of the population in Belize had access to electricity as of 2019.[4] • The Power sector in Belize is regulated by Public Utilities Commission. The Belize Electricity Limited (BEL) controls the transmission and distribution sector in the country. The generation sector has presence of IPPs but is largely dominated by BEL.[3,8] • To reduce the dependence on hydro power and oil, the Government is planning to increase the share of renewable energy in the generation mix with special focus on solar, wind and biomass.[3]
Infrastructure	• To increase the quality of electricity supply, the country has set a target to reduce the transmission & distribution losses from 12% to 10% by 2030.[10] • The national grid operates at voltage levels of 6.6 kV to 115 kV with total length of transmission and distribution lines reaching 3,000 kms in 2018.[3] • As per the National Determined Contribution (NDC), the country aims to install 40 MW utility scale solar power by 2025.[10]
Financing	• The Belize Electricity Limited has planned to invest USD 125 Mn to increase the share of renewable energy through capacity additions.[10] • The Economic Development Council has till now mobilized investments worth USD 200 Mn for energy sector.[10] • The UAE-Caribbean Renewable Energy Fund (UAE-CREF) has sanctioned USD 50 Mn fund to support renewable energy rural electrification project in Belize.[11]
Energy Imperatives	• Per capita consumption of 1.16 MWh is relatively low in comparison to the global average of 3.35 MWh as on 2019.6 • The total solar installed capacity has reached 6.5 MW in 2020.[7,3] The total power demand of the country clocked 682.4 GWh in 2019, with 65.0% coming from hydropower followed by biopower and gas & oil based thermal power plants with 31.2% and 3.59% share respectively.[3]

Benin	Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
	1,181.0	2.9	1.5
Africa	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
	4.2	0.7	52.4

Cumulative Solar Installed Capacity (MW)



Renewable Energy Generation by Source



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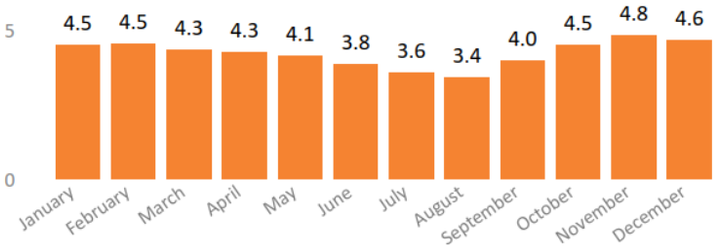
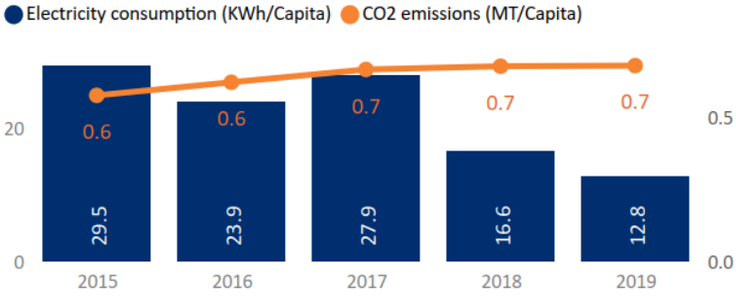
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



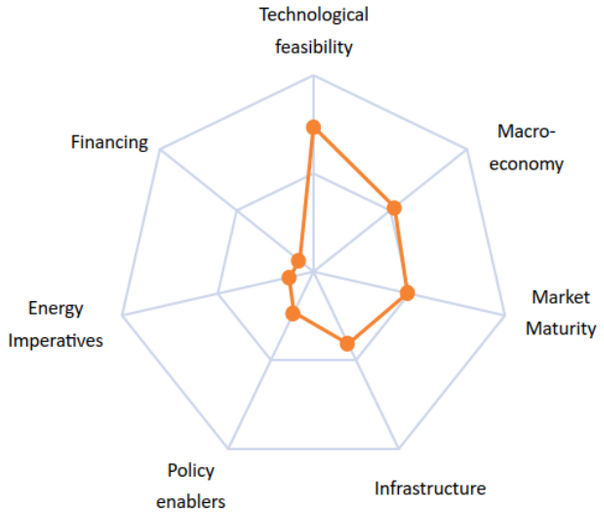
CO2 Emissions & Electricity Consumption



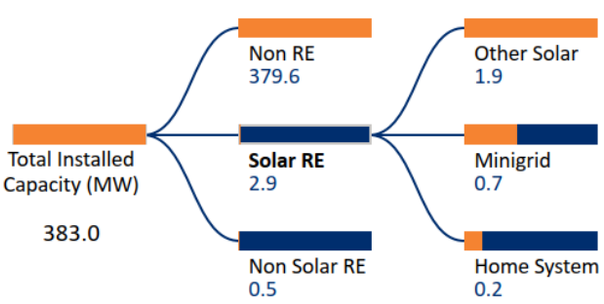
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers



Installed Generation Capacity by Source



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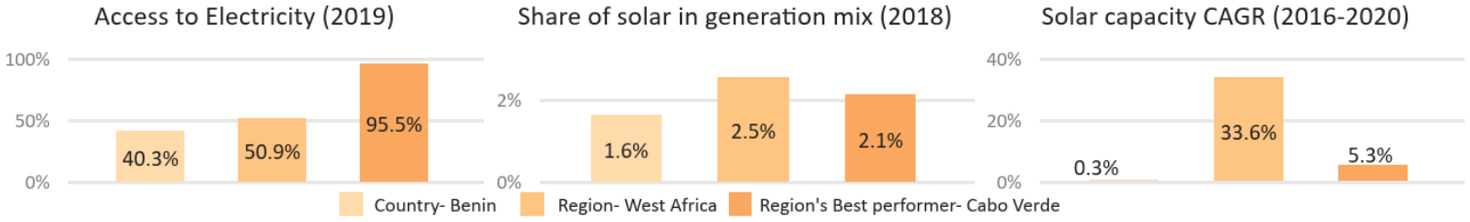
Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Energy Imperatives

Key Insights

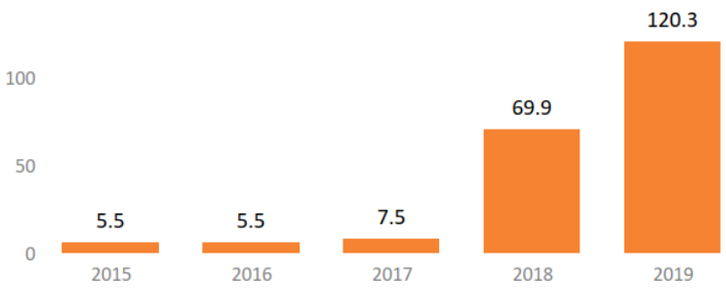
Drivers	Insights
Macro-economy	• Benin is a lower-middle income economy with a GDP per capita (PPP) at USD 3,572 in 2021.[1,2] • The GDP (Real) is expected to recover from 2% growth in 2020 to 5% in 2021.[1] • Benin's economy is heavily reliant on the informal re-export and transit trade with Nigeria (approximately 20% of GDP) and on agriculture, especially cotton.[3]
Policy enablers	• Benin adopted the National Policy for the Development of Renewable Energyin 2020, which sets out the vision of government for development of renewable energies between 2020-2030.[4] • Renewable energy target of the country is to achieve 24.6% share in the energy mix by 2025.[17] • In 2020, the Beninese Government has exempted the VAT on imports of solar panels.[5]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.33 kWh/ m^2/ day and specific yield 4.2 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Benin.[6] • Benin is reliant on electricity imports for a significant share of its energy supply. Its domestic energy generation is mainly powered by Biomass. [7,8] • Renewable Energy accounted for 3.4% of total generation in 2019.[9]
Market Maturity	• 40% of the population in Benin had access to electricity as of 2019.[15] • The Government of Benin has demonstrated commitment to power sector reforms by installing a management contract to run its national electricity distribution utility, SBEE (Société Béninoise d'Energie Electrique), as well as enacting a new energy code that supports IPP investments.[12] • Share of solar power in generation mix was 1.62% in 2018.[11]
Infrastructure	• The Government of Benin (GoB) is building generation assets, pursuing IPP transactions, expanding transmission capacity, and modernizing its distribution network while expanding access through grid and off-grid connections.[12] • By November 2019, construction of 79 mini grids was completed in 77 rural villages with capacity ranging from 15 kW to 75 kW of which 13 would be connected to the national grid.[22]
Financing	• The Universal Energy Facility, a results-based financing facility managed by Sustainable Energy for All (SEforALL) and funded by GIZ, has now opened a new window of financing for minigrid projects in Benin.[20] • The US Trade and Development Agency (USTDA) also plans to extend a grant funding for technical assistance to Beninese mini-grid utility Sherlock Grids SAS.[21]
Energy Imperatives	• In 2019, total Installed Capacity of Power Generation in Benin was 394 MW.[14] • Per capita consumption of 0.129 MWh is well below in comparison to the global average of 3.35 MWh in 2019.9 • The installed solar PV capacity grew marginally from 1 MW in 2015 to 3 MW in 2019.[11] • In June 2019, the country's Council of Ministers approved construction of additional four solar PV plants with a combined capacity of 50 MW.[22] • The solar home system (SHS) and pico-solar market in Benin is experiencing strong growth. In 2019, 53,265 SHS and pico-solar products were sold by companies affiliated with GOGLA and Lighting Global, up from 14,488 in 2018 - nearly a four-fold increase.[22]

Plurinational State of Bolivia

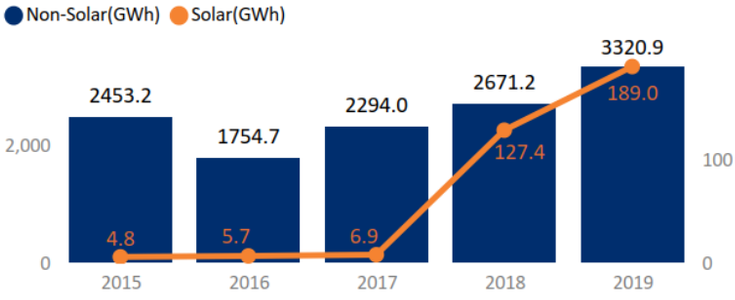
Latin America & Caribbean

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
8,450.0	120.3	5.3
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.5	2.0	51.7

Cumulative Solar Installed Capacity (MW)

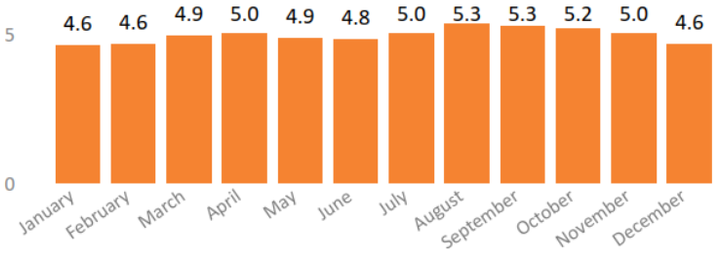


Renewable Energy Generation by Source

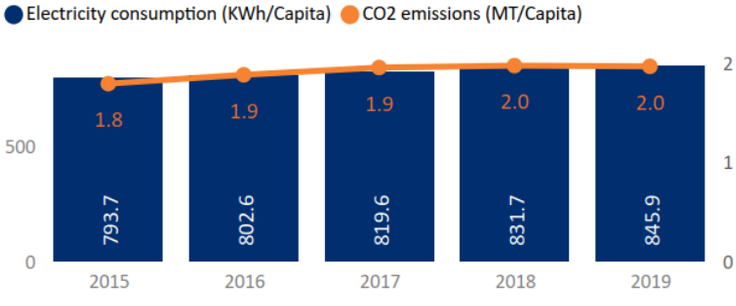


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



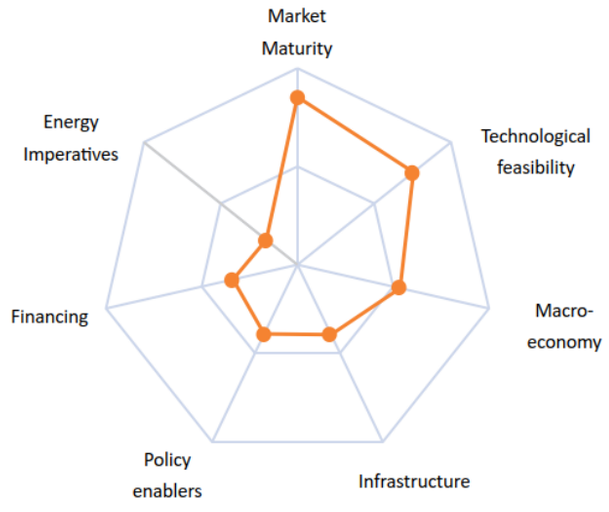
CO2 Emissions & Electricity Consumption



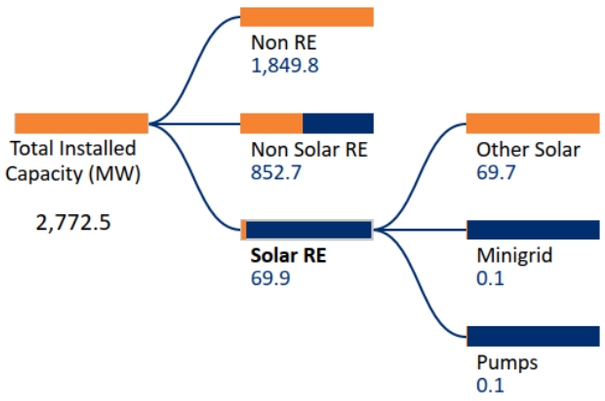
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
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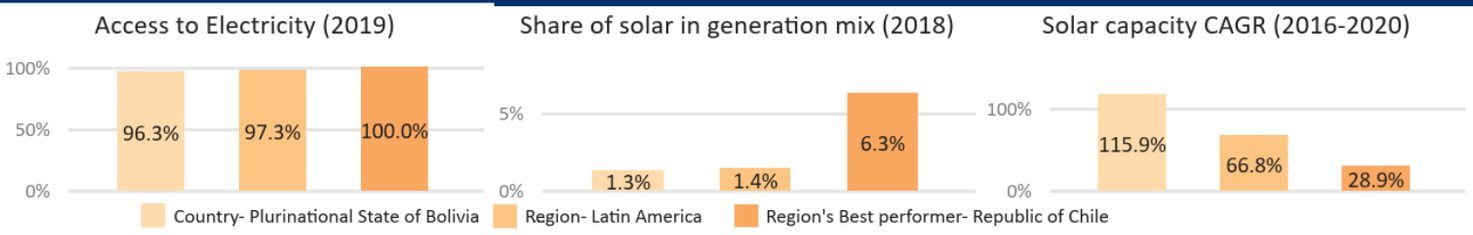
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

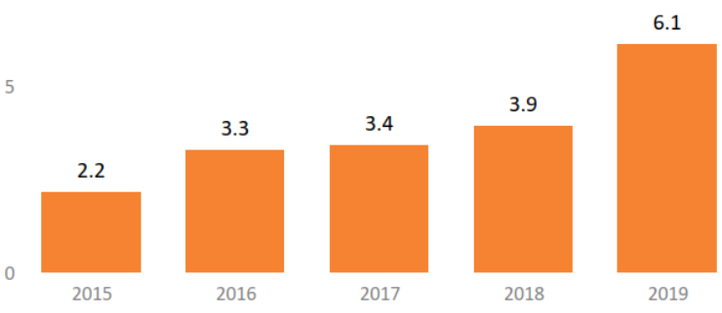
Areas of Improvement → Energy Imperatives, Financing

Key Insights

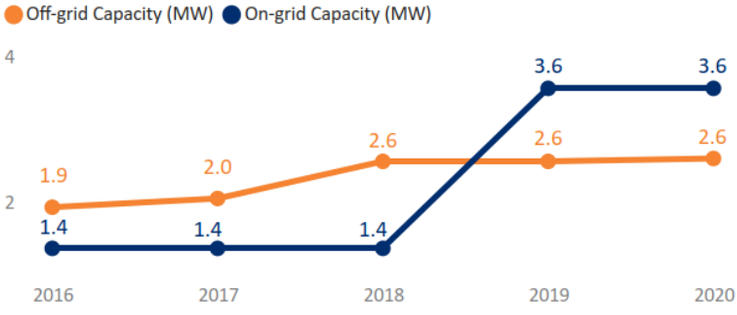
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, the GDP (Real) declined at a rate of 7.7% in 2020. In 2021, it is expected to growth at 5.5% from 2020 level.[1] • As of 2019, fuels and mining products dominated the total exports with a share of 58.4% followed by agricultural products having 14.0% share.[17] • The inflation rate (CPI) of Bolivia has improved reaching 0.9% in 2020 from 1.8% in 2019.[1]
Policy enablers	• The country has set NDC goal to increase share of 'alternative' energy (wind, biomass, geothermal and solar) and other sources of energy (combined cycle) to 9% by 2030.[8,9] • The Electric Plan 2020-2025 aims to have 183 MW RE installed capacity by 2025, with 20 MW solar PV capacity additions.[10] • In March 2021, the government launched the net metering scheme to encourage the solar rooftop PV installations in the country.[11]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation, (GHI) of 5.42 kWh/m^2/day and specific yield 4.52 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[5] • In 2019, 5.2% of the country's power demand was met through RE sources.[7] • Bolivia is vulnerable to fluctuating prices of fossil fuels because of its substantial dependence on them for electricity generation.[7]
Market Maturity	• 96% of the population in Bolivia had access to electricity as of 2019.[4] • National Electricity Company (Empresa Nacional de Electricidad)-ENDE controls majority of the power sector in the country having 80% share in Generation & Transmission and 51% share in Distribution sector.[12,16] • Solar PV accounted for 1.8% share in generation mix in 2019.[7] • Between 2010-19, Bolivia has attracted investments worth USD 1.2 bn for clean energy projects.[9]
Infrastructure	• To strengthen the power sector, the Government aims to attract investments worth USD 25 bn by 2025.[12] • Currently, a total of 17 RE projects (six wind, five solar, three combined cycle, two biomass and one geothermic) are under study in Bolivia.[12] • As of 2020, ENDE had installed transmission lines with a total length of 7,483 km with system availability of 99.92%.[13] • Bolivia's Power company ENDE has announced to expand the transmission network by initiating 6 transmission line projects (currently under study).[12]
Financing	• In 2018, the Inter-American Development Bank had approved loan of USD 51.6 mn to promote RE technologies (solar, wind and geothermal) in the country.[14] • The Agence Française de Développement (AFD) has disbursed a loan EUR 60 mn for the development of Oruro photovoltaic power station in Bolivia. The project also received financing of EUR 17.5 mn from Central Bank of Bolivia and EUR 8.5 mn by the European Union (LAIF).[15] • Concessional loans from international donor, for the development of RE projects, are accepted by law on a case-by-case basis.[16]
Energy Imperatives	• Per capita consumption of 0.80 MWh is relatively low in comparison to the global average of 3.31 MWh in 2020.[6] • The total installed capacity of solar PV has shown a CAGR of 44.8% between 2010-20, reaching 120.3 MW in 2020 from 2.9 MW in 2010.[3] • As of 2019, Natural Gas dominated the generation mix having 61.8% share followed by Hydro power and Biofuels with 32.0% and 2.6% share respectively.[7] • In the last decade, the total electricity generation in the country has recorded a CAGR of 4.8%, reaching 10.1 TWh in 2019 from 6.65 TWh in 2010.[7]

	Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
Botswana	3,209.0	6.1	2.6
Africa	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
	5.2	2.7	66.2

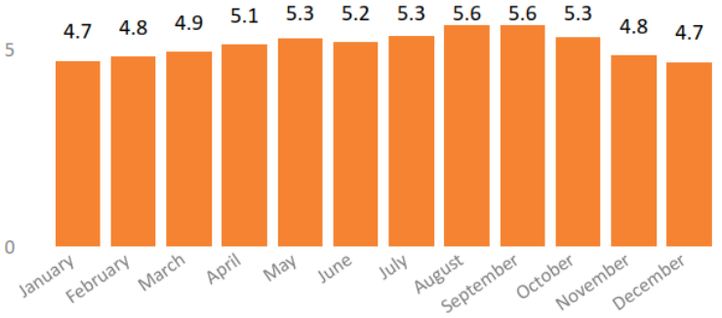
Cumulative Solar Installed Capacity (MW)



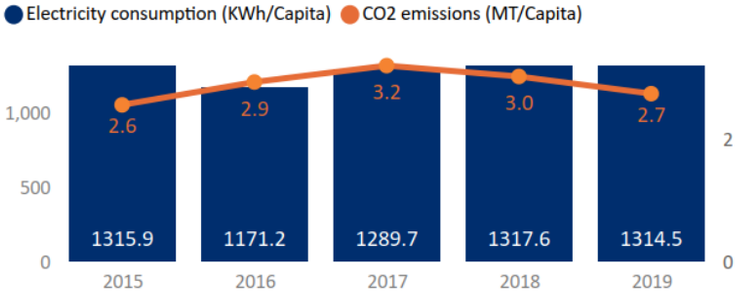
Cumulative Solar Off-grid & On-grid Capacity



Monthly variation in PVout (kWh/kWp/day)



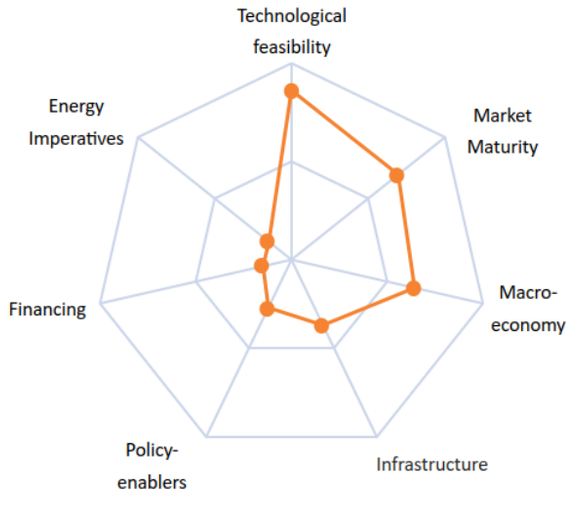
CO2 Emissions & Electricity Consumption



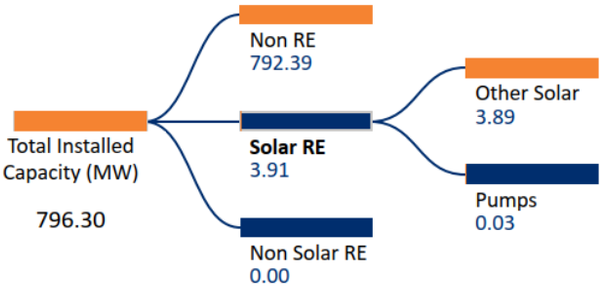
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

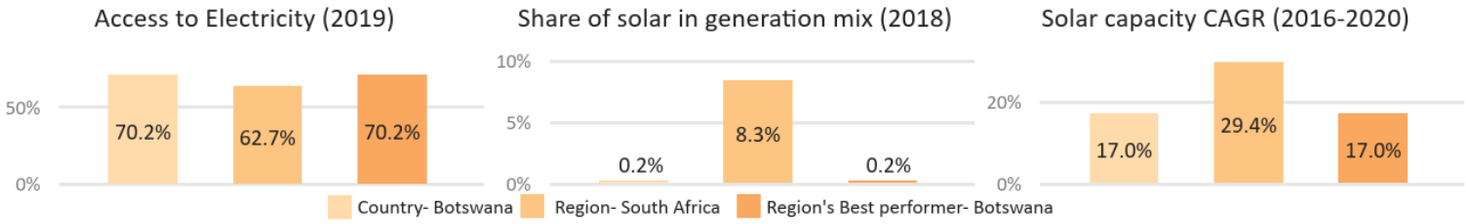


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Market Maturity

Areas of Improvement → Energy Imperatives, Financing

Key Insights

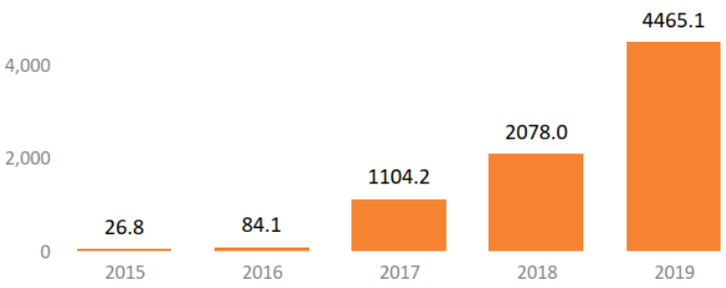
Drivers	Insights
Macro-economy	• The GDP (Real) growth rate is expected to recover to 7.5% in 2021, which was poised at -8.3% in 2020.[1] • Botswana is an upper-middle income economy with a GDP per capita (PPP) at USD 3,572 in 2021.[1,2] • Diamond mining fuelled much of the economic expansion and currently accounts for one-quarter of GDP, approximately 85% of export earnings and about one-third of the government's revenues.[3]
Policy enablers	• The Ministry of Mineral Resources, Green Technology and Energy Security (MMGE) leads the electricity sector through the Department of Energy.[12] • In 2020, Botswana announced that renewable energy would account for at least 15% of the country's energy mix by 2030; this share is slated to increase to 50% 2036.[11] • In 2020, Botswana's Ministry of Mineral Resources, Green Technology and Energy Security (MMGE) had launched a net metering scheme for rooftop PV systems.[13]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 6.07 kWh/ m^2/ day and specific yield 5.16 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Botswana.[5] • Botswana largely depends on coal powered generation facilities for fulfilling its power needs.[6] • Around 29% of Botswana's current power demand is covered by domestic coal power generation, remaining 71% depends on imports from South Africa.[13] • Share of RE in electricity mix was 0.2% in 2019, which the Government is looking to aggressively increase to 15% by 2030.[6]
Market Maturity	• 70% of the population in Botswana had access to electricity as of 2019.[7] • Botswana Power Corporation (BPC) is a state-owned integrated company for electrical power generation, transmission and distribution in Botswana.[14] • Botswana Energy Regulatory Authority is responsible for providing an efficient energy regulatory framework for Electricity, Gas, Coal, Petroleum products, Solar and all forms of renewable energy.[10] • Share of solar in generation mix was 0.18% in the year 2018.[8]
Infrastructure	• The reliability of the distribution network in some parts of the country has been below the desired standards due to factors such as aged equipment, network overloads where demand exceeds installed network capacity and inadequate maintenance.[14] • Botswana is interconnected with its neighbours through the Southern African Power Pool (SAPP).[12] • Botswana imports a large of its electricity needs from neighbouring countries such as South Africa, Mozambique and Namibia.[16]
Financing	• The Renewable Energy Strategy and Road Map of 2018 encompasses an Investment Programme which is derived from the Capacity Expansion Plan and guides the RE strategy.[11] • World Bank has tied up with Botswana on Renewable Energy strategy while also have lined up funds for West Africa off-grid projects.[15] • In 2018, the Government of Botswana issued an off-grid solar action plan supported by funding from the World Bank's Energy Sector Management Assistance Programme.[12]
Energy Imperatives	• Per capita consumption of 1.58 MWh is relatively lower in comparison to the global average of 3.35 MWh in 2019.[6] • Total Installed power generation capacity in Botswana was 761 MW in 2019.[4] • The installed Solar PV capacity grew marginally from 4 MW in 2018 to 6 MW in 2019.[8] • 4 new solar and thermal power plants are planned for construction by the Government of Botswana by 2026.[18]

Brazil

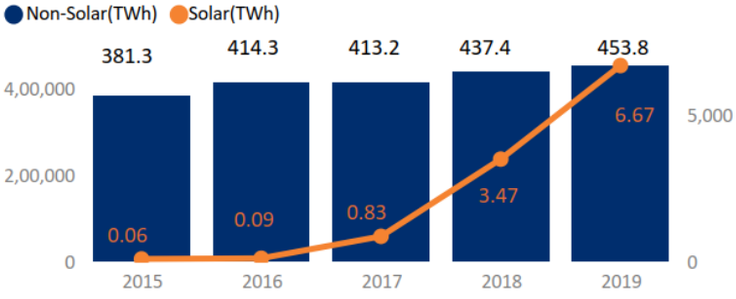
Latin America & Caribbean

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
506.9	7,879.2	7.2
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.3	2.2	59.1

Cumulative Solar Installed Capacity (MW)

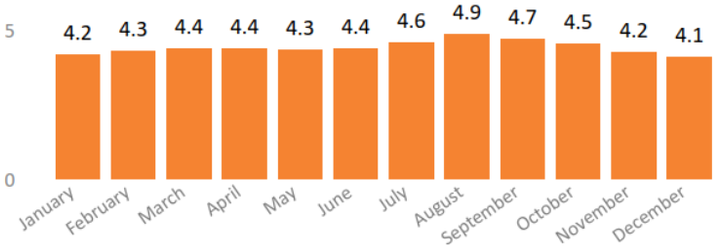


Renewable Energy Generation by Source

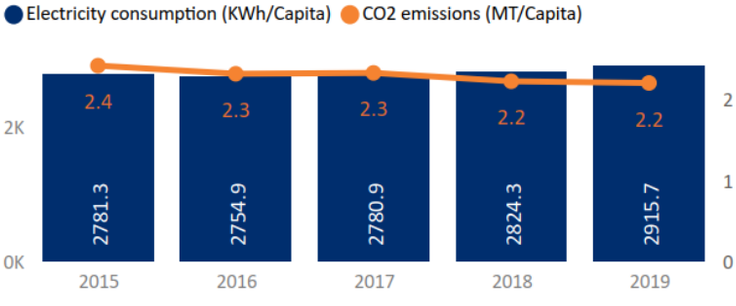


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



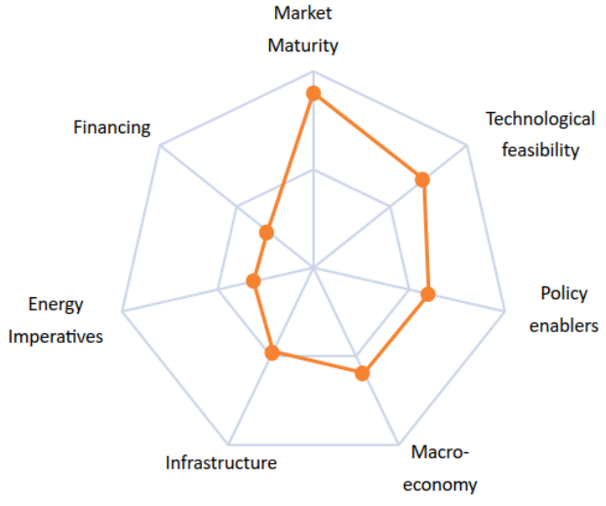
CO2 Emissions & Electricity Consumption



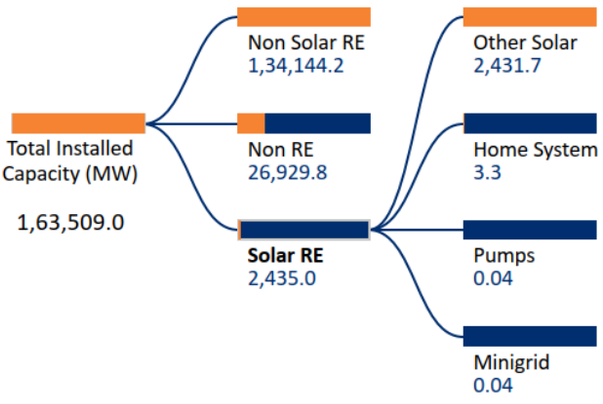
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers



Installed Generation Capacity by Source



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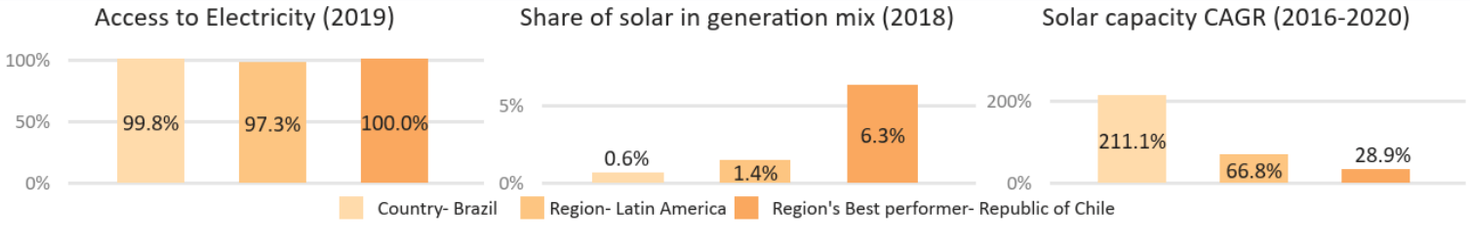
Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

Areas of Improvement → Financing, Energy Imperatives

Key Insights

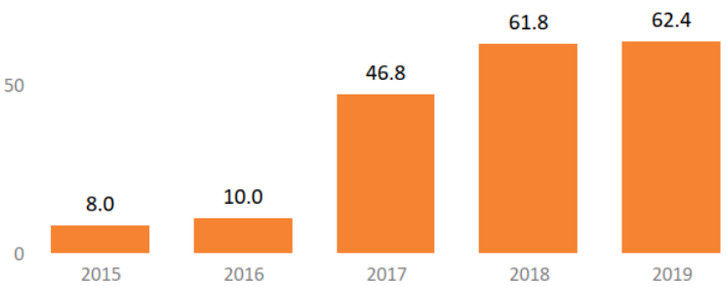
Drivers	Insights
Macro-economy	• On account of COVID-19 pandemic, the GDP (Real) has declined by 4.1% in the year 2020; In 2021, it is expected to bounce back to an annual growth rate of 3.7%.[1] • The inflation rate (CPI) of Brazil has improved to 3.2% in 2020 from 3.7% in 2019.[1] • In 2020, Agricultural products dominated the total exports with a share of 33.4%, followed by Manufactures and fuels & mining products having 26.5% and 23.1% share respectively.[16]
Policy enablers	• Brazil has set a target to achieve 9 GW utility scale solar PV to be installed by 2026.[6] • The Net metering policy has triggered an exponential growth of small-scale solar PV as the total capacity reached 5 GW in 2020 from 81 MW in 2016.[3,7] • The Ten-Year Energy Expansion Plan aims to have 63% of the total power generation coming from solar PV.3,8 • To promote the renewable energy investments, standard PPA with sufficient duration and purchase obligations have been developed.[7]
Technological Feasibility	• Owing to relatively high levels of solar irradiation (GHI) of 5.28 kWh/m^2/day and specific yield 4.27 kWh/kWp, a strong technical feasibility is envisaged for solar projects in Country.[4] • As of 2020, renewable energy accounted 20.9% share in the generation mix.[3] • 5 MW/10 MWh battery storage project is being installed in Rio de Janeiro to supply power during the peak hours.[14]
Market Maturity	• Brazil's 100% population had access to electricity as of 2019.15 • In 2019, Brazil recorded USD 4.84 B investment in clean energy. Between 2016-19, distributed solar PV alone has seen investments worth USD 3.2 Billion, with USD 2.36 billion alone in 2019.7 • Brazil's solar PV industry is highly competitive recording lowest average auction price of USD 17.5/MWh in 2019.7 • To reduce the dependence on hydro power, the Government is resorting to solar and wind. 133 solar PV power plants and 312 onshore wind power plants are under construction or at permit stage.[3]
Infrastructure	•The transmission system of Brazil operates 230 kV to 750 kV (AC voltage levels) and 600 kV to 800 kV (DC voltage levels). •The total length of transmission lines grew at a CAGR of 5.0% in the last decade reaching 162,700 ckm in 2020.[3] •Power Distribution is operated by 102 power distribution companies with a total line network of 3,698,921 ckm in 2020.[3] •The National grid of Brazil is interconnected with Uruguay, Argentina, Venezuela and Paraguay.[3]
Financing	• Brazil is the biggest green bond market in the region with volumes going beyond USD 1 billion in 2019.[13] • Brazil's Innova Energia Program, launched in 2013, supported cooperation between companies and institutes in various fields including renewable energy through grants and soft loans.[10,3] • Between 2010-19, the Brazilian National Development Bank (BNDES) has disbursed USD 24 billion for renewable energy projects. Around 52.5% of bank's credit portfolio relates to green economy and social development projects.[7,11] • In 2021, International Finance Corporation has sanctioned USD 120 million loan to Brazil to promote financing of renewable projects with special focus on solar PV projects.[12]
Energy Imperatives	• Per capita consumption of electricity, at 2.96 MWh, is comparable to the global average of 3.31 MWh in 2020.[5] • The total solar installed capacity has reached 7.9 GW in 2020 and is expected to reach 28.5 GW by 2030.[3] • The industrial sector accounts for 35.0% share in the electricity consumption followed by residential and commercial having 31.2% and 17.3% respectively.[3] • As of 2020, Hydropower dominates the total installed capacity with a share of 60.9%, followed by onshore wind and Gas having 9.5% and 9.4% share respectively.[3]

Burkina Faso

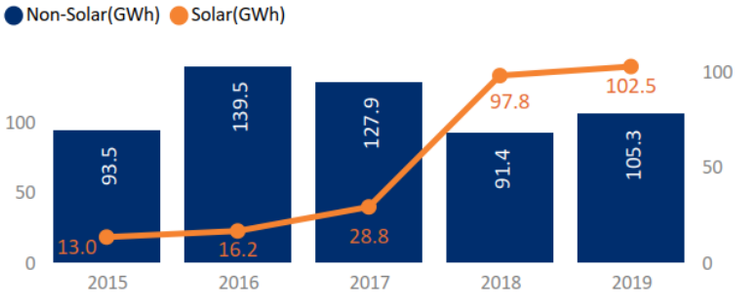
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
1,568.1	62.4	27.0
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.6	0.2	51.4

Cumulative Solar Installed Capacity (MW)

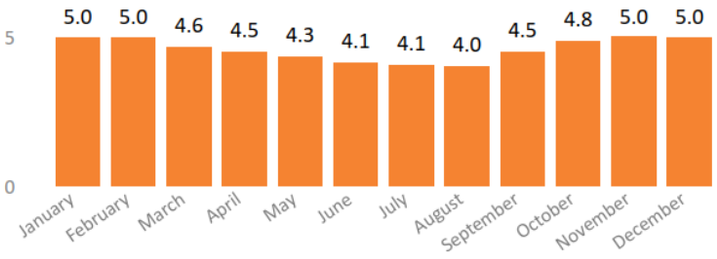


Renewable Energy Generation by Source

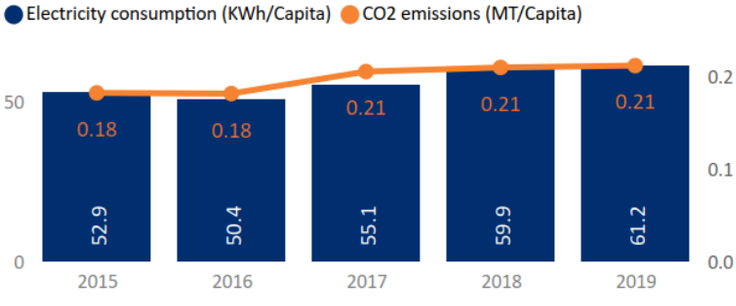


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



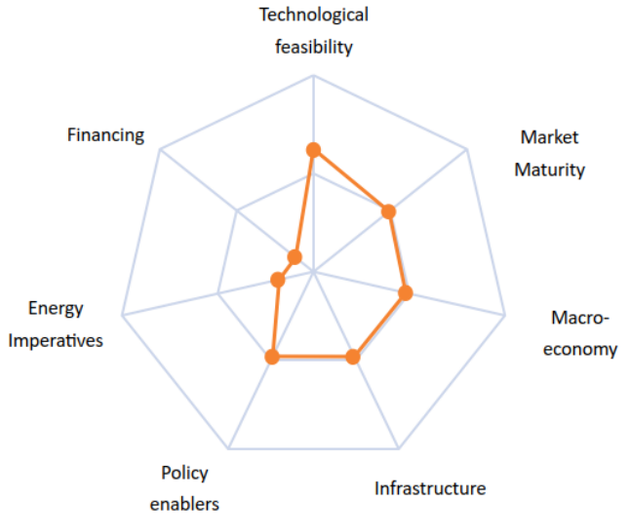
CO2 Emissions & Electricity Consumption



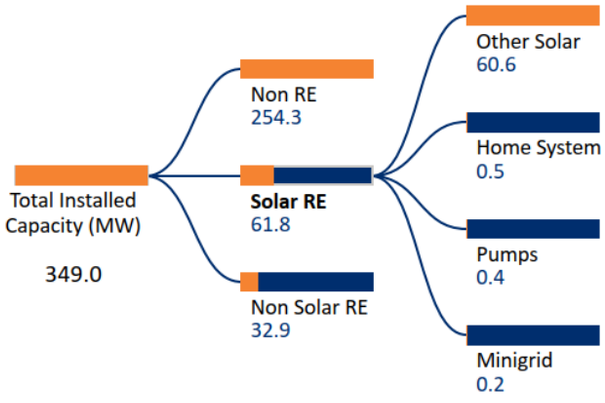
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



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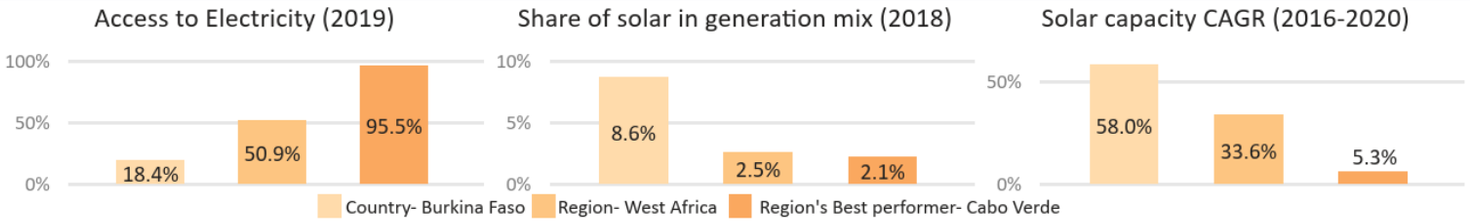
Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Market Maturity

Areas of Improvement → Financing, Energy Imperatives

Key Insights

Drivers	Insights
Macro-economy	• The GDP (Real) growth is expected to recover from 0.8% in 2020 to 4.3% in 2021.[1] • Burkina Faso is a low-income economy with a per capita GDP (PPP) of USD 2,262 in 2021.[1,2] • The economy is largely based on agriculture, which employs 80% of the workforce.[3]
Policy enablers	• In 2016, the Government of Burkina Faso (GoBF) created the National Agency for Renewable Energy and Energy Efficiency (ANEREE) to promote the use of renewable energy.[7] • The GoBF has set forth a bold national plan and has taken steps to introduce legislation to encourage private-sector investment and to liberalize electricity generation and distribution.[7]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.81 kWh/m^2/day and specific yield 4.57 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Burkina Faso.[6] • Share of RE in electricity generation mix was 4.26% in the year 2019.[4] • Burkina Faso Solar Energy and Access project (SEAP) aims to improve access to solar energy and increase the mobilization of private financing for greater access to electricity.[9] • There were 93 existing mini grids in 2018 promoted by local cooperatives.[1]
Market Maturity	• 18% of the population in Burkina Faso had access to electricity as of 2019.[5] • The National Electricity Company of Burkina (SONABEL) is the main vertically integrated electricity operator with a national monopoly on the generation and distribution of electricity in the urban centres.[12] • The energy regulator in the country is the Electricity Regulatory Authority.[10]
Infrastructure	• Burkina Faso has electrical interconnection with Cote' De Ivoire and Ghana.[16] • In 2017, Burkina Faso inaugurated the Zagtouli solar power plant with support from the European Union and the French Development Agency (AFD).[7] • Burkina Faso has relatively dense transmission and distribution network; 63% of the population lives within 15 km of the network.[14]
Financing	• The Green Climate Fund (GCF) has pledged to provide Euro 24.3 Mn to the Yeleen Rural Electrification Project in 2018.[13] • In January 2021, The European Investment Bank confirmed EUR 38.5 Mn of new financial and technical support to transform renewable power generation in Burkina Faso.[8] • The World Bank approved financing of USD 75 Mn from the International Development Association (IDA) and USD 93 Mn from the Clean Technology Fund via the Sustainable Renewables Risk Mitigation Initiative (SRMI) to increase access to electricity in rural areas in Burkina Faso.[9]
Energy Imperatives	• Per capita consumption of 0.09 MWh is relatively lower in comparison to the global average of 3.35 MWh in 2019.[4] •The installed Solar PV capacity grew from 47 MW in 2017 to 62 MW in 2019.[11] • Launched in 2016, The National Plan for Economic and Social Development seeks to increase country's electricity access rate from 20% to 80%.[7]

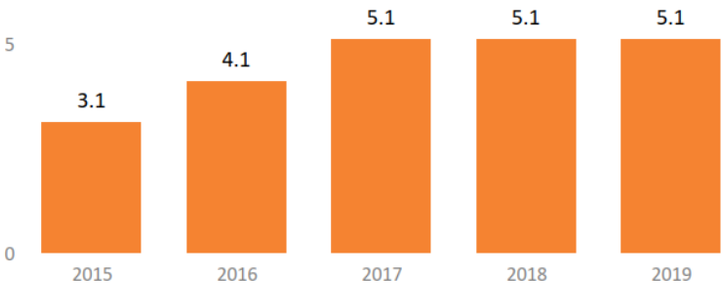
Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
275.9	5.1	4.7

Burundi

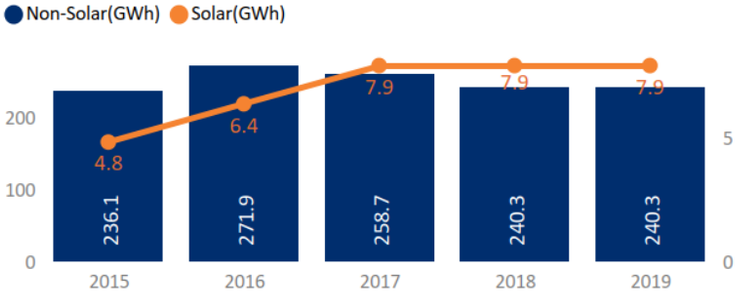
Africa

Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
4.2	0.1	46.8

Cumulative Solar Installed Capacity (MW)

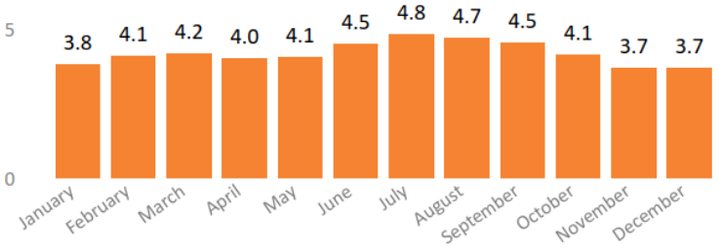


Renewable Energy Generation by Source

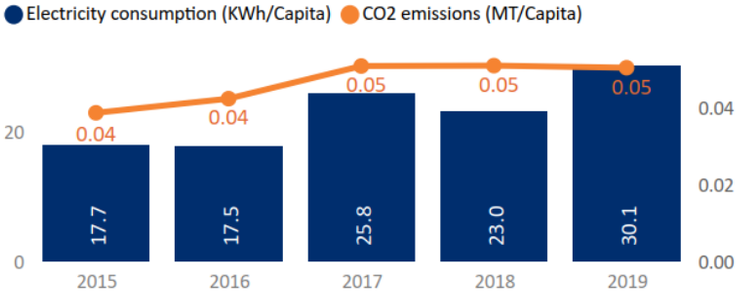


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



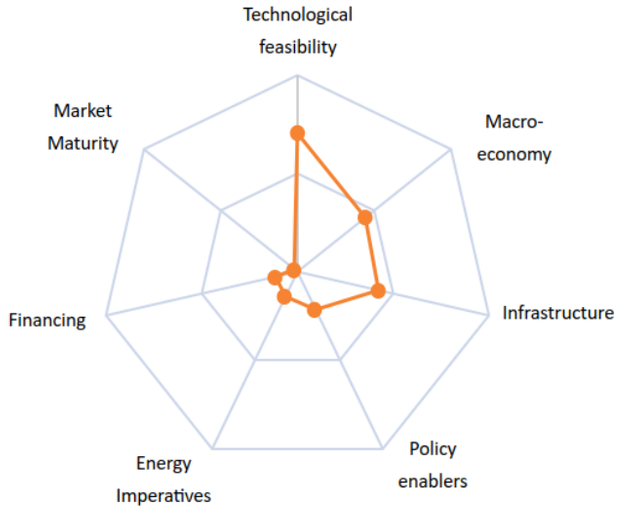
CO2 Emissions & Electricity Consumption



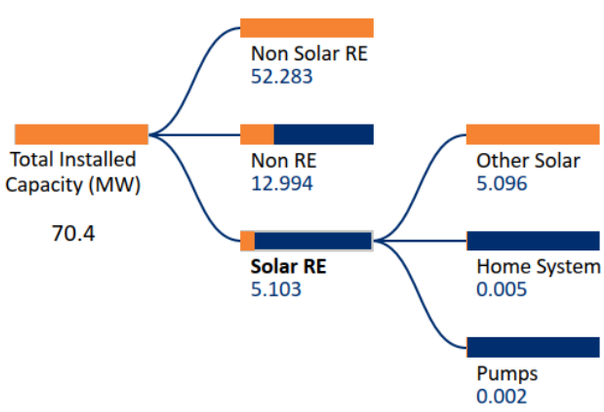
Ease of Doing Solar Classification

Potential

Performance against 7 drivers

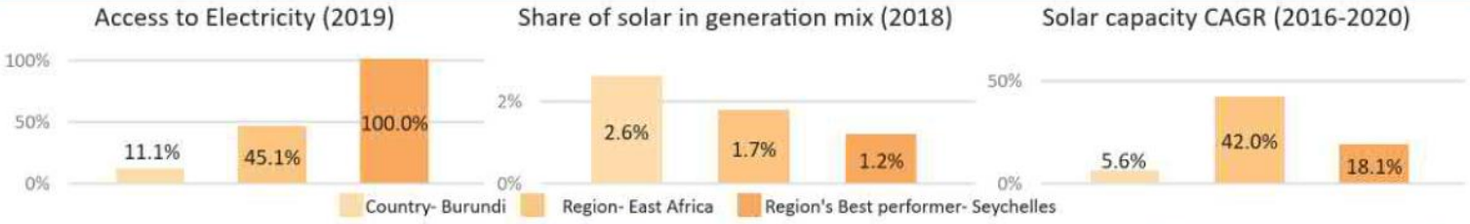


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Market Maturity, Financing

Key Insights

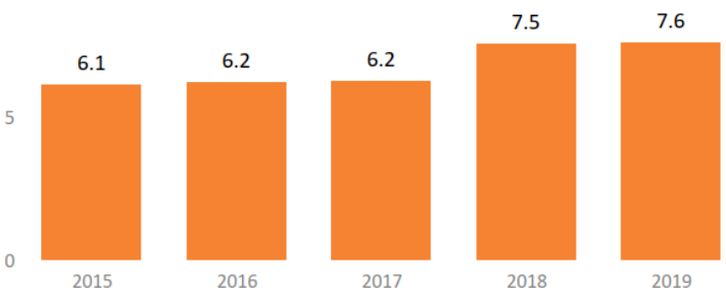
Drivers	Insights
Macro-economy	• The GDP (Real) growth rate is expected to recover from -1.3% in 2020 to 2.8% in 2021.[1] • Burundi is a low income economy2 with a GDP per capita (PPP) at USD 772.3 as of 2021.[1] • Burundi's primary exports are coffee and tea, which account for 90% of foreign exchange earnings.[4] • Electricity deficiency is a major barrier to development of economy in Burundi.[1]
Policy enablers	• Ministère de l'Hydraulique, Énergie et des Mines (Ministry of Water, Energy and Mines) designs and implements national policies on energy.[5] • Burundi targets to achieve 50% share of renewable electricity in generation by 2025.[17] • Solar panels and wind turbines are exempted from import duties.[5] • Burundi Investment Promotion Authority works to attract investments and assists foreign investors with setting up operations in the country.[5]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.19 kWh/m²/day and specific yield 4.16 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Burundi.[15] • Burundi is mainly dependent on Hydro Power and Coal Power which have a share of about 63.5% and 32.6% of total electricity generation respectively.[11] • Share of RE in the electricity generation mix was 2.8% in 2019.[11]
Market Maturity	• 11% of the population in Burundi had access to electricity as of 2019.[7] • AREEN (Autorité de Régulation des secteurs de l'Eau potable et de l'Énergie) (Energy and Water Regulatory Authority) takes responsibility for concession agreements, standards and tariff approval in the country.[5]
Infrastructure	• Burundi imports electricity from neighbouring countries Democratic Republic of Congo (DRC) and Rwanda through a cross-border hydropower complex.[6] • Transmission, distribution and generation infrastructure needs investment for rehabilitation and modernisation.[6] • Due to frequent load shedding and unreliable grid supply many large industrial consumers use diesel generators for backup power.[19]
Financing	• The International Development Association (IDA) has approved grants worth USD 100 Mn to improve essential services through solar power in rural and remote areas of Burundi.[16] • The African Development Bank-managed Sustainable Energy Fund for Africa (SEFA) approved a USD 990,000 grant to support the preparation of a 9-MW solar-hydro hybrid project in Burundi.[14] • Gigawatt Global has made investments for the 7.5 MW Maguba Solar plant which is under development.[18]
Energy Imperatives	• Total installed electricity generation capacity in the country was 56 MW in 2019.[8] • Peak demand is expected to grow from 89 MW in 2020 to 249 MW in 2030.[16] • Per capita consumption of 0.038 MWh is significantly lower in comparison to the global average of 3.35 MWh in 2019.[7] • The installed solar PV capacity grew from 3 MW in 2015 to 5 MW in 2019.[10]

Cabo Verde

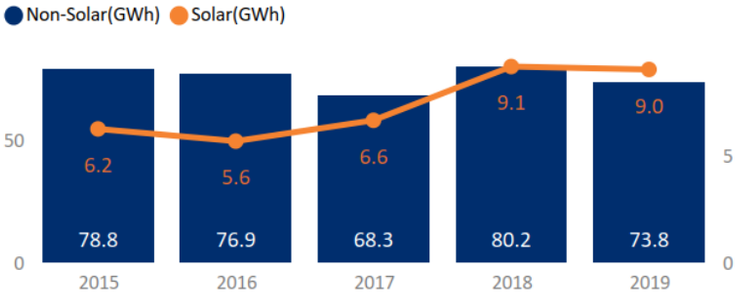
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
356.0	7.6	0.8
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.7	1.2	55.0

Cumulative Solar Installed Capacity (MW)

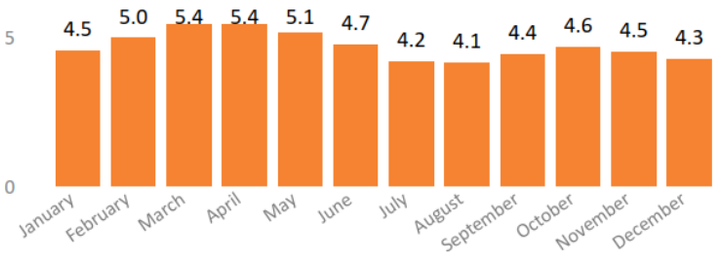


Renewable Energy Generation by Source

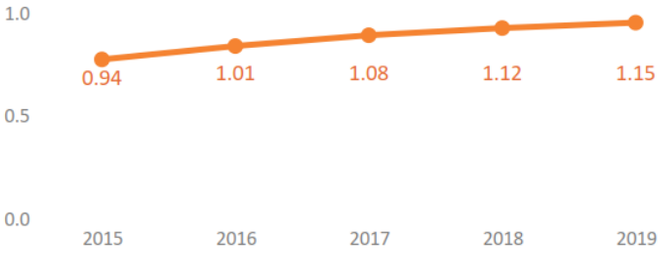


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



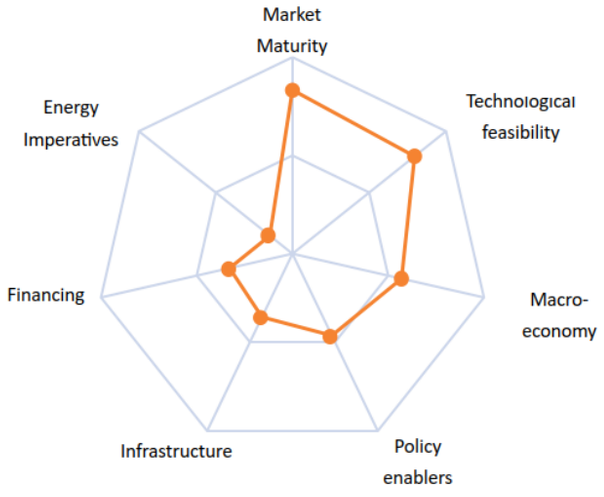
CO2 Emissions (Metric Tonnes/Capita)



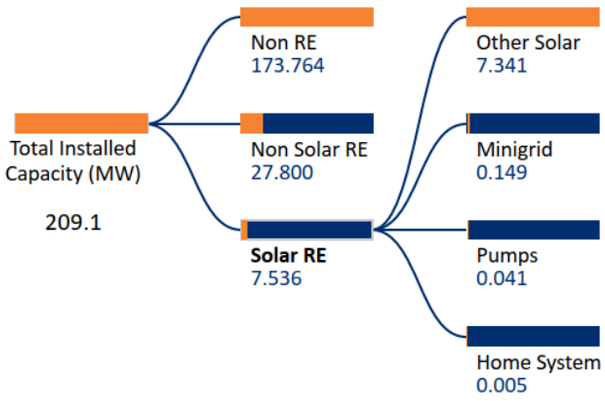
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



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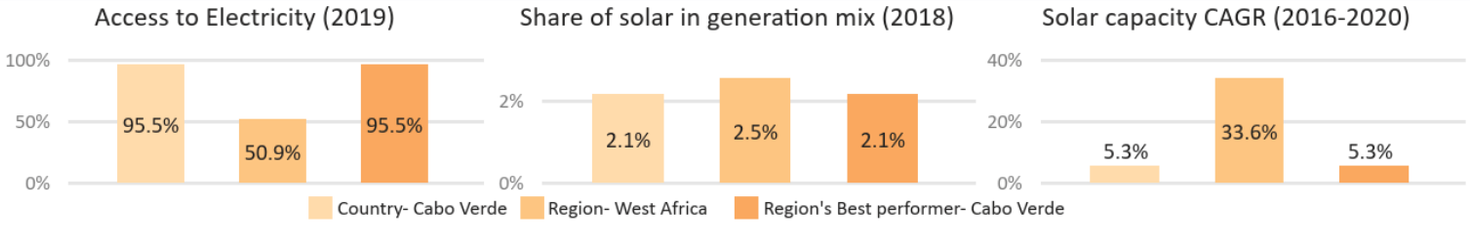
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity; Technological feasibility

Areas of Improvement → Energy Imperatives; Financing

Key Insights

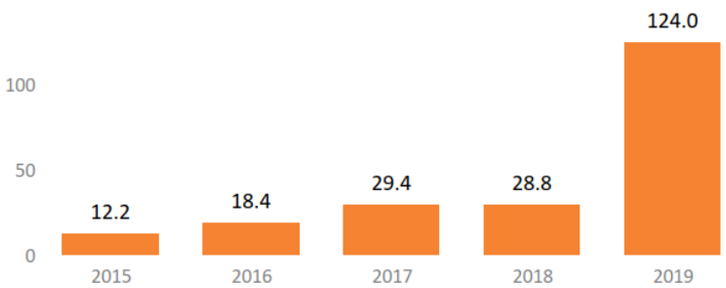
Drivers	Insights
Macro-economy	• The GDP (Real) has is expected to recover from -14% growth in 2020 to 5.8% 2021.[1] • Cabo Verde's economy relies heavily on tourism which was severely hit during the pandemic.[3] • The economy of Cabo Verde is service-oriented with commerce, transport, and public services accounting for more than 70% of GDP.[5]
Policy enablers	• Ministry of Industry, Trade and Energy (MICE) is the nodal agency for RE in the country.[8] • The 2018-2040 Master Plan for the Electricity Sector presents a strategy with an objective of reaching 54% of total energy requirements supplied by RE sources by 2030.[11] • The country targets to add 251 MW Solar PV and more than 620 MW of storage capacity by 2030.[11] • Cabo Verde offers tax benefits for investments and has a master plan for the electricity sector that identifies sites for developing RE projects.[4]
Technological Feasibility	• Owing to relatively very high solar irradiation levels of 5.64 kWh/m²/day and specific yield of 4.66 kWh/kWp, very strong technical feasibility is envisaged for solar projects in Cabo Verde.[12] • Fossil fuels contributed to about 82% of electricity generation in the year 2019.[5] • A few small independent power producers are already operating in Cabo Verde. These IPPs are operating small-scale solar power systems in a few rural communities.[4]
Market Maturity	• 96% of the population in Cabo Verde had access to electricity as of 2019.[10] • ELECTRA, the vertically integrated electricity and water utility dominates the market and manages power generation, transmission and distribution activities.[8] • Economic Regulatory Agency (ARE) regulates electricity sector in the country.[8] • Share of Solar PV in the total generation was 2.12% in 2018.[7] • To ensure improved access to electricity, Government policies are aimed at facilitating connections and ensuring price affordability.[11]
Infrastructure	• ELECTRA owns about 1,570 km of distribution lines.[14] • Electricity transmission and distribution losses, mostly due to theft, are 27% on an average but vary across island and over time.[14] • Under the 2018-2040 Master Plan for the Electricity Sector, a load management system (ESS & Converters) has been identified to handle excess RE and release it during periods of high energy consumption/demand.[11]
Financing	• Agency of International Cooperation for Development (AECID) has invested 0.6 mn Euros for Minigrid Vale da Custa under the Strategic Plan for Promotion of Solar Heaters.[11] • GEF has also made investment of 5 million Euros for promotion of Market based Renewable Energy projects and Energy Efficiency projects.[11] • In 2015, Cape Verde was awarded a USD 0.93 mn grant by the African Development Bank-hosted Sustainable Energy Fund for Africa (SEFA) to develop the world's first wave-driven desalination system.[16] • Lux Dev has invested 4.5 mn Euros under Renewable Energy Support Program.[11] • A World Bank funding of approximately USD 16.5 mn aimed at increasing Renewable Energy Generation and improving the performance of the power utility in the country is under approval.[15]
Energy Imperatives	• Total installed capacity in 2018 was 209 MW.[6] • Per capita consumption of 0.94 MWh is substantially lower than the global average of 3.35 MWh in 2019.[9] • Solar PV capacity growth is yet to pick up the pace, with installed capacity growth from 6 MW in 2010 to 8 MW in 2019.[7] • RE contributed to 23% of the total electricity mix of the country as of 2018.[10]

Cambodia

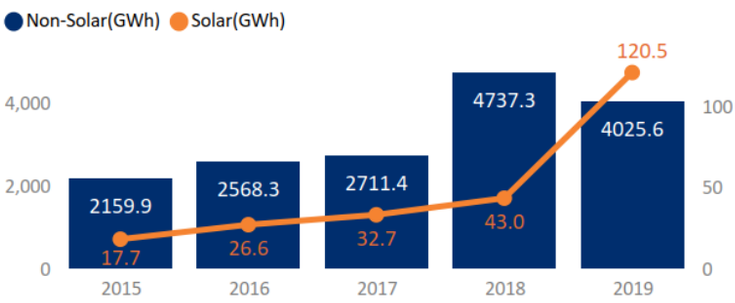
Asia & Pacific

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
8,215.0	208.0	1.3
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.1	1.0	53.8

Cumulative Solar Installed Capacity (MW)

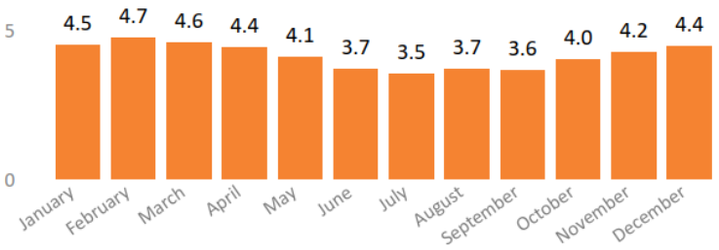


Renewable Energy Generation by Source

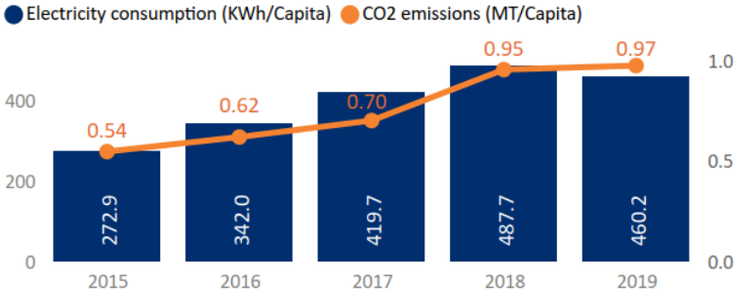


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



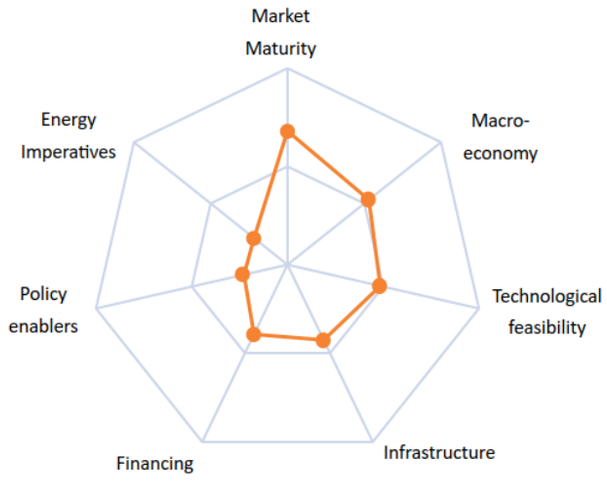
CO2 Emissions & Electricity Consumption



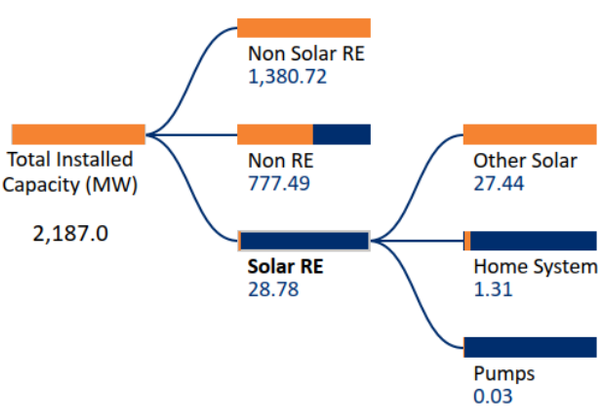
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers



Installed Generation Capacity by Source



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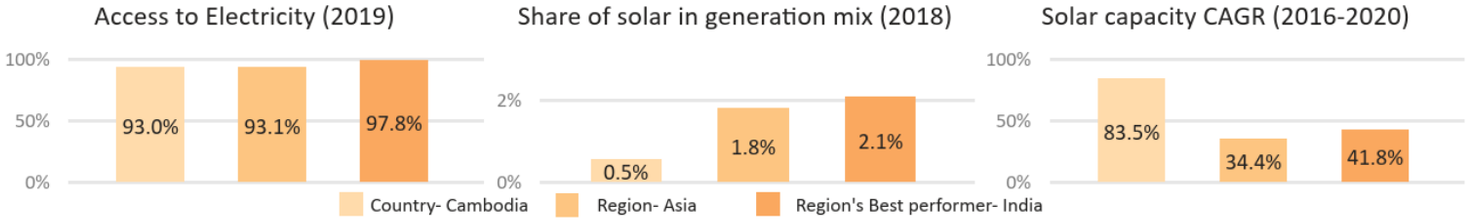
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Macroeconomy

Areas of Improvement → Energy Imperatives, Policy enablers

Key Insights

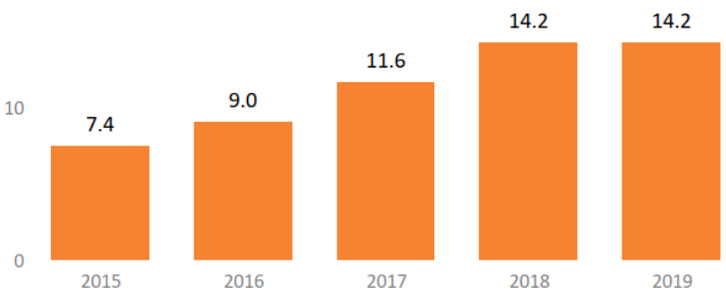
Drivers	Insights
Macro-economy	• On account of COVID-19 Pandemic, the GDP (Real) declined by 3.5% in 2020;In 2021, growth rate is expected to bounce back to 4.2%.[1] • The inflation rate (CPI) of Cambodia has risen to 2.9% in 2020 from 2.0% in 2019.[1] • The services sector is a major contributor to the GDP with45.1% share followed by industrial and agricultural sector with34.2% and 20.7% share respectively as of 2019.[15]
Policy enablers	• The country has set a target to achieve 100% electrification of all villages and connecting minimum 70% of the households to the grid by 2030.[11] • By 2022, the Government aims to increase the solar PV installed capacity to 415 MW from 208 MW in 2020.[2,3] • The Basic Energy Plan 2019 aims to allow the private companies, foreign entities to install solar PV in the country.[10]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.09 kWh/m^2/day and specific yield 4.09 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[5] • In 2019, 1.17% of the country's power demand was met through RE sources.[6] • Cambodia's electricity sector is vulnerable to fluctuating prices of fossil fuels owing to its dependence on fossil fuels for electricity generation.[7]
Market Maturity	• 93% of the population in Cambodia had access to electricity as of 2019.[4] • Solar PV accounted for 0.21% share in generation mix in 2019, indicating a lot more that needs to be done in the RE space.[6] • Between 2010-19, Cambodia has attracted investments worth USD 651.6 Mn for clean energy projects.[7]
Infrastructure	• In 2019, the country has faced blackouts due to droughts; the Government is thus focusing more on adding solar and wind capacity in future to reduce over-dependence on Hydropower for electricity generation.[7] • The national grid of the country is connected with Vietnam, Thailand and Lao PDR through interconnectors.[11] • In 2020, USD 1,652 Mn were invested by the Government and the private investors to strengthen the sub-transmission and distribution of the country.[13]
Financing	• To strengthen the power sector, the Government aims to attract investments worth USD 3 Bn from private investors in the coming 8 years.[11] • In 2019, the Asian Development Bank (ADB) approved a loan of USD 7.64 Mn for development of 100 MW solar project.[14] • In 2020, The ADB sanctioned another USD 127.8 Mn loan to improve the reliability of electricity supply through new additions of transmission lines and substations.[2]
Energy Imperatives	• Per capita consumption of 0.55 MWh is relatively low in comparison to the global average of 3.35 MWh in 2019.[6] • The total installed capacity of solar PV witnessed a CAGR of 57.6% between 2010-20, reaching 208.0 MW in 2020 from 2.1 MW in 2010. A total of 179 MW capacity was added alone in 2019 & 2020.[3] • In the last decade, the total power demand in the country has increased at CAGR of 16.6% reaching 9.16 TWh in 2019 from 2.30 TWh in 2010.[6]

Cameroon

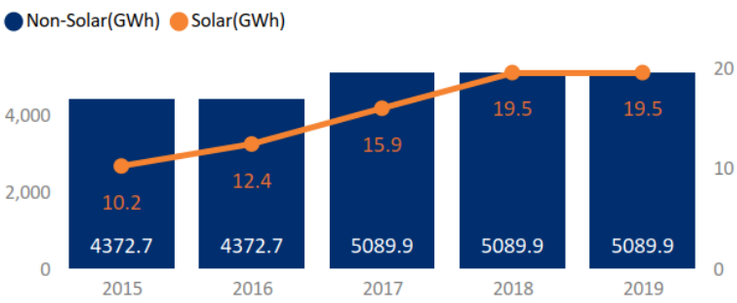
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
6,598.0	14.3	14.3
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.2	0.3	46.1

Cumulative Solar Installed Capacity (MW)

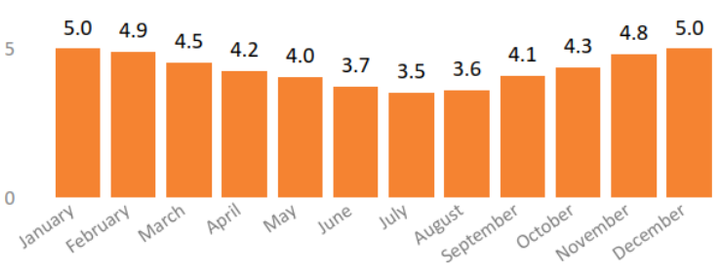


Renewable Energy Generation by Source

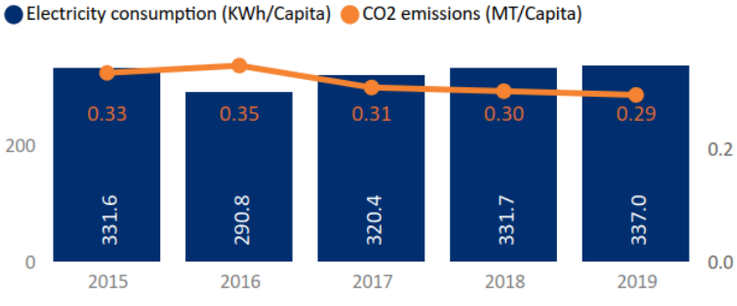


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



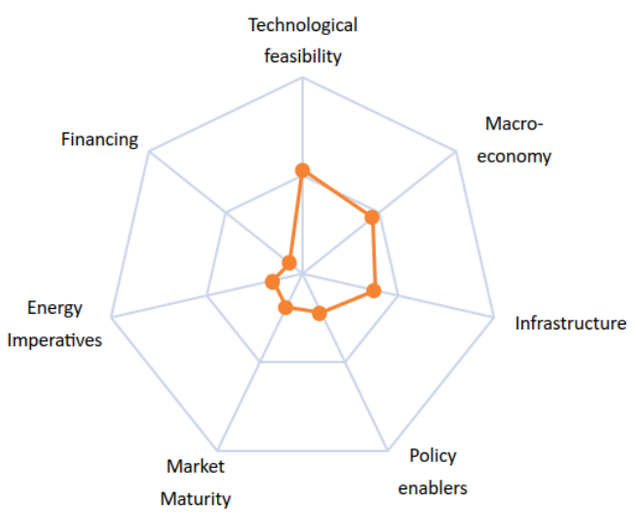
CO2 Emissions & Electricity Consumption



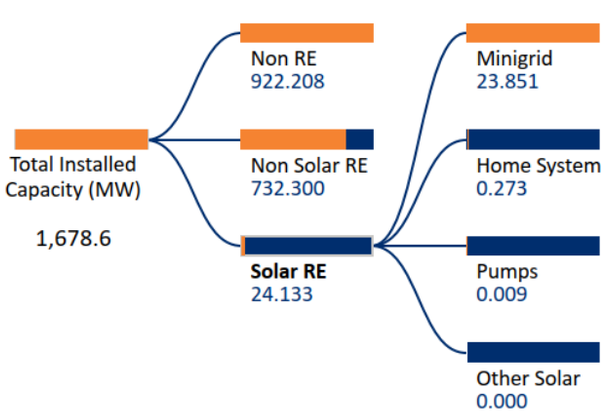
Ease of Doing Solar Classification

Potential

Performance against 7 drivers



Installed Generation Capacity by Source



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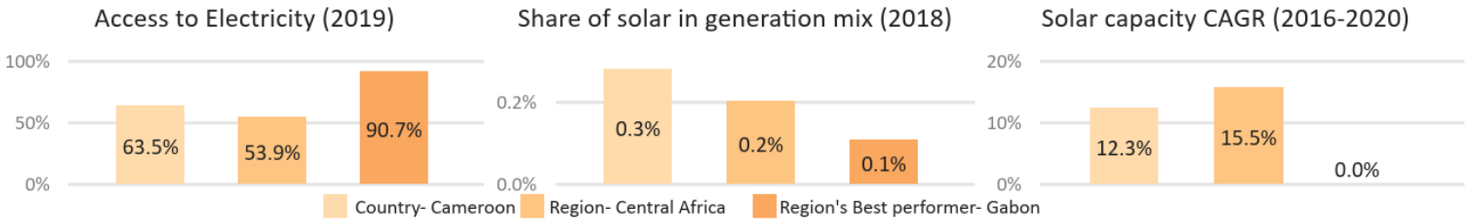
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Energy Imperatives

Key Insights

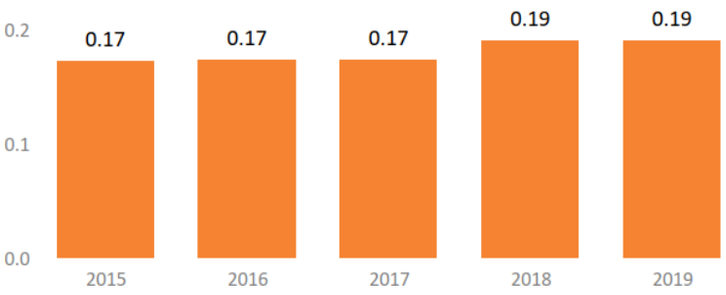
Drivers	Insights
Macro-economy	• The GDP (Real) growth rate is expected to recover from -2.8% in 2020 to 3.4% in 2021.[1] • Cameroon is a lower-middle income economy2 with a GDP per capita (PPP) at USD 3,801 as of 2021.[1] • The economy is mainly dependent on oil & gas and agriculture.[3]
Policy enablers	• The Ministry of Water Resources and Energy is responsible for formulation and implementation of policies and strategies of RE in Cameroon.[4] • The country targets a 25% share of RE, including 6% of Solar Power, in the energy mix by 2035.[15] • The rural energy fund (REF) managed by the rural electrification agency, Agence dElectrification Rurale (AER), to streamline interventions and increase effectiveness of investments in rural energy.[9]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.3 kWh/m²/day and specific yield 4.2 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Cameroon.[6] • About 38% of power generation was from fossil fuels while the share of RE was less than 1% in 2019.[8] • The Northern regions of Cameroon are endowed with very high levels of solar radiation that can be commercially exploited.[13] • About 135 Mini grids totalling to 11.2 MW capacity exists in the country.[13]
Market Maturity	• 63% of the population in Cameroon had access to electricity as of 2019.[7] • ARSEL ensures the regulation, control, and monitoring of the activities of operators in the electricity sector in Cameroon.[5] • Cameroon adopted the Rural Electrification Master Plan 2016-2035 (REMP) in 2017 with a target to achieve 100% electricity access by 2035.[9]
Infrastructure	• In 2014, Cameroon had 37,194 km of power lines. The PDSE 2030 plans for an additional 2,420 km of power lines by 2030 with an estimated investment cost of USD 1.76 Mn.[13] • Grid power unreliability has been a key challenge for the country due to erratic rainfall and droughts and country's over-dependence on hydropower.[17] • The Cameroon-Chad Power Interconnection Project comprising of 1,024 HV lines is planned to be completed by 2022 and will enable the country to export power to Chad.[16]
Financing	• AFD has launched a financing scheme for RE and energy efficiency projects in Cameroon with a provision of a line of credit of USD 16.9 Mn.[13] • USTDA has granted over USD 932,000 to conduct the technical, regulatory and financial analysis required to develop up to 134 solar-powered mini-grids in Cameroon.[12] • The EU has granted Circa 10 Bn to partially finance the country's Rural Electricity Access Project for underserved Regions.[14] • The Islamic Development Bank (USD 20.8 Mn), OPEC (USD 14.3 Mn) and BADEA (USD 10.8 Mn) have committed additional support for phase 2 of the Rural Electrification Project.[13]
Energy Imperatives	• Total installed power generation capacity in Cameroon was 1.6 GW as of 2018.[10] • Per capita consumption of 0.33 MWh is very low in comparison to the global average of 3.35 MWh in 2019.8 • Installed solar PV capacity has grown from from 12 MW in 2017 to 14 MW in 2019.[11] • In 2019, GDS Orion Solar signed an agreement with the Investment Promotion Agency to invest close to EUR 23 Mn to build a 20 MW solar power project.[15]

Chad

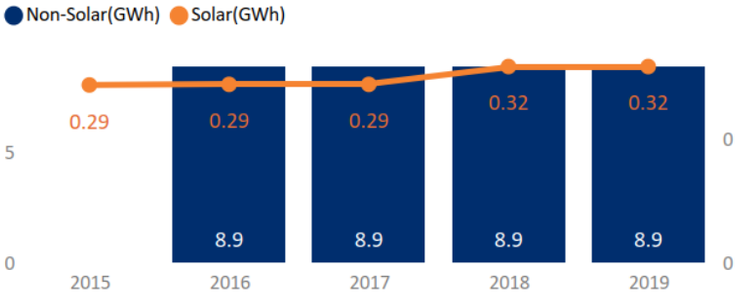
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
221.0	0.2	0.2
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
5.0	0.1	36.9

Cumulative Solar Installed Capacity (MW)

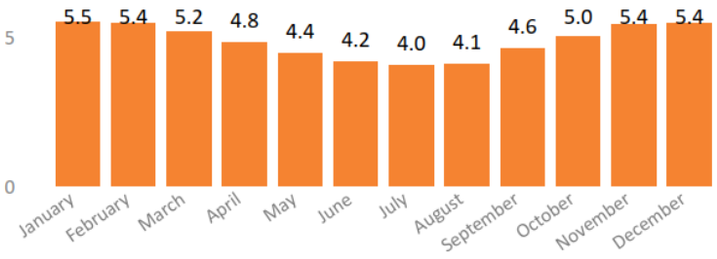


Renewable Energy Generation by Source

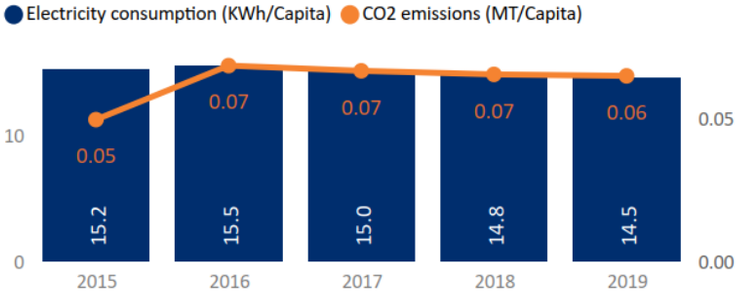


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



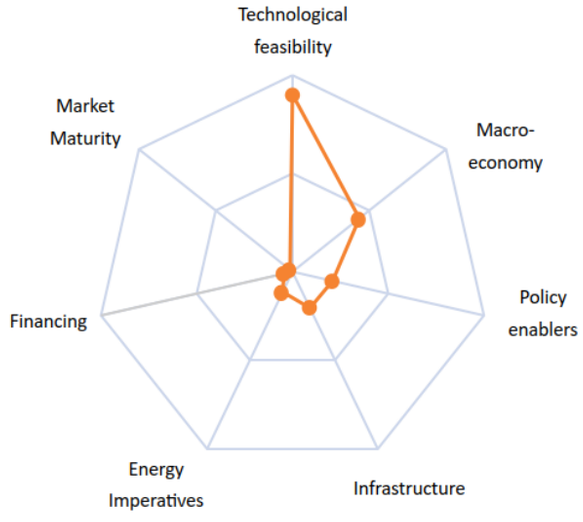
CO2 Emissions & Electricity Consumption



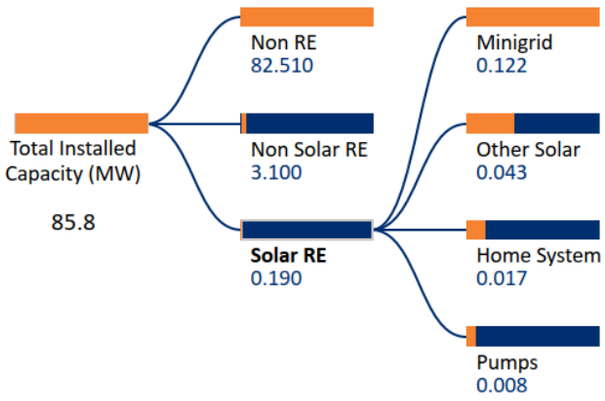
Ease of Doing Solar Classification

Potential

Performance against 7 drivers

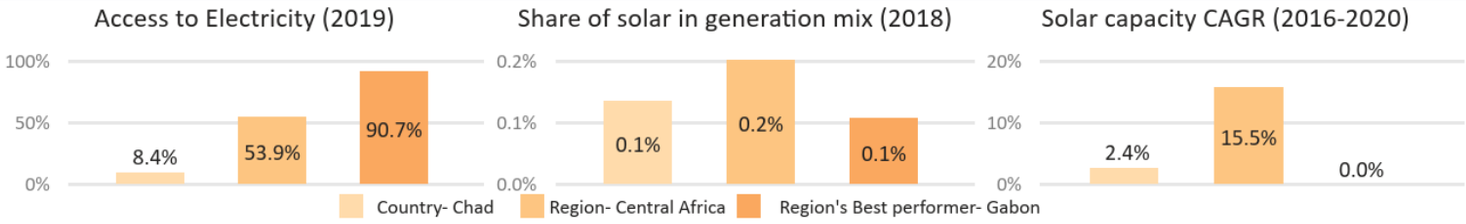


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Market Maturity, Financing

Key Insights

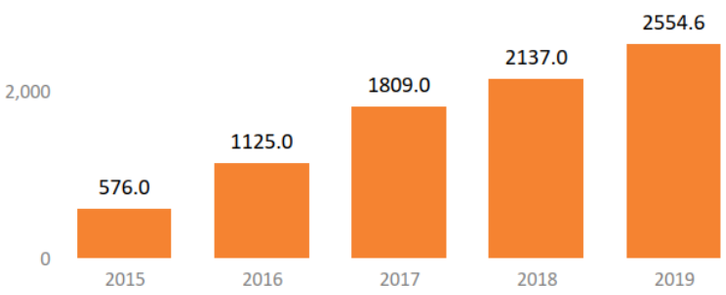
Drivers	Insights
Macro-economy	• The GDP (Real) growth is expected to recover from -0.9% in 2020 to 1.8% in 2021 as the country recovers from pandemic impacts.[1] • Chad is a low-income economy with a GDP per capita (PPP) at USD 1,621 in 2021.[1,2] • Chad's economy is heavily dependent on petroleum indicating a high concentration risk.[3]
Policy enablers	• Ministry of Energy & Petroleum is responsible for sustainable energy development and related policies in the country.[4] • Chad is yet to set renewable energy targets as of 2021.[19] • Equipment purchased for RE projects are exempted from VAT in the country providing requisite support for RE development.[5]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 6.26 kWh/m^2/day and specific yield 5.01 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Chad.[7] • Chad's generation mix consisted of 96% fossil fuel-based power as of 2019; the share of RE was 3.9%.[8] • IRENA/ADFD is facilitating the country in installation of 6 MW of solar PV systems with battery storage, across six cities in Chad.[6]
Market Maturity	• Only 8% of the population in Chad had access to electricity as of 2019.[9] • "Societe Nationale d'Electricite (SNE)" is the sole generation, transmission and distribution utility in Chad.[4] • Share of solar in electricity generation mix was 0.13% in 2018.[17] • Two Solar PV plants each of 50 MW, by IPP Merl Solar, are planned to be connected to electricity grid of SNE in the coming time.[14]
Infrastructure	• The national utility is facing challenges due to inadequacy of its T&D network, below par commercial performance and financial constraints.[10] • The Cameroon-Chad Power Interconnection project, comprising of 1,024 km of HV lines is planned to complete in 2022 and will enable Chad to import power from Cameroon.[11]
Financing	• The Global Environmental Facility (GEF) has approved a USD 1.8 Mn credit line for five Solar PV mini grids of about 50 kW each in Chad.[12] • The 60 MW Djermaya Solar PV project is being funded by AfDB (Euro 18 Mn) and EIB (Euro 6.35 Mn).[13,18] • Overseas Private Investment Corporation (OPIC) has committed USD 10 Mn to support introduction of off-grid solar kits and appliances in Chad.[15]
Energy Imperatives	• Total installed capacity in Chad was 89 MW in 2019.[16] • Per capita electricity consumption of 0.014 MWh is much lower in comparison to the global average of 3.35 MWh in 2019.[8] • Installed solar PV capacity in Chad was 0.2 MW in 2020.[17]

Republic of Chile

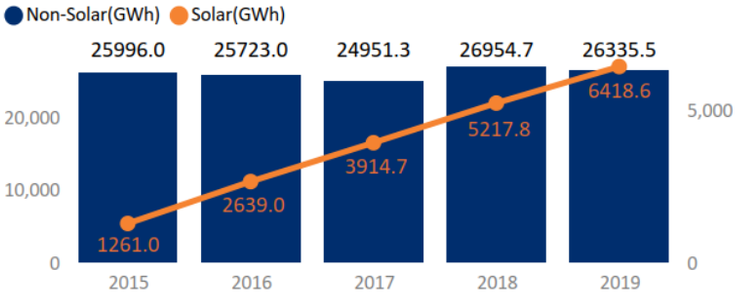
Latin America & Caribbean

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
73.0	3,105.5	NA
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
5.1	4.4	72.6

Cumulative Solar Installed Capacity (MW)

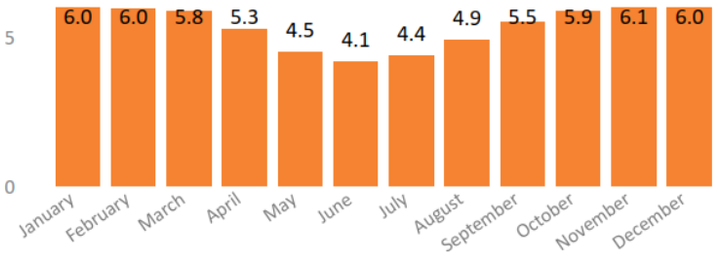


Renewable Energy Generation by Source

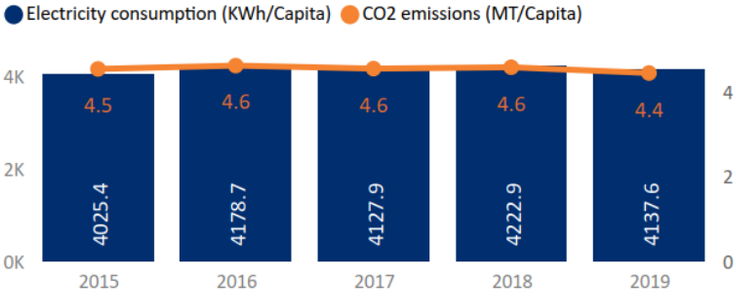


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



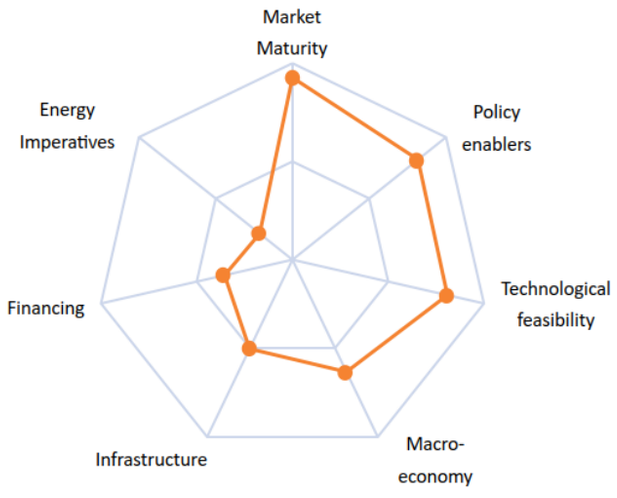
CO2 Emissions & Electricity Consumption



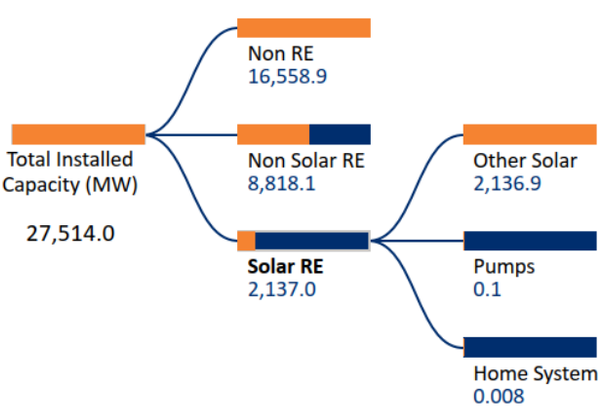
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers



Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
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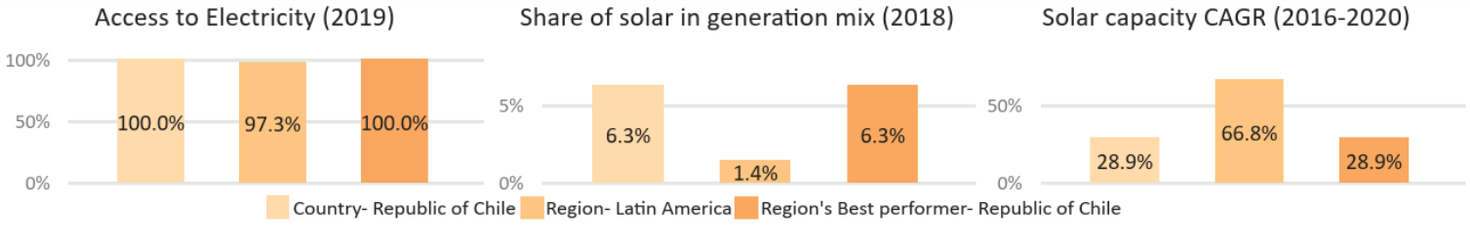
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity; Policy enablers

Areas of Improvement → Energy Imperatives; Financing

Key Insights

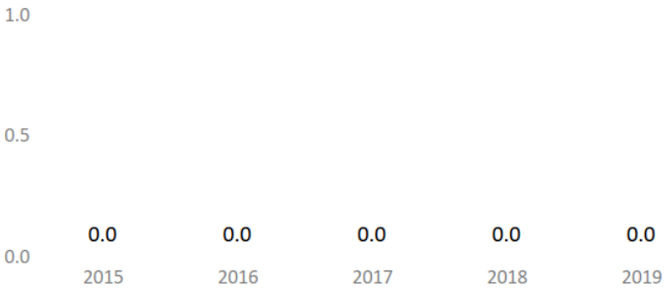
Drivers	Insights
Macro-economy	• On account of COVID-19 pandemic, the GDP (Real) declined by 5.8% in 2020.In 2021, it is expected to bounce back to an annual growth rate of 6.2%.[1] • Chile is a high-income country with a GDP per capita (PPP) at USD 23,366 in 2020.[4,1] • In 2019, Chile has secured 43rd rank out 189 countries in the Human Development Index.[2]
Policy enablers	• The country has set an ambitious target to have 70% share of renewable energy in the generation mix by 2030.[10] • To promote the development of RE, policies such as carbon tax and net metering are already implemented in the country.[11,12] • Renewable energy auctions are in operation since 2014. In 2020, 11 renewable energy projects of 2.6 GW capacity were auctioned with investment of more than USD 2.5 bn.[3]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.76 kWh/m²/day and specific yield 5.09 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[5] • In 2020, 22.1% of the country's electricity demand is met through renewable energy sources.[3]
Market Maturity	• 100% of the population in Chile had access to electricity as of 2019.[4] • Between 2010-19, Chile had attracted investments worth USD 18.08 bn for clean energy projects, with USD 4.9 bn alone in 2019.[8] • The Power sector in Chile is regulated by National Energy Commission. The power sector got unbundled in 1980's and the generation, transmission and distribution sectors are completely privatised, operated by multiple private companies.[3] • To reduce the dependence on fossil fuels for electricity generation, around 150 renewable energy projects with a total capacity of 5.8 GW are expected to be operational by 2023.[3]
Infrastructure	• The Transmission of the country is divided into 4 interconnected systems: the SING, the SIC, the Magallanes system, and the Aysén system. The systems operate on voltages level ranging from 66 kV to 500 kV with the total transmission line length reaching 35,676 ckm in 2020.[3] • The distribution systems is operated approximately by 25 distribution companies. The total length of lines has reached 40,116 ckm in 2020 and is expected to reach 43,548 ckm by 2025.[3] • To upgrade the transmission infrastructure, a total of 210 projects worth USD 2.7 bn are expected to be tendered between 2020-24.[16]
Financing	• In the Latin America region, Chile is placed 2nd in terms of investment in clean energy. It has also ranked 12th in the EY Renewable Energy Country Attractiveness Index (RECAI) in 2021.[8,17] • The Climate Investment Funds (CIF) and the Inter-American Development Bank (IDB) have jointly developed a fund to finance the renewable energy projects in the country.[13] • The Chilean Economic Development Agency (CORFO) has launched the "Green Credit" program in 2020 for financing of renewable projects in the country.[14]
Energy Imperatives	• Per capita consumption of 4.12 MWh is relatively high in comparison to the global average of 3.31 MWh in 2020.[6] • The total solar installed capacity has reached 3.20 GW in 2020 and is expected to touch 16.91 GW by 2030.[7,3] • A total of 78.6 TWh electricity was generated in 2020, with 51.5% coming from fossil fuels.[3] • In 2020, the industrial sector dominated the total power demand having 60.4% share followed by residential and commercial sector having 17.5% and 11.9% share respectively.[3]

Comoros

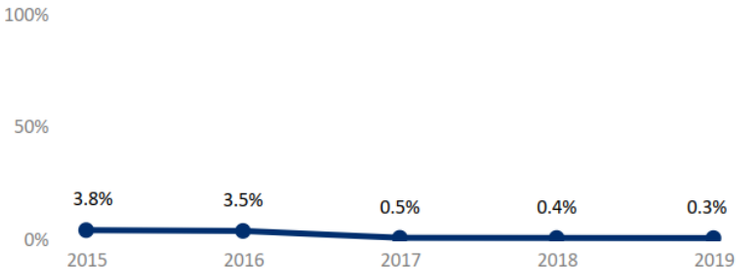
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
59.3	0.0	NA
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.2	0.3	47.9

Cumulative Solar Installed Capacity (MW)

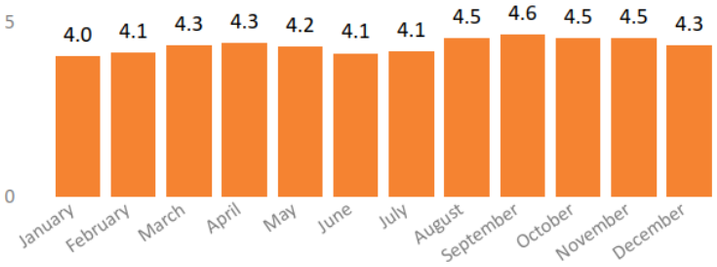


Share of electricity production from RE

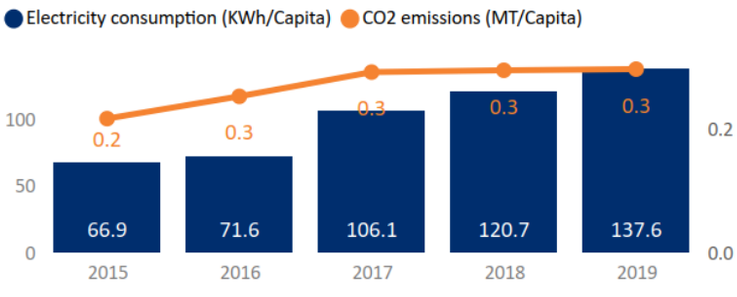


Renewables include electricity production from hydropower, solar, wind, biomass. and waste, geothermal, wave and tidal sources.

Monthly variation in PVout (kWh/kWp/day)



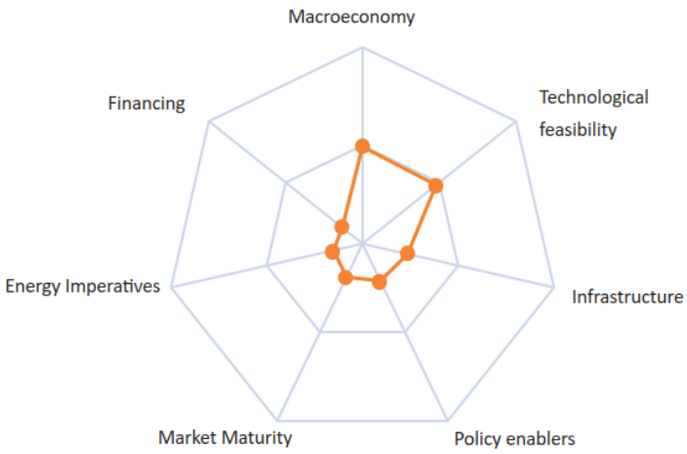
CO2 Emissions & Electricity Consumption



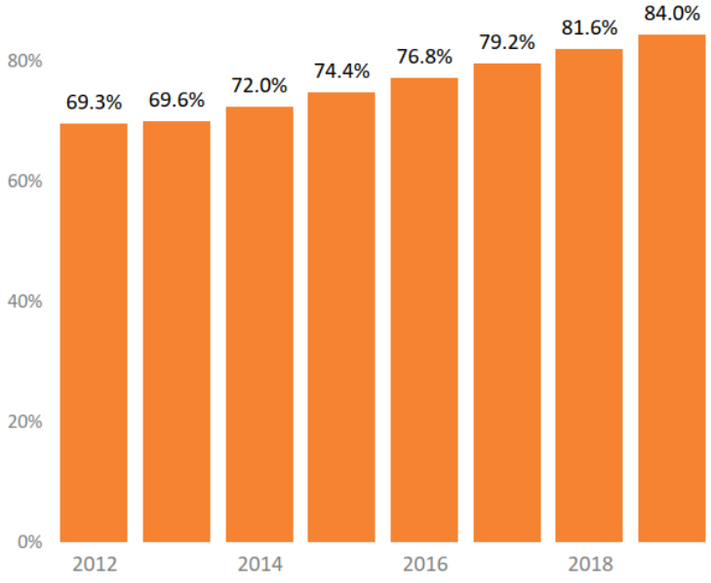
Ease of Doing Solar Classification

Potential

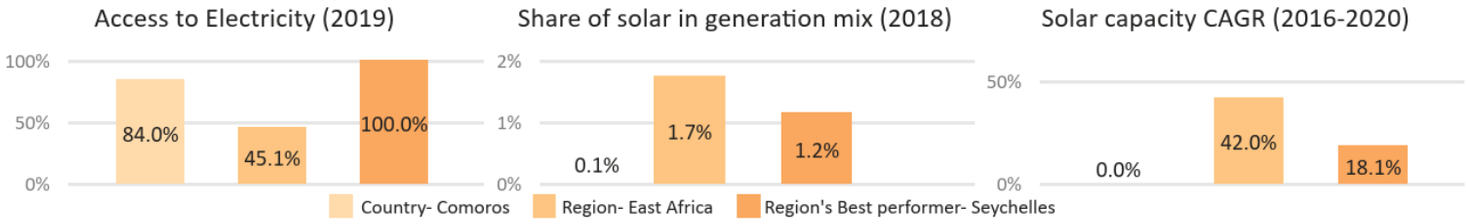
Performance against 7 drivers



Access to Electricity



Country's regional performance and characteristics



Areas of Strength → Macroeconomy; Technological feasibility

Areas of Improvement → Financing; Energy Imperatives

Key Insights

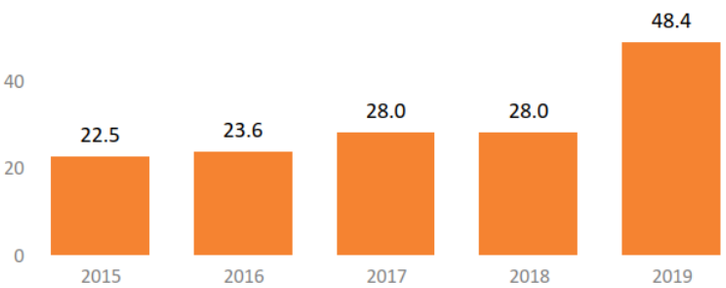
Drivers	Insights
Macro-economy	• Comoros in a Middle-income economy[2] with a GDP per capita (PPP) at USD 3,022 in 2021.[1] • The GDP (Real) growth rate is expected to recover from -0.5% in 2020 to 0% in 2021.[1] • Comoros is a small island nation and its economy is based on subsistence agriculture and fishing which account for 50% GDP.[3] • Economy was hit hard due cyclone Kenneth in 2019 and then COVID-19 outbreak in 2020.[4]
Policy enablers	• The Energy, Mines, and Water Directorate (Direction Générale de l'Energie, des Mines et de l'Eau, DGEME) oversees the energy sector in the country.[5] • The "document de politique de l'énergie électrique et des produits pétroliers de l'Union des Comores" adopted in 2012 prioritizes renewable energy for electricity generation.[14] • Import of equipment and materials for development of renewable energy is free of customs duties and taxes in the country.[15]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.05 kWh/m^2/day and specific yield 4.16 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Comoros.[16] • Electricity production is mainly fueled by diesel (entirely imported) powered thermal power plants.[9] • Two 3 MW solar PV + battery storage pilot projects by independent power producer (IPP) are currently under development.[5]
Market Maturity	• SONELEC, the vertically integrated state-owned power utility, manages generation, transmission, and distribution across all three islands of the country.[5] • The Gestion de l'Eau et de l'Electricité aux Comores (MAMWE) regulates the electricity sector, determines tariff and defines the standards of service.[6] • The credibility and financial viability of the utility as an off taker is a major barrier to private sector investments in RE sector of the country.[5]
Infrastructure	• Most of the generation capacity have reached advanced operating life resulting frequent outages on the network.[9] • The capital had 12 to 20 hours of electricity supply while rest of the Comoros had only 6 hours per day in 2016.[9] • The World Bank is running a project "Comoros Solar Energy Integration Platform" with an objective to add solar PV and energy storage facilities to the Comorian power generation mix.[5]
Financing	• In 2014, Sustainable Energy Fund for Africa (SEFA) approved a USD 480,000 grant to Comoros to facilitate private sector participation in developing RE.[13] • The EU is supporting Solar PV through a grant of EUR 2 Mn grant with an objective to install 6 grid connected micro power stations with a total capacity of 300 kW.[6] • The World Bank has invested USD 28.6 Mn in Power Storage, Pilot PV and System upgrades of which USD 2.6 Mn will come from SIDS DOCK Trust Fund.[5]
Energy Imperatives	• Electricity demand has increased at a much faster pace than the GDP and population of Comoros in past few years.[12] • 84% of the population in Comoros had access to electricity as of 2019.[11] • Per capita consumption of 0.137 MWh is extremely low compared to the global average of 3.35 MWh in 2019.[9] • Electricity price is around 33 US cents/ kWh, reported to be second highest in Africa.[5]

Costa Rica

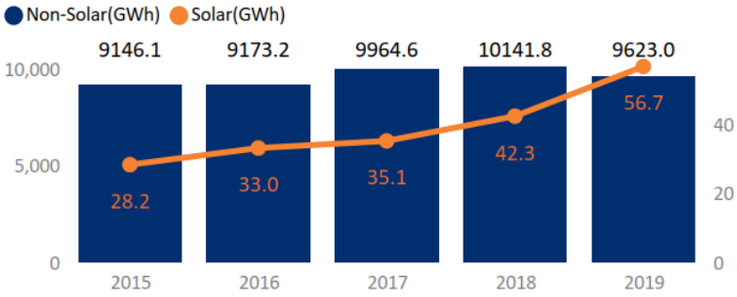
Latin America & Caribbean

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
9,988.6	56.8	1.6
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.0	1.7	69.2

Cumulative Solar Installed Capacity (MW)

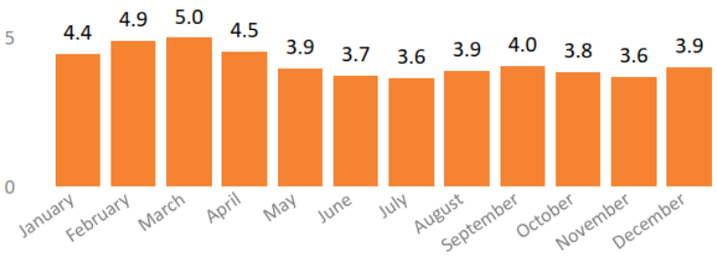


Renewable Energy Generation by Source

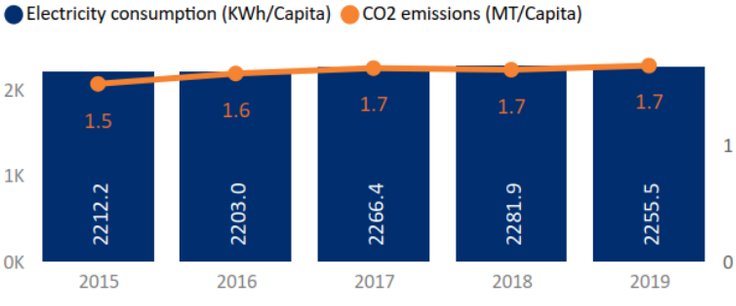


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



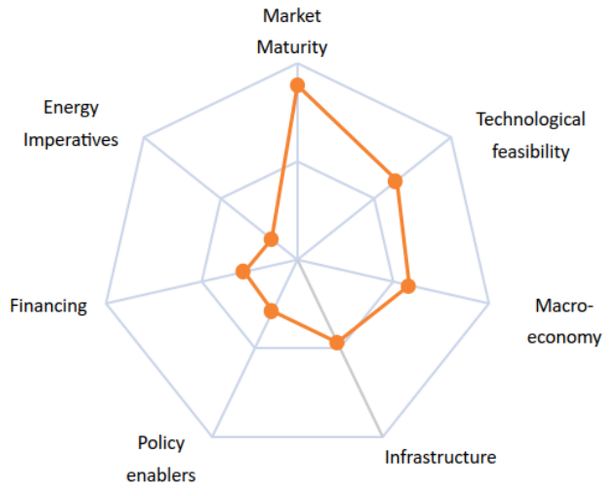
CO2 Emissions & Electricity Consumption



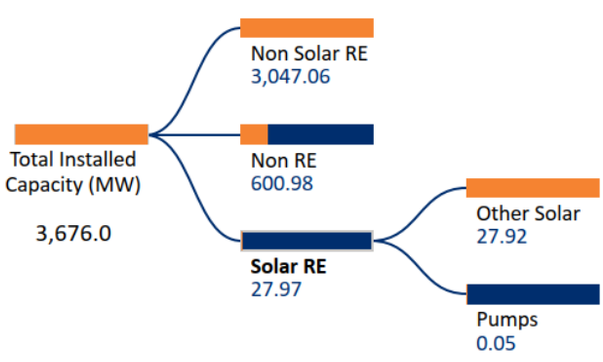
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



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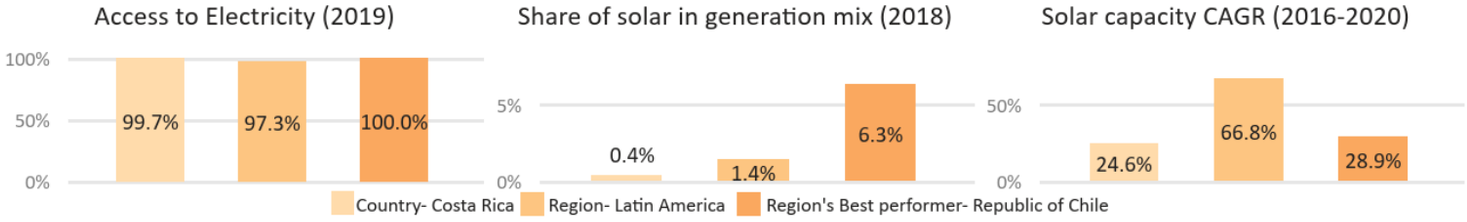
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

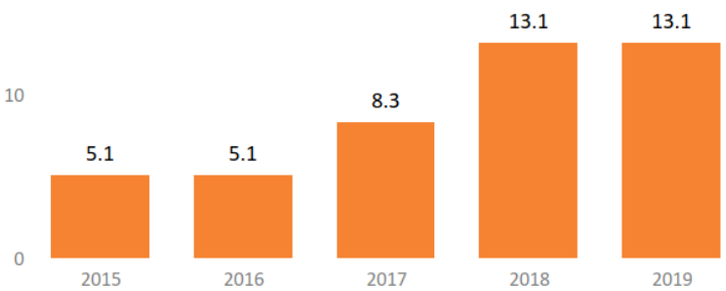
Areas of Improvement → Energy Imperatives, Financing

Key Insights

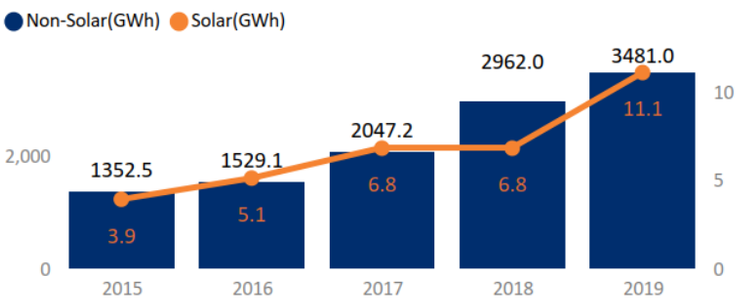
Drivers	Insights
Macro-economy	• On account of COVID-19 Pandemic, the GDP (Real) declined by 4.8% in 2020; In 2021, GDP growth is expected to bounce back to 2.6%.[1] • Costa Rica is an upper middle-income country with a GDP per capita (PPP) of USD 19,990 as of 2020. [4,1] • In 2019, Costa has secured 62nd rank out 189 countries in the Human Development Index.[2]
Policy enablers	• In 2018, the country has set a target to have 100% share of renewables in the generation mix by 2021.[3] • The National Decarbonisation Plan 2018-2050 aims to make Costa Rica zero emission country by 2050 by investing in clean initiative for various sectors such as transportation, agriculture, energy, industry, waste management etc.[3] • To encourage the installation of Solar PV power plants, net metering and feed in tariff are already effective in the country.[3] • The Regulations on the Efficient Use of Energy and Tax Incentives, 1994, provides incentives such as tax exemptions and import duty exemption on renewable energy equipments.[11]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 4.89 kWh/m^2/day and specific yield 3.96 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Country.[5] • In 2019, 99.15% of the country's power demand was met through renewable energy sources.[8]
Market Maturity	• 100% of the population in Costa Rica had access to electricity as of 2019.[4] • Between 2010-19, the country has attracted investments worth USD 2.07 Bn in clean energy with investments worth USD 7.6 Mn recorded in 2019.[9] • The Power sector in Costa Rica is regulated by Public Services Regulatory Authority (ARESEP). The Generation, Transmission, and Distribution sectors are controlled by the Institute of Electricity (ICE) with some exception to other public institution and cooperatives to generate and distribute electricity.[3]
Infrastructure	• Transmission and distribution losses were 9.9% in 2018, indicating a relatively efficient T&D infrastructure.[3] • Dependence on hydro power poses a risk to the power system, thus the government is planning for capacity additions of renewable energy technologies in the coming years.[3]
Financing	• In 2019, IFC sanctioned a loan of USD 35 Mn to Davivienda Bank of Costa Rica to fund green projects including small-scale renewable energy generation project in the country.[12] • The World Bank in June 2021 sanctioned USD 300 mn loan to Costa Rica to accelerate the clean energy technologies deployment in the country.[13] • In 2015, the Central American Bank for Economic Generation and Promerica Bank of Costa Rica had a technical cooperation agreement to encourage renewable energy through green credits.[14]
Energy Imperatives	• Per capita consumption of 2.1 MWh is relatively low in comparison to the global average of 3.35 MWh in 2019.[6] • The total solar installed capacity has reached 57 MW in 2020 and is expected to reach 131.7 MW by 2030.[7,3] • In 2018, Costa Rica's total installed capacity reached 3.6 GW with 65% of the installed capacity is coming from hydro followed by oil based thermal power having 13% share respectively.[9] • In 2018, the share of commercial sector in the total power demand stood at 60% followed by the residential sector accounting near to 40% demand.[3]

Cote d'ivoire	Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
	6,926.0	13.1	13.1
Africa	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
	4.0	NA	60.7

Cumulative Solar Installed Capacity (MW)

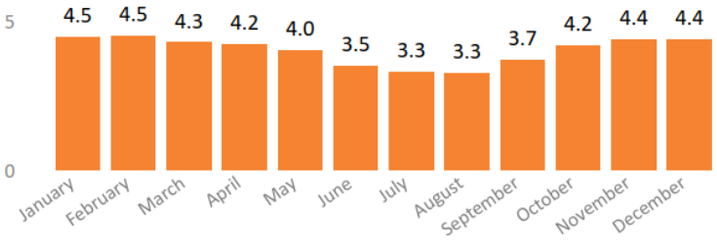


Renewable Energy Generation by Source

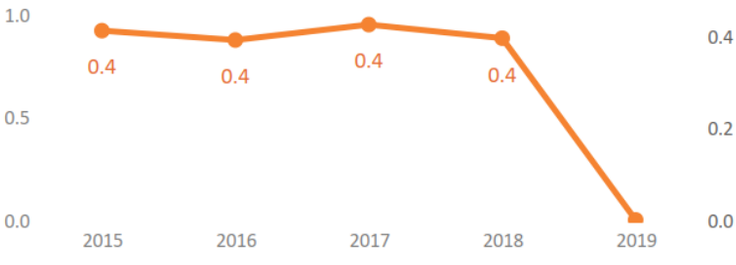


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



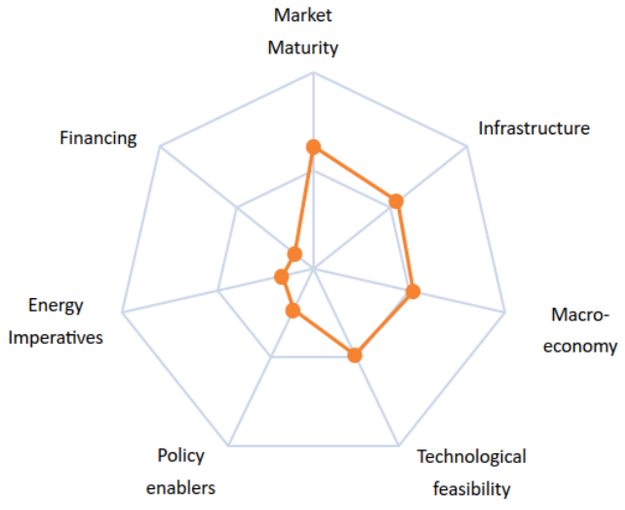
CO2 Emissions (Metric Tonnes/Capita)



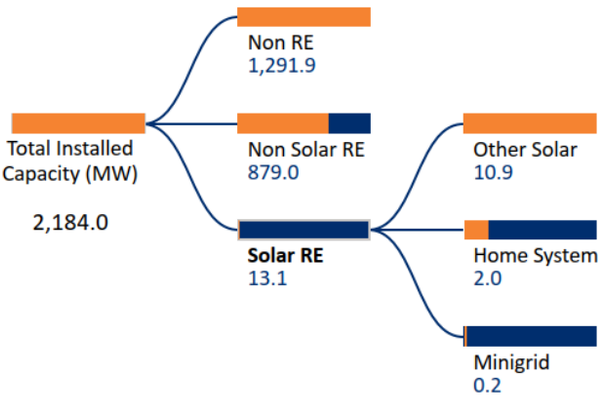
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers

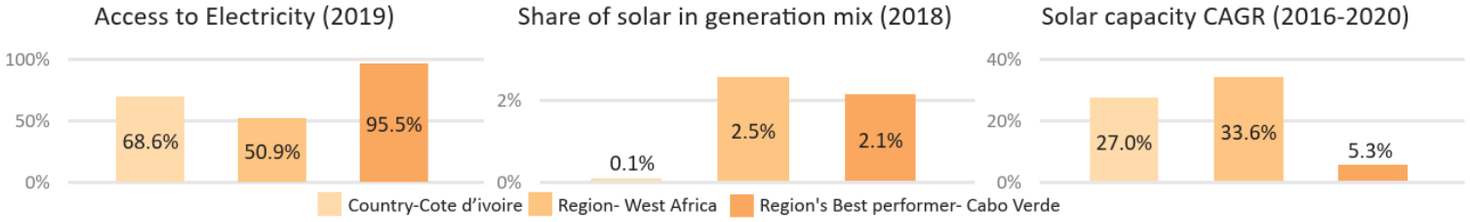


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Infrastructure

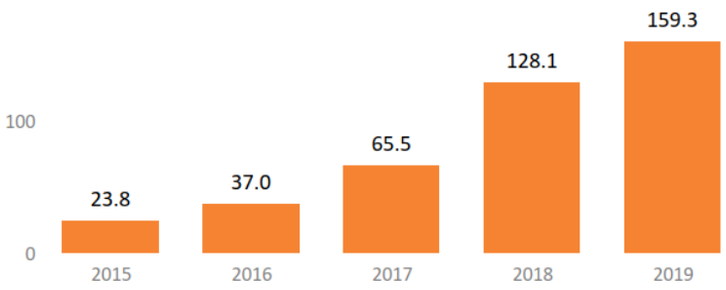
Areas of Improvement → Financing, Energy Imperatives

Key Insights

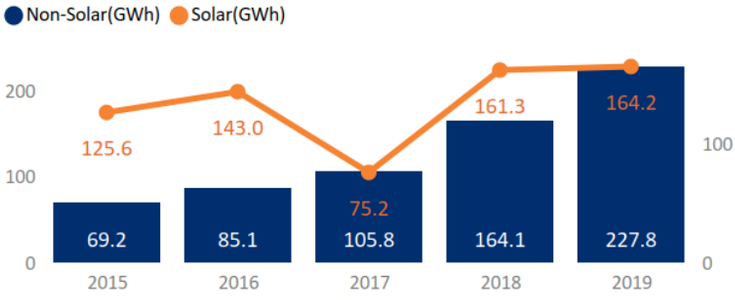
Drivers	Insights
Macro-economy	• GDP (at current prices) is USD 61.4 Bn as of 2020. Real GDP grew by 2.3% in 2020, but was well below the 2019 level of 6.4% mainly on account of COVID-19 pandemic. [2,3,4] • Agriculture, manufacturing sector, services and exports are expected to support the Ivorian economic turnaround in 2021.[4,5] • Côte d'Ivoire is the largest economy in the West African Economic Monetary Union (WAEMU).[12,14]
Policy enablers	• The revised national energy policy adopted in 2013 has set the objective for Côte d'Ivoire to become the main energy hub in West Africa.[12] • The implementation of National Development Plan (PND) 2021-25 aims to maintain a stable socio-political environment and increase the mobilization of domestic resources.[4] • The strategic plan 2013-2030 for the development of the electricity sector aims to retrofit existing rural diesel grids with solar PV.[13,18]
Technological Feasibility	• Owing to relatively very high solar irradiation level (GHI) of 5.05 kWh/m^2/day and specific yield of 4.00 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Côte d'Ivoire.[1] • The country is a net exporter of electricity with grid connections with Benin, Burkina Faso, Ghana, Guinea, and Togo.[11] • The Cote d'Ivoire – Liberia – Sierra Leone – Guinea interconnection project will help reduce the cost of electricity supply at the utility level and increase the quantum of electricity traded among all the participating countries.[17] • As of 2019, renewable generation is 3492 GWh which constitutes 30% of total electricity generated. The country has set a target to take this share to 42% by 2035.[10,16]
Market Maturity	• 69% of total population had access to electricity as of 2019 and the country has set a target to increase the coverage to 99% by 2035.[6,16] • Private operators in Côte d'Ivoire are responsible for 70% of energy production and 100% of its distribution.[16] • Cote d'Ivoire's energy demand is expected to grow at 8% annually, reaching about 9,500 MUs by 2020.[8] • RE share in total final electricity consumption is 63.5% as of 2018.[6]
Infrastructure	• Regional off-grid electrification project (ROGEP) aims to increase electricity access through modern off-grid electrification in Côte d'Ivoire.[15] • Côte d'Ivoire joined Scaling Solar program and signed an agreement with International Finance Corporation (IFC) in 2019 to develop a 60 MW of solar project.[8] • The Energie Electrique de Côte d'Ivoire (EECI) is the sole generator, transmitter, and distributor of electric energy.[13]
Financing	• In 2018, international fund flow was USD 32 Mn (in PPP terms) to support clean and renewable energies.[6] • The World Bank Group (WBG) is currently financing 29 active projects valued at a total of $3.5 Bn.[5] • Côte d'Ivoire's 2016-2020 National Development Program aims to attract USD 32 mn in private investment for renewable energy.[18] • KfW (German development bank) is preparing to support the rehabilitation of transmission lines as a prerequisite to connecting solar power plants in the north of Côte d'Ivoire.[18]
Energy Imperatives	• 42% of rural population had access to electricity as of 2019.[6] • Total installed capacity in the country was 2185 MW as of 2019 with 41% (887 MW) contribution from renewables.[10] • As of 2019, Hydro constitutes approximately 99% (879 MW) of renewable capacity and remaining 1% (8MW) coming from solar PV.[10] • Côte d'Ivoire's electrical system is the third largest in West Africa after Nigeria and Ghana.[11]

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
15.6	163.2	7.2
Cuba	**Average PVout in kWh/kWp (2020)**	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
Latin America & Caribbean	4.5	2.3	NA

Cumulative Solar Installed Capacity (MW)

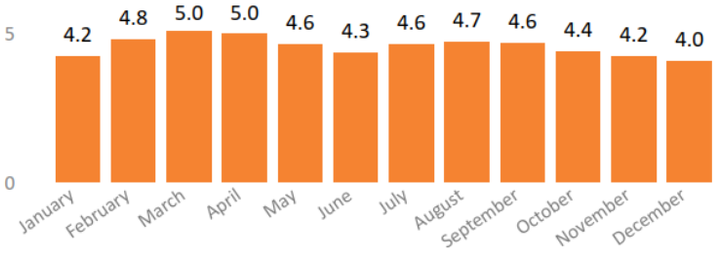


Renewable Energy Generation by Source

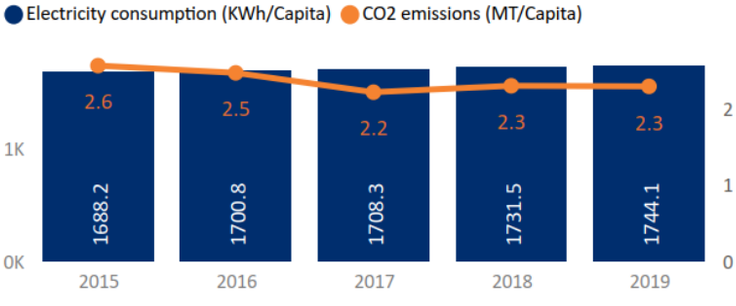


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



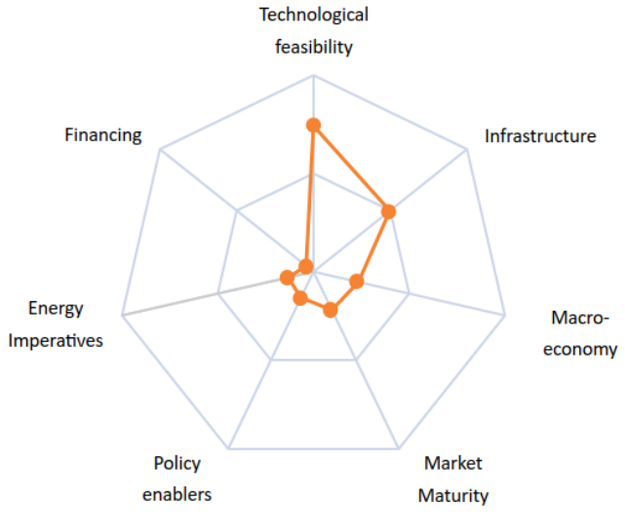
CO2 Emissions & Electricity Consumption



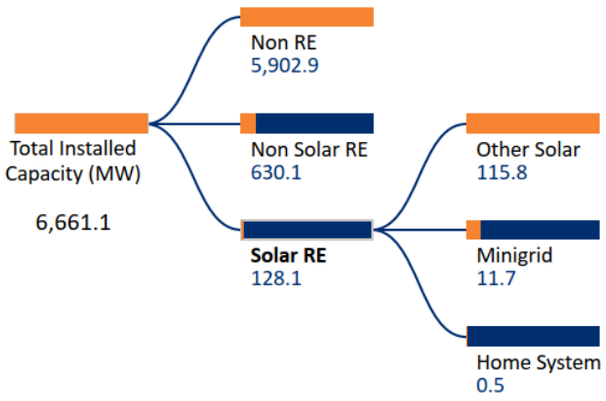
Ease of Doing Solar Classification

Potential

Performance against 7 drivers



Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
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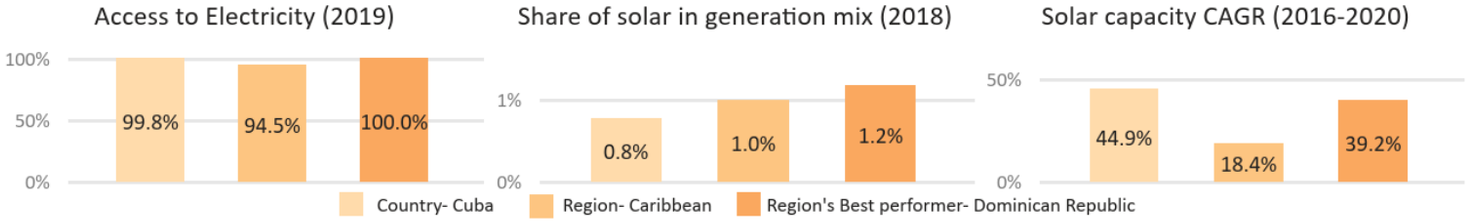
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Infrastructure

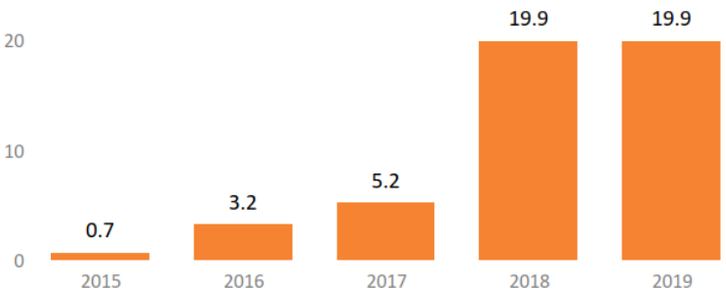
Areas of Improvement → Financing, Energy Imperatives

Key Insights

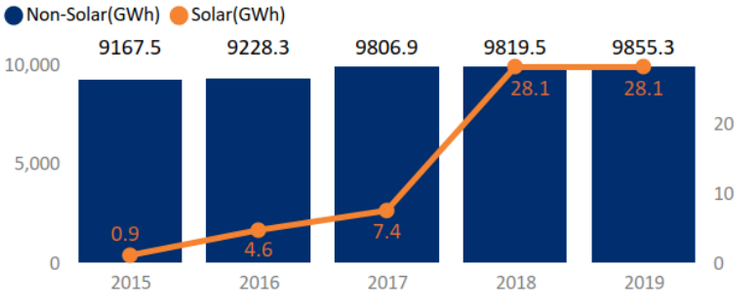
Drivers	Insights
Macro-economy	• Owing to the COVID-19 and US sanctions, Cuba's GDP declined by 11% in 2020.[2] • In 2019, revenue generated from medical staff working abroad, tourism and food products have dominated the total exports of country having 62.3%, 20.4% and 8.4% share respectively.[2]
Policy enablers	• The country aims to achieve 24% share of renewable energy in the generation mix by 2030.[3] • Cuba has developed an ambitious Renewable Energy program as one of the topmost priorities within the Cuban economic development policy.[10]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.41 kWh/m²/day and specific yield 4.52 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[7]
Market Maturity	• As of 2019, 100% of the population in the country had access to electricity.[12] • Cuba is blessed with high solar irradiation index, however 2019 data reveals that solar PV has accounted a mere of 0.77% share in generation mix.[5,6] • The Ministry of Energy and Mines (MINEM) controls the power sector in the country. The generation sector has presence of independent power producers, while the transmission and distribution of electricity is handled by state run entity named Unión Eléctrica.[11]
Infrastructure	• The government aims to invest USD 3.5 bn for 2.1 GW capacity addition of renewables through development of onshore wind, solar photovoltaic and biomass power each having 700 MW capacity.[4] • The country is largely dependent on liquid fuel based thermal plants for generation of power. In 2014, these plants accounted for almost 81% share in the generation mix.[11]
Financing	• In 2019, under the IRENA/ADFD facility, the Abu Dhabi Fund for Development (ADFD) has sanctioned USD 15 mn for the developing a 10 MW solar PV project to support the country in achieving its renewable energy target.[3] • The EU together with the Cuban authorities developed a program with EUR 18 mn budget to support Cuba's Energy policy and attract foreign investment for promoting renewables in the country.[10]
Energy Imperatives	• Per capita consumption of 1.7 MWh is relatively low to the global average of 3.35 MWh as of 2019.[8] • The total installed capacity of solar PV has risen at a CAGR of 44.9% between 2015-20 reaching 163.2 MW in 2020.[6] • As of 2019, 74% of the total land area is available for developing utility scale solar parks across the country indicating favourable environment of the sector.[9]

Democratic Republic of Congo	Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
	1.6	19.9	19.9
Africa	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
	4.1	0.03	36.2

Cumulative Solar Installed Capacity (MW)

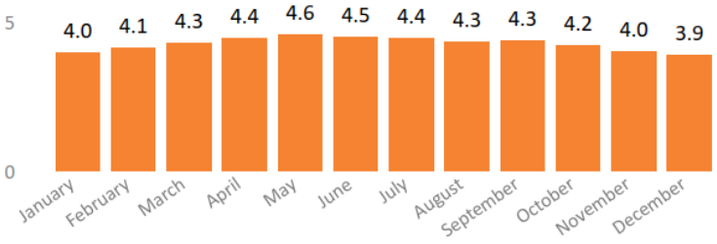


Renewable Energy Generation by Source

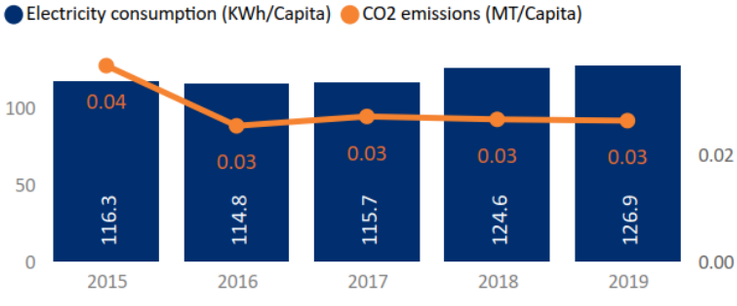


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



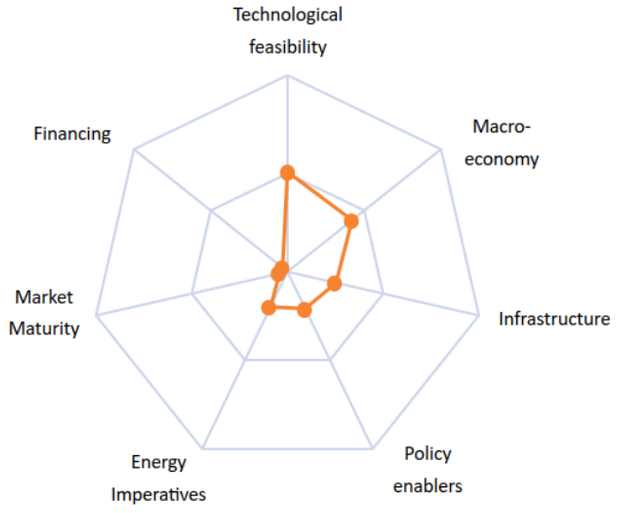
CO2 Emissions & Electricity Consumption



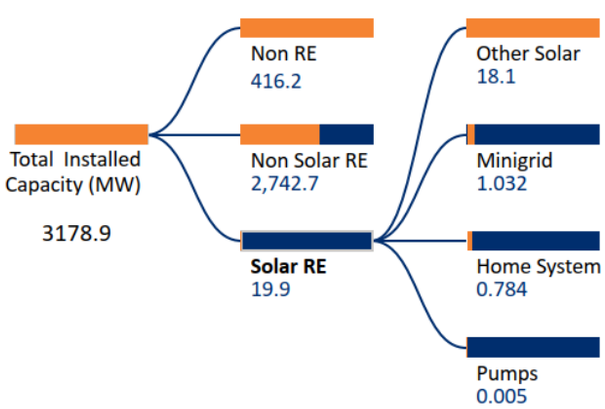
Ease of Doing Solar Classification

Potential

Performance against 7 drivers



Installed Generation Capacity by Source



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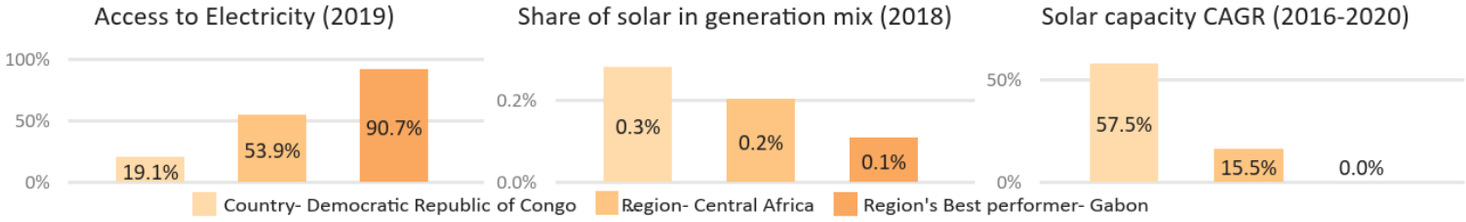
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Market Maturity

Key Insights

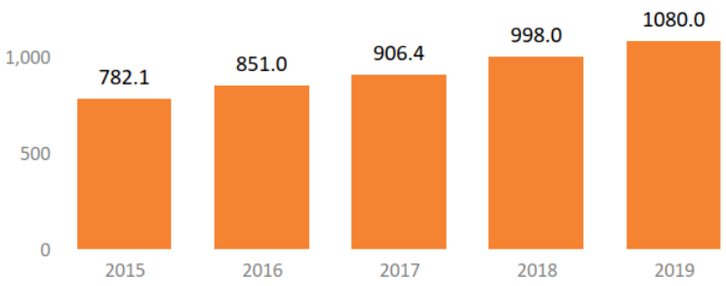
Drivers	Insights
Macro-economy	• On account of Covid-19 pandemic, GDP (Real) declined by 0.1% but it is expected to recover back to 3.8% in 2021.[3,5] • Democratic Republic of Congo is blessed with abundant natural resources making mining sector as major contributor to the economy.[6] • Government investment decelerated from its pre-COVID level by an estimated 10.2% in 2020.[6] • The Democratic Republic of the Congo (DRC) is a member of the Common Market for Eastern and Southern Africa (COMESA), the Economic Community of Central African States (ECCAS), and the Southern African Development Community (SADC).[9]
Policy enablers	• The National Electrification Agency (AGENA) and National Electrification Fund (FONEL) were created to increase access to energy in rural areas and secondary cities.[8] • The National Electrification Fund is a financial mechanism that funds private operators, small businesses, NGOs, and rural cooperatives that are involved in decentralized systems using renewable energies.[8]
Technological Feasibility	• Owing to relatively very high levels of average solar irradiation level (GHI) of 5.19 kWh/m^2/day and specific yield of 4.12 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in DRC.[1] • The Congo National Committee aims to promote sustainable energy development in the DRC as a part of the World Energy Council's energy vision.[10] • Renewable energy share in total final energy consumption was 96.4% as of 2018.[15]
Market Maturity	• 19% of population has access to electricity as of 2019 and the country has set a target to achieve universal access by 2030.[11,15] • The country is endowed with abundant energy and resources potential which are largely untapped. Government is making efforts to increase the supply of renewable energy by constructing new power plants including solar PV plants.[10] • The Electricity Access and Service Expansion (EASE) Project was approved in 2017 with USD 145 Mn commitment to expand access to electricity in target areas and promote private sector investment.[13]
Infrastructure	• The Government of DRC, with support of Lighting Africa, developed a USD 1.5 Mn Domestic Power Markets Development Project (PMEDE) for off-grid.[11] • 20,000 solar lanterns are being provided to social institutions in selected off-grid districts. In addition, 5,000 basic plug-and-play Systems are being distributed to town halls, schools, and healthcare facilities.[11] • The prefeasibility studies to electrify 21 provincial cities and development of national geospatial electrification plan along with an investment prospectus for the first 5 years is almost finished.[6]
Financing	• Electricity is prioritized under Investment Code Law which set up National Agency for Investment Promotion (ANAPI) as a One-Stop-Shop for all investment including renewable energy investments.[8] • The World Bank portfolio in the DRC is financing 20 national projects (USD 4.23 Bn) and 4 regional projects (USD 565 Mn) valued at a total of USD 4.8 Bn as of March 1, 2021.[6]
Energy Imperatives	• Per capita electricity consumption was 0.127 MWh in 2019 which is significantly lower in comparison to the global average.[14] • The Congo River basin remains the world's largest untapped source of renewable hydroelectric energy and has a potential to install up to 100 GW of hydropower capacity.[11,12] • The clean energy company and the ministry of energy and hydraulic resources of DRC has aimed to set up a 400 MW solar PV power plant to provide sustainable and stable energy supply in DRC.[17] • An agreement for the development and construction of 40 MW solar park of USD 50 Mn has been signed by provincial Government of Tshopo.[16]

Kingdom of Denmark

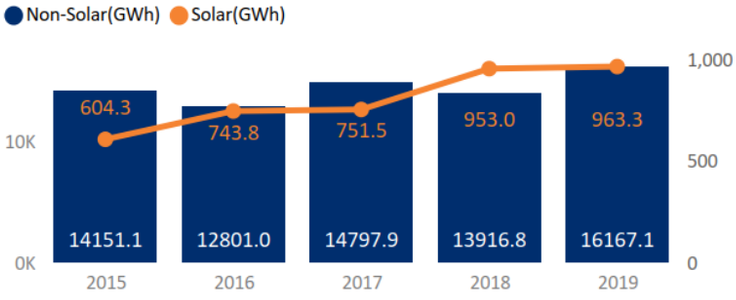
Europe

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in GW (2020)	Off-Grid Solar Capacity in MW (2019)
31.1	1.3	NA
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
2.8	5.6	85.3

Cumulative Solar Installed Capacity (MW)

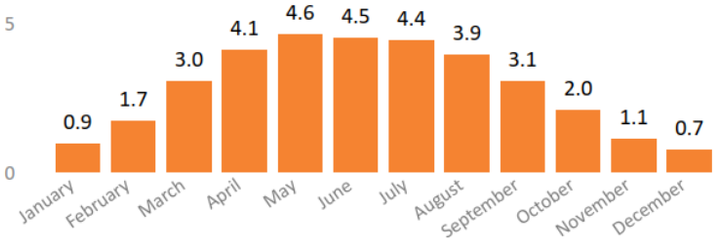


Renewable Energy Generation by Source

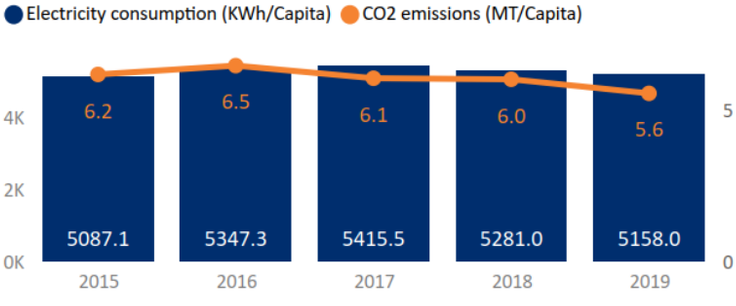


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



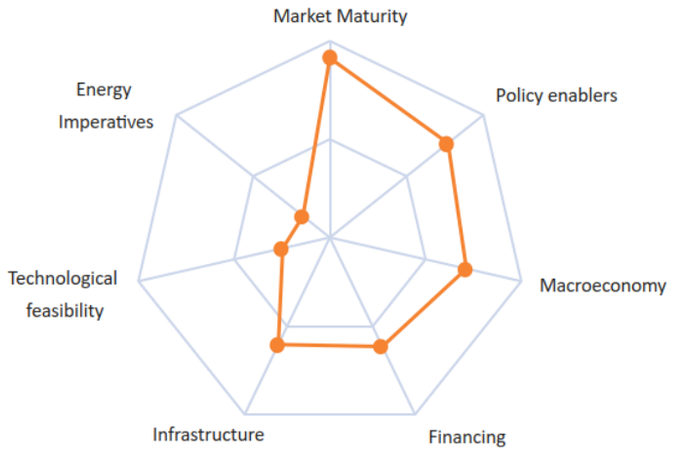
CO2 Emissions & Electricity Consumption



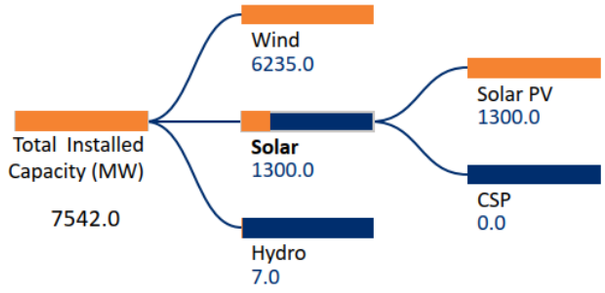
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers

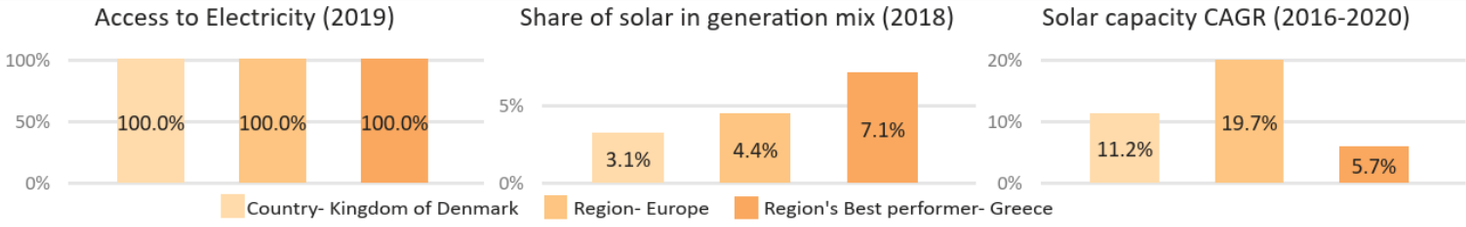


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Policy enablers

Areas of Improvement → Energy Imperatives, Technological feasibility

Key Insights

Drivers	Insights
Macro-economy	• Real GDP has grown at a rate of 2.9% in 2019 which declined by 3.3% in 2020 owing to Covid 19 impact.[2] • The Danish economy has one of the highest GDP per capita in the world (USD 59,830 PPP in 2019) making it a highin-come group country.[1] • In 2020, the agricultural sector accounted for 1.4% , Industry contributed 20.9% and the services sector contributed 64.9% of GDP.[1]
Policy enablers	• The Danish Energy Agency (DEA) is constituted under the Ministry of Energy, Utilities and Climate and is responsible for energy production, supply, and consumption as well as to reduce carbon emissions.[3] • By 2030, Denmark aims to cut GHG emissions by 70% from 1990 levels.[4] • In 2030, renewables may provide for at least half of the country's total energy consumption.5 The total share of renewables is expected to be 54% in 2030.[6]
Technological Feasibility	• Denmark receives an average of 1603 hours of sunlight per year. It is sunny 36.6% of daylight hours while 63.4% of daylight hours are likely cloudy or with shade, haze, or low sun intensity.[8] • Denmark receives relatively moderate of solar irradiation of 2.77 kWh/m^2/day and specific yield of 2.84 kWh/ kWp, a moderate technical feasibility is envisaged for solar projects in Country.[9]
Market Maturity	• Since 1990, 100% of the population in Denmark had access to electricity.[16] • The Danish Utility Regulator (DUR) is the independent regulator in Denmark which performs monitoring and regulation of the infrastructure of the Danish electricity network.[11] • Denmark is part of the Nordic electricity spot market (Nord Pool Spot), where Denmark is divided into the two price areas - West Denmark and East Denmark.[12] • Energinet is the Danish national transmission system operator for electricity and natural gas. It is an independent public enterprise owned by the Danish state under the Ministry of Climate and Energy.[13]
Infrastructure	• The transmission network in Denmark is divided into two separate transmissions grids: Western and Eastern. The West Danish grid is connected to the European continental grid, whereas the East Danish grid is connected to the Nordic grid.[14] • East Denmark is connected to Sweden by four AC interconnections with a total transmission capacity of 1,900 MW and to Germany by a DC interconnection with a total transmission capacity of 600 MW.[14]
Financing	• Denmark has a strong banking sector, characterised by a high degree of concentration with domestic banks own more than 85% of the total assets.[1] • The Danish Green Investment Fund is an independent government loan fund that aims to co-finance investments that promote a green transformation of Danish society.[15]
Energy Imperatives	• The total share of renewables (RES) is expected to be 54% in 2030.[6] • The Danish electricity consumption was 33.5 TWh in 2019. The commercial and public services constitute to 29% and the Industry constitute to 14% of the electricity consumption.[17]

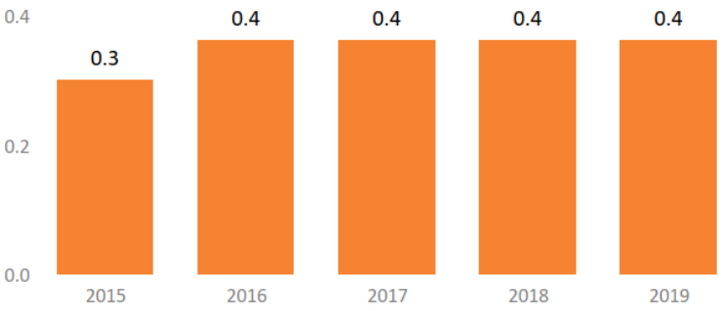
Djibouti

Africa

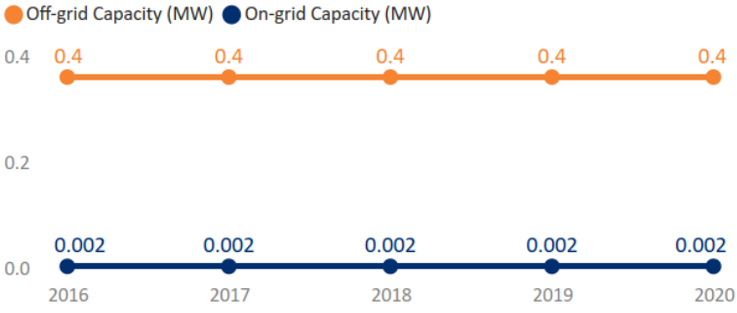
Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
469.0	0.4	0.4

Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
4.8	0.4	60.5

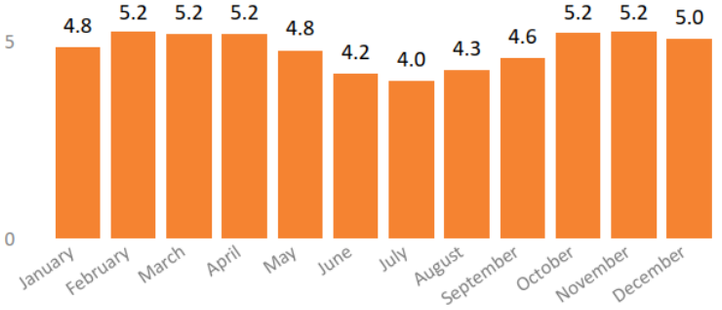
Cumulative Solar Installed Capacity (MW)



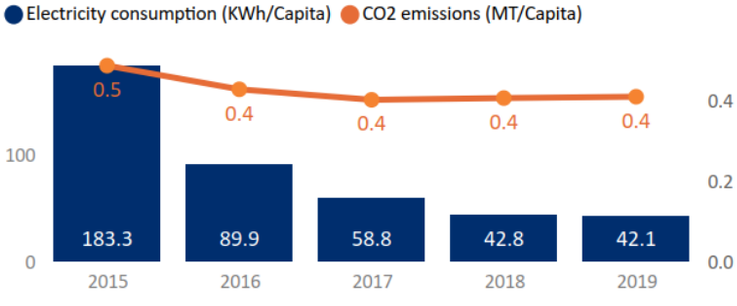
Cumulative Solar Off-grid & On-grid Capacity



Monthly variation in PVout (kWh/kWp/day)



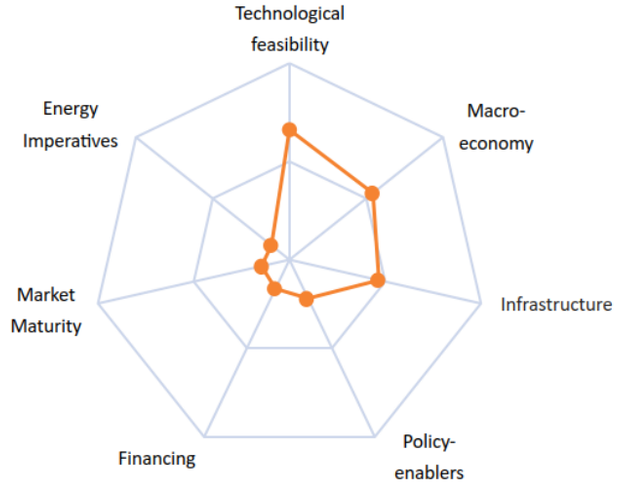
CO2 Emissions & Electricity Consumption



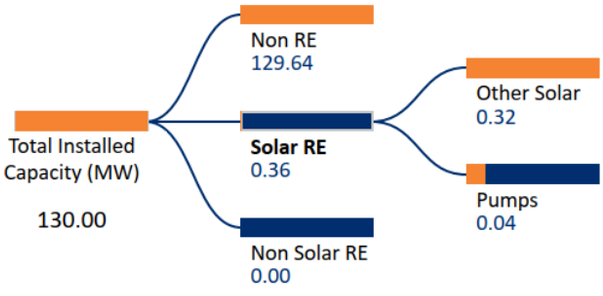
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers

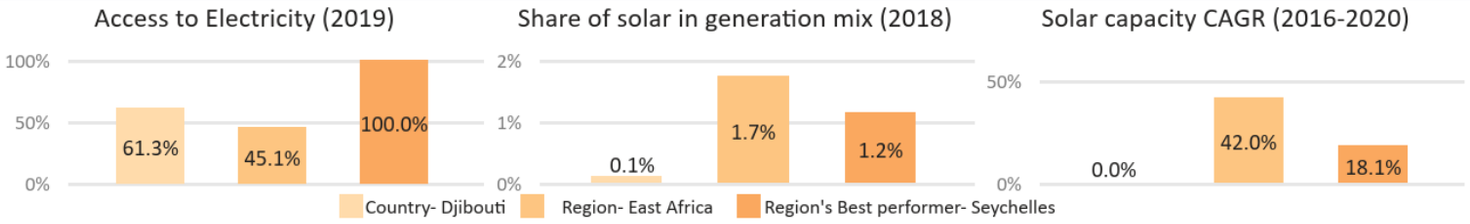


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Energy Imperatives, Market Maturity

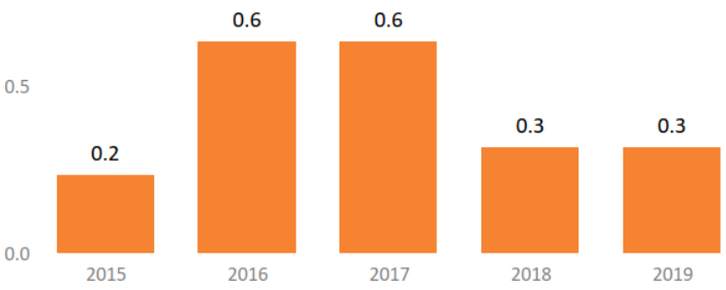
Key Insights

Drivers	Insights
Macro-economy	• GDP (at current prices) was USD 3.4 Bn in 2020. The country's medium-term economic outlook remains positive despite the impact of COVID-19; Real GDP contracted by a mere 1% in 2020. [2,3,10] • Output growth is set to reach 5.5% in 2021 and average 6.2% over 2022 and 2023, as free zone re-exports as well as economic activity in transportation, logistics, and telecommunication services to Ethiopia are expecting a rebound.[10]
Policy enablers	• Djibouti provides a tax exemption for all RE equipment to promote investments in the RE sector.[15] • The Agence Djiboutienne de Développement Social (ADDS) is currently developing an off-grid solar project aimed at achieving the targets set by the Solar Development Programme.[11] • In 2014, the Djibouti government launched the "Djibouti Vision 2035", whose goals among others include the promotion of 100% electricity generation from RE sources.[14]
Technological Feasibility	• Owing to relatively very high average solar irradiation level (GHI) of 6.06 kWh/m^2/day and specific yield of 4.8 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Djibouti.[1] • RE could be a source of growth as Djibouti has abundant geothermal, solar, and wind potential.[10] • According to the Centre des Etudes et la Recherche de Djibouti (CERD), the South-West region gets the highest irradiation levels particularly in Dikhil.[11] • The country has the potential to generate more than 300 MWs of electric power from renewable energy sources.[16] • The installed capacity was supplemented by imported electricity from Ethiopia through a 230 kV line constructed in 2011.[14]
Market Maturity	• 61% of total population had access to electricity as of 2019.[6] • RE share in total Final electricity consumption was 27.8% as of 2018.[6] • Djibouti is a member of the Eastern African Power Pool which aims to optimize the available energy resources and reduce electricity cost in the region.[4] • Djibouti has an installed off-grid capacity of 0.3 MWe from solar PV as of 2019.[14]
Infrastructure	• The government of Djibouti invested USD 391.77 Mn in development of Grand Bara Solar PV park with a total capacity of 300 MW.[9] • In 2020, Africa Finance Corporation (AFC) announced a USD 63 mn strategic investment to construct and operate a 60 MW wind project in Djibouti.[9] • The Multilateral Investment Guarantee Agency (MIGA) recently announced it has insured investments in 58.9 MW of wind power project which is also country's first IPP.[13] • Government of Djibouti has signed a Memorandum of Understanding (MoU) with French-based energy group, Engie, to build a 30 MW solar power plant.[17]
Financing	• International financial flow in 2018 was at USD 31 Mn (in PPP terms) to support clean and renewable energy.[6] • Djibouti has an Ease of Doing score of 60.5 (out of 100) and ranks 112nd among 190 countries in 2020.[7] • As of March 2021, Djibouti's active portfolio comprises 14 IDA projects worth about USD 240 mn.[10] • The CREC Renewable Energy Park will be the first U.S. infrastructure project in Djibouti built by the U.S. private sector.[12]
Energy Imperatives	• Per capita electricity consumption in 2019 was 42 kWh which is significantly lower in comparison to the global average.[5] • 25% of rural population in the country had access to electricity in 2019.[6] • Djibouti's electricity demand is expected to considerably increase due to various large-scale infrastructure projects including ports, free trade zones and railways that the Government has undertaken.[9] • Djibouti relies on imported electricity with about 70% supplied from hydropower by Ethiopia and the rest from diesel-powered generators.[14]

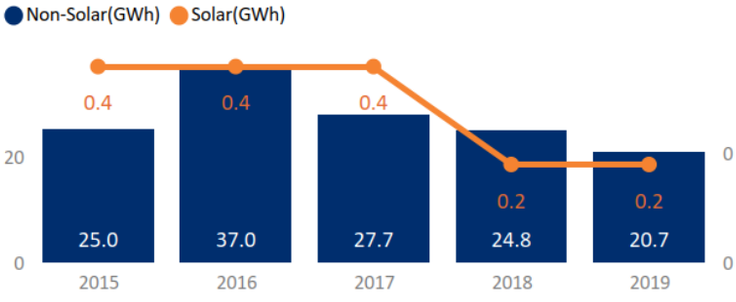
Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
100.2	0.3	NA

Dominica	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
Latin America & Caribbean	4.1	2.2	60.5

Cumulative Solar Installed Capacity (MW)

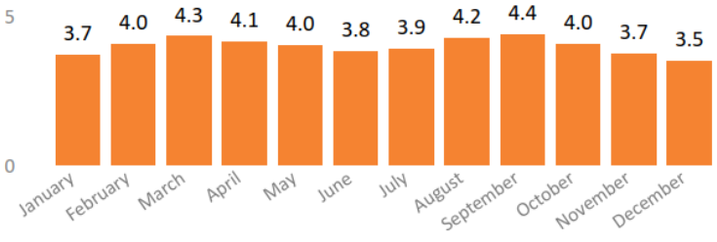


Renewable Energy Generation by Source

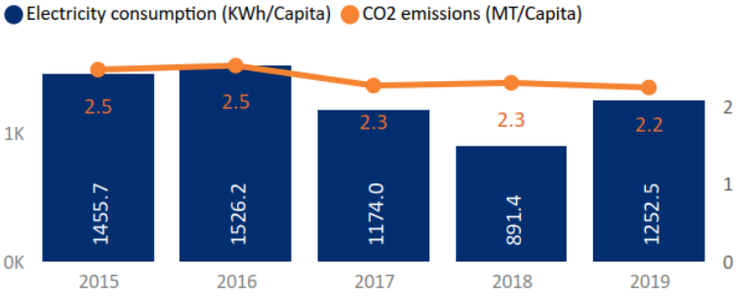


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



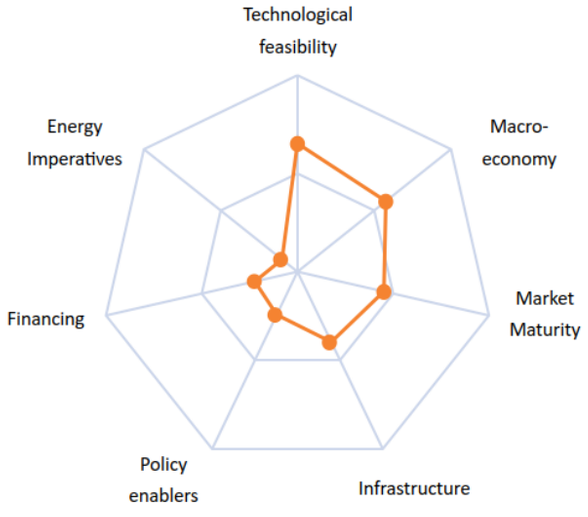
CO2 Emissions & Electricity Consumption



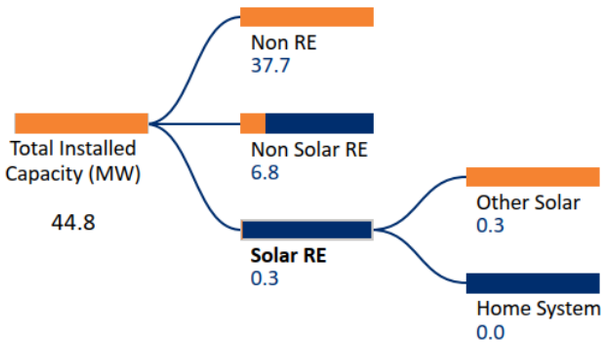
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers



Installed Generation Capacity by Source



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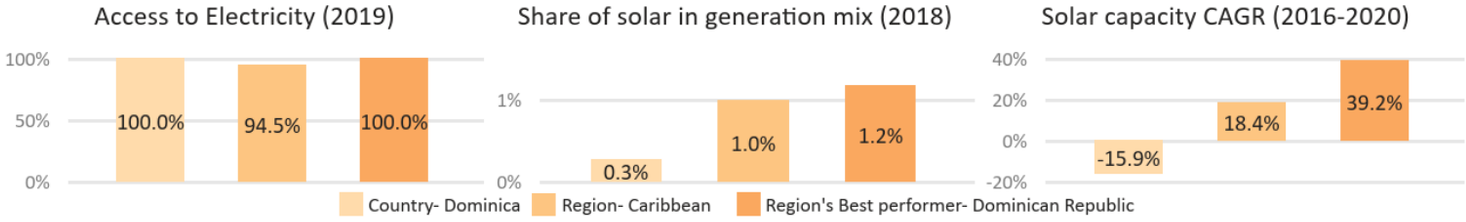
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Energy Imperatives, Financing

Key Insights

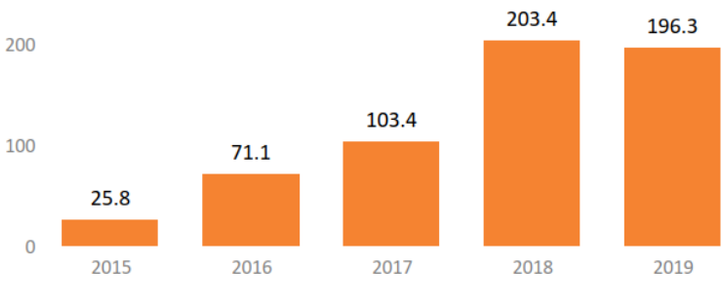
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, the GDP (Real) declined at a rate of 10.2% in 2020. In 2021, it is expected to bounce back at a rate of 1.5% from 2020 level.[1] • Dominica is an upper middle-income country with a GDP per capita (PPP) USD 11,072 in 2020. [4,1] • The inflation rate (CPI) of Dominica has reduced to -0.3% in 2020 from 1.5% in 2019.[1]
Policy enablers	• National Resilience Development Strategy 2030 aims to develop renewable energy to create a robust power infrastructure in the country.[3] • In 2018, the government had signed an agreement with Clinton Climate Initiative (CCI) to manage Sustainable and Resilient Energy Plan (S-REP) to identify a cost effective, reliable and climate resilient electricity.[3] • The Electricity Law 2006, aims to develop renewable technologies including solar, wind, hydro and geothermal power in the country.[3]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 4.94 kWh/m^2/day and specific yield 4.09 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Country.[5] • As of 2018, 2% of the country's power demand was met through RE sources (wind & solar).[3] • The total potential for RE in the country is more than 375 MW with solar potential of 45 MW.[8]
Market Maturity	• 100% of the population in Dominica had access to electricity as of 2019.[4] • The Power sector in Dominica is regulated by Independent Regulatory Commission (ICE). Dominica Electricity Services (DOMLEC) controls the generation, transmission, and distribution sector of the country.[3] • To increase private sector participation in the power sector, the Government has introduced the Electricity Supply Act in 2006 which has revoked the universal license of DOMLEC. Thus, opening avenues for other entities to participate.[3]
Infrastructure	• The country's transmission and distribution losses was at 6.5% in 2018 indicating an efficient T&D infrastructure.3 • The national grid operates at frequency of 50 Hz with voltage levels of 230/400 V & 11 kV with a consumer base of more than 35,300 consumers as of 2018.[3] • The Hurricane Marie in 2017 had damaged many power installations, post which solar panels and battery storage systems were installed in critical health facilities in the country.[11]
Financing	• The EU in 2019 signed a financing agreement worth USD 2.83 mn with Dominica to increase RE capacity in the country.[3] • In 2019, the World Bank had sanctioned USD 27 mn support to Dominica for the development of Geothermal power plant in the country.[9] • International fund flows to Dominica in support of clean and RE was at USD 1.7 mn in 2018 in PPP terms.[4]
Energy Imperatives	• Per capita consumption of 1.25 MWh is relatively low as compared to the global average of 3.35 MWh in 2019.[6] • The total solar installed capacity has reached 0.31 MW in 2020 and is expected to reach 2.4 MW by 2030.[7,3] • As of 2018, Dominica's total installed capacity was at 41.9 MW with 82.3% share coming from oil based thermal power plants alone.[3] • The commercial sector accounts for 50% of the total power demand followed by the residential and industrial sector having 41% and 7% share respectively.[10]

Dominican Republic

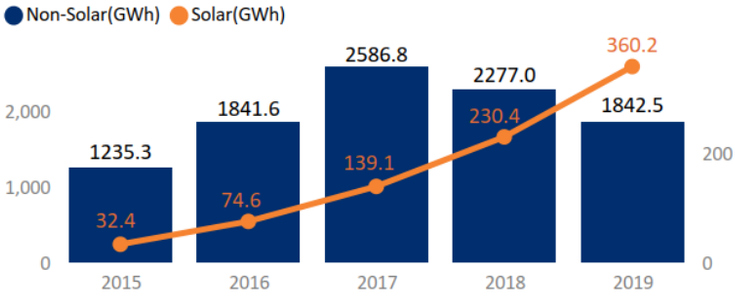
Latin America & Caribbean

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
16.4	266.8	21.1
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.5	2.5	60.0

Cumulative Solar Installed Capacity (MW)



Renewable Energy Generation by Source



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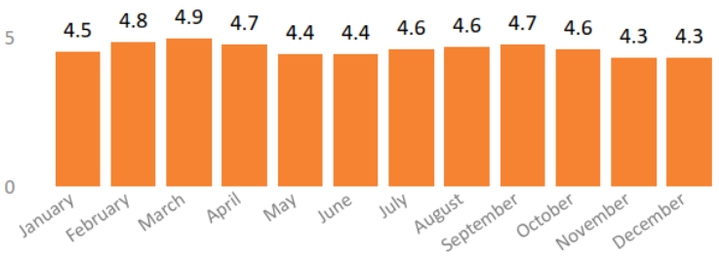
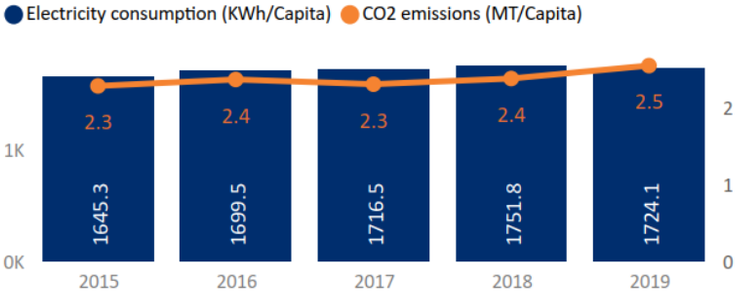
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



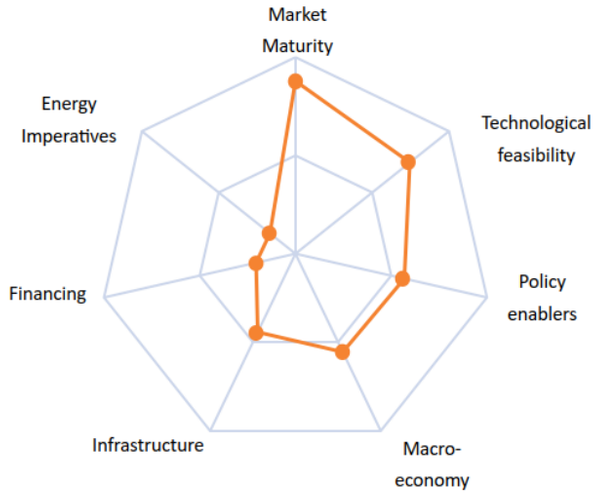
CO2 Emissions & Electricity Consumption



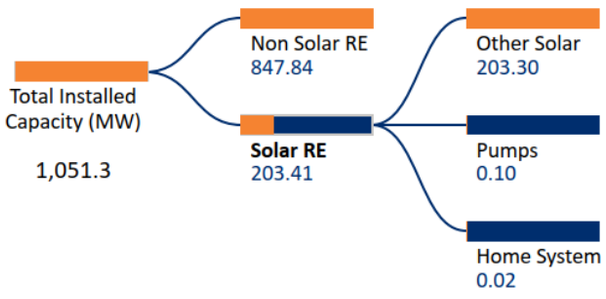
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



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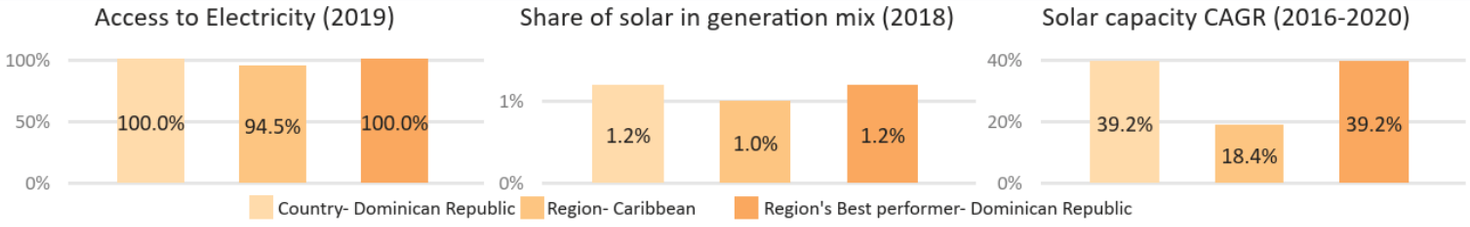
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity; Technological feasibility

Areas of Improvement → Energy Imperatives; Financing

Key Insights

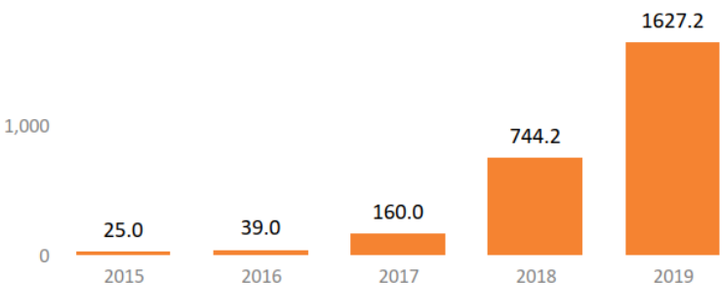
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, the GDP (Real) has declined at a rate of 6.7% in 2020. In 2021, it is expected to bounce back to grow at 5.5% from 2020 level.[1] • Dominican Republic is an upper middle-income country with a GDP per capita (PPP) USD 18,608 in 2020. [4,1] • The inflation rate (CPI) of Dominican Republic has risen to 3.8% in 2020 from 1.8% in 2019.[1]
Policy enablers	• To promote RE investments in the county, standardised PPA with sufficient duration and purchase obligations are operational in the country.[9] • To encourage solar PV installations net metering, feed-in-tariff are already in place in the country.[3] • There are various incentives such as tax exemptions on imports, sale tax exemption, reduced transmission fees for RE in the country.[3]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.42 kWh/m²/day and specific yield 4.50 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[5] • In 2019, 11% of the country's power demand was met through RE sources.[9] • Total Potential for solar PV is estimated to be 1.9 GW by 2030.[3]
Market Maturity	• 100% of the population in Dominican Republic had access to electricity as of 2019.[4] • In 2019, Dominican Republic recorded USD 138 million worth investment in clean energy. Between 2010-19, distributed solar PV alone attracted investments worth USD 438 million.[9] • Energy in the country is traded through long term bilateral contracts or in the wholesale power market.[14] • The Power sector in Dominican Republic is regulated by Superintendency of Electricity. The generation, transmission, and distribution utilities were unbundled in 1997. Generation sector has presence of private generators while transmission and distribution sectors are majorly operated by Government entities.[3,8]
Infrastructure	• The distribution sector has been facing technical and non-technical losses of 28-30%, while in eastern provinces the losses are greater than 50%.[13] • To improve the power infrastructure the government has taken steps such as blackout reduction program and expansion & modernisation of grid.[3,14] • 70,000 units of solar home systems with a total capacity of 102 MW are expected to be installed in the country by 2030.[14] • OC-SENI is responsible for the outage scheduling, short, medium- and long-term operation planning and annual assessment of transmission capacity. [14]
Financing	• The DEG - Deutsche Investitions- und Entwicklungsgesellschaft mbH sanctioned USD 62 million long-term loan in 2018 for the development of solar farm in the country.[15] • In 2019, the European Investment Bank (EIB) provided green loans worth EUR 3.6 million for financing of renewable energy and energy efficiency investment in country.[16] • Successful financing for several solar and wind projects resulted in a boom in the utility-scale market in the country.[3]
Energy Imperatives	• Per capita consumption of 1.72 MWh is relatively low in comparison to the global average of 3.35 MWh in 2019.6 • The total solar capacity installed was at 267 MW in 2020 and is expected to reach 891 MW by 2030.[7,3] • The industrial sector accounts for 59.0% share in the electricity consumption followed by residential and commercial sectors having 21.7% and 17.2% share respectively.[3] • As of 2019, the total installed capacity was 7.4 GW with 71% of the installed capacity based on fossil fuels.[9]

Egypt

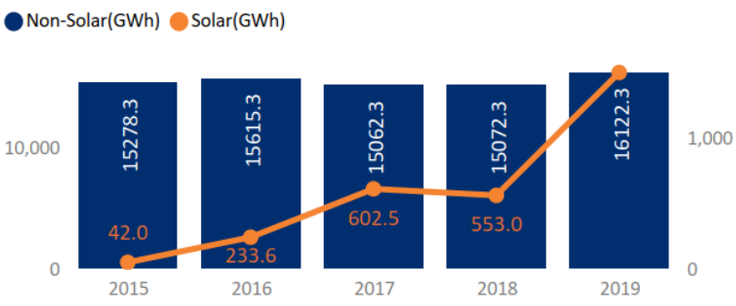
Middle East

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
165.6	1,659.2	44.2
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
5.4	2.5	60.1

Cumulative Solar Installed Capacity (MW)

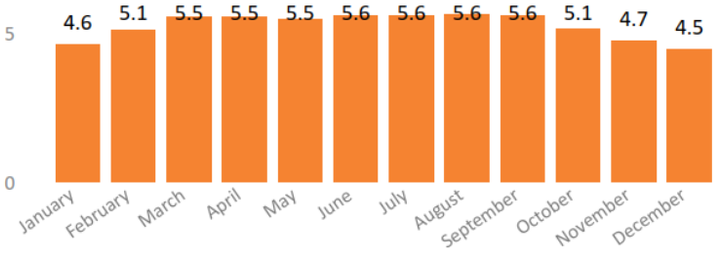


Renewable Energy Generation by Source

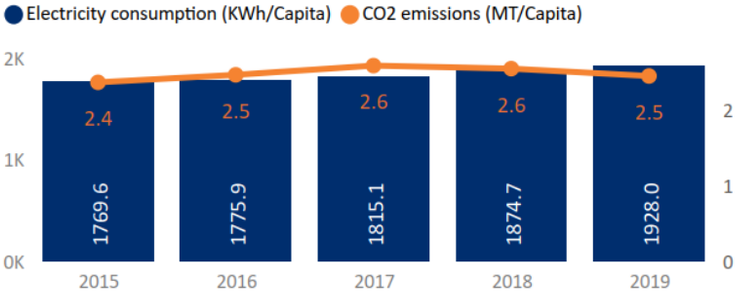


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



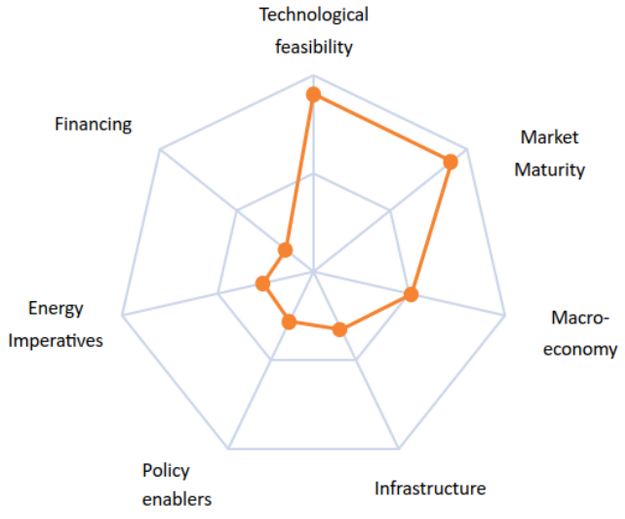
CO2 Emissions & Electricity Consumption



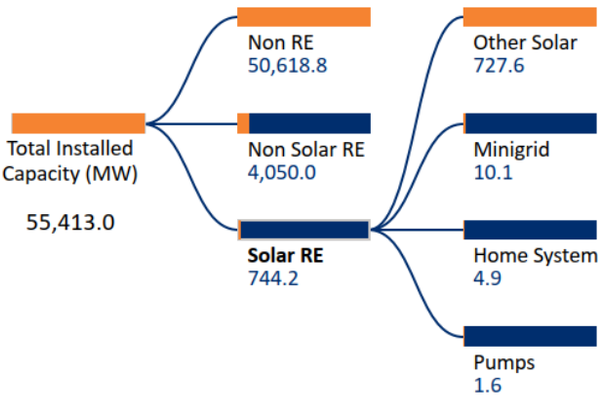
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



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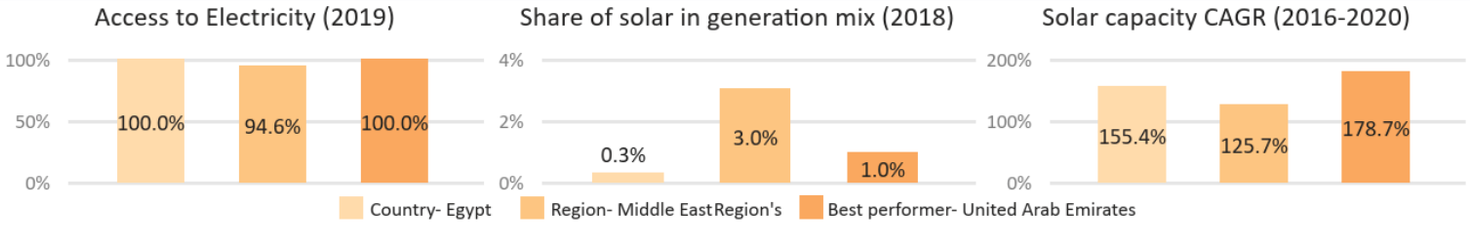


Areas of Strength → Technological feasibility, Market Maturity

Areas of Improvement → Financing, Energy Imperatives

Key Insights

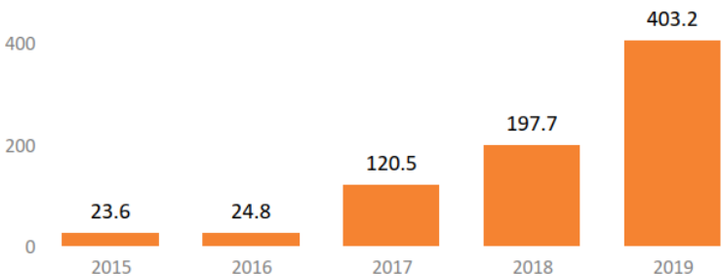
Drivers	Insights
Macro-economy	• On account of COVID-19 Pandemic, the GDP (Real) average for world has declined by 3.6% in 2020. However, in Egypt it had grown by 3.6% making it one of the few countries in the world to have positive GDP growth in 2020.[1] • The inflation rate (CPI) of Egypt has improved to 5.7% in 2020 from 13.9% in 2019.[1] • Oil and Gas, tourism, construction, financial services, income from Suez Canal operations and manufacturing are the highest revenue earners for the country.[6]
Policy enablers	• Under the Integrated Sustainable Energy Strategy (ISES), the Egyptian government aims to achieve 20% share of renewable energy in generation mix by 2022 and 42% by 2035.[11] • The Egypt Electricity law, enacted in 2015, aims to attract private sector players by allowing them to generate and distribute electricity to consumers in the country.[7] • To encourage investments in renewable energy competitive bidding, net metering, feed-in-tariff, tax incentives have already been introduced by the government.[7]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 6.26 kWh/m^2/day and specific yield 5.35 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[2] • As per IRENA's REmap analysis, Egypt has potential to satisfy 53% of its power demand through renewable energy by 2030.[11]
Market Maturity	• Since 2017, 100% of the population in the country has access to electricity.[3] • Egypt is blessed with very high solar potential, however as of 2019, solar PV has accounted only 1.90% share in generation mix which indicates significant head room for improvement.[4] • The Power sector in Egypt is regulated by Egyptian Electric Utility and Consumer Protection Regulatory Agency (EgyptERA). The generation has presence of some Independent Power Producers (IPPs) while transmission and distribution sectors are wholly controlled by the government entities.[7]
Infrastructure	• The transmission system of Egypt operates between 33 kV to 500 kV AC voltage levels. The total length of transmission lines grew at a CAGR of 1.6% in the last decade reaching 49,535 ckm in 2020.[7] • Distribution of electricity in the country is done by 9 subsidiary companies of Egyptian Energy Holding Company (EEHC) with total line length of 535,069 ckm as of 2020.[7] • Egypt is a part of The Eight Country Interconnection Project (EIJLLPST), which interconnects Egypt, Iraq, Jordan, Libya, Lebanon, Palestine, Syria, and Turkey. In 2020, the country has clocked 588.4 GWh of exports against 97.4 GWh imports.[7,10]
Financing	• The KfW, Deutsche Bank, HSBC are the top financers of clean energy project in the country.[9] • In April 2021, several multilateral organisations such as the European Bank for Reconstruction and Development (EBRD), the OPEC Fund for International Development (the OPEC Fund), the African Development Bank (AfDB), the Green Climate Fund (GCF) and Arab Bank, together has sanctioned USD 114 Mn for the development of 200 MW solar power plant in the country.[12]
Energy Imperatives	• Per capita electricity consumption of 1.92 MWh is relatively low in comparison to the global average of 3.35 MWh in 2019.[5] • The total generation from solar PV has risen at a CAGR of 37.8% between 2010-19 reaching 3,680 GWh in 2019 from 206 GWh in 2010.[4] • In 2019, Oil & Gas based thermal power plants dominated the generation mix having 90.0% share in the generation mix.[4] • In the last decade, the total power demand in the country has risen at CAGR of 3.8% reaching 193,293 GWh in 2019 from 137,616 GWh in 2010.[4]

El Salvador

Latin America & Caribbean

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
6,220.9	429.5	4.0
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.8	1.0	65.3

Cumulative Solar Installed Capacity (MW)



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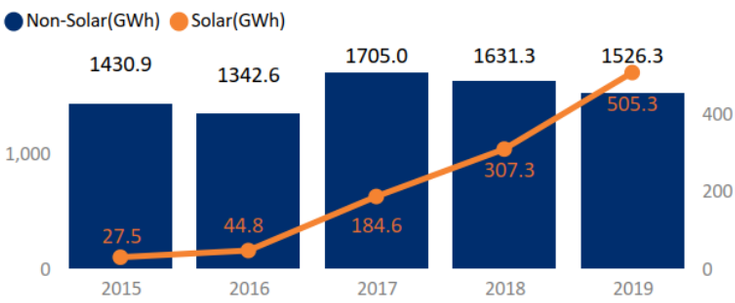

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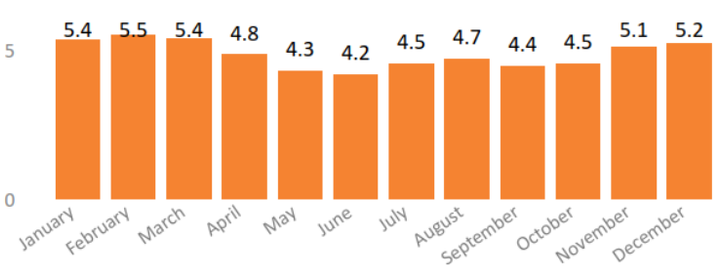
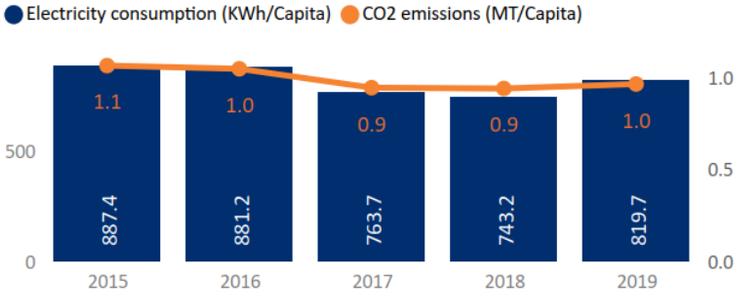
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



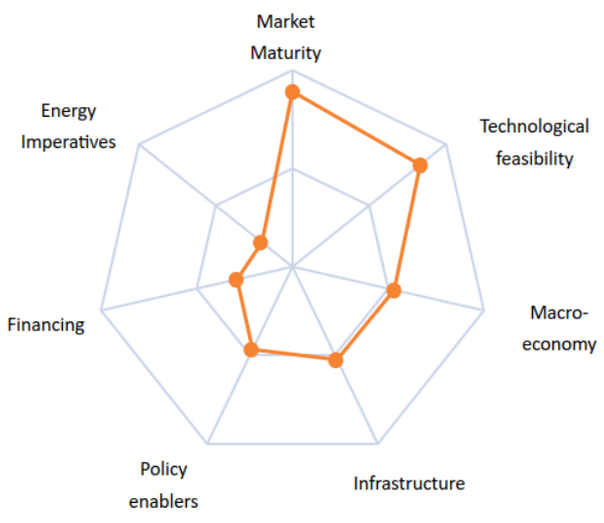
CO2 Emissions & Electricity Consumption



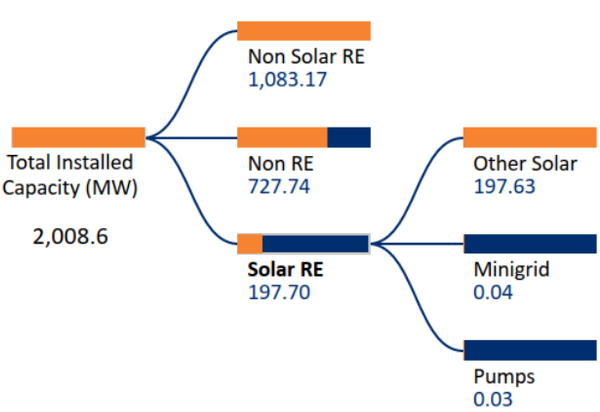
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers

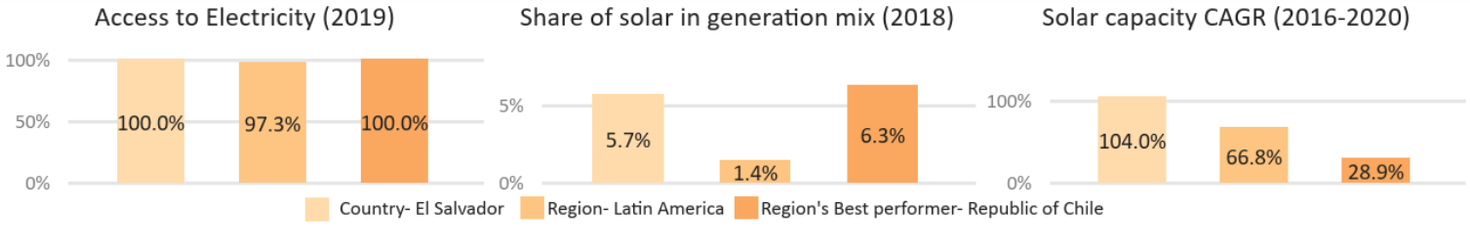


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

Areas of Improvement → Energy Imperatives, Financing

Key Insights

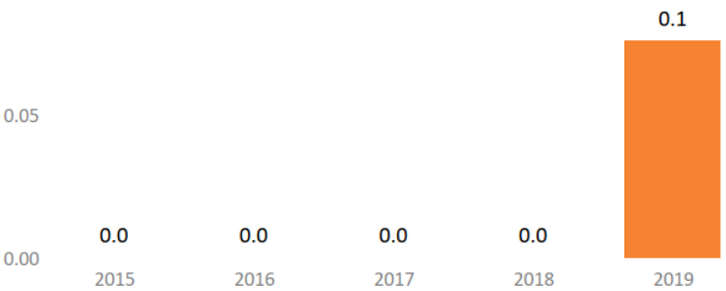
Drivers	Insights
Macro-economy	• El Salvador is a lower-middle income economy[2] with a GDP per capita (PPP) at USD 1,621 as of 2021.[1] • The GDP (Real) growth is expected to recover from -8.6% in 2020 to 4.2% in 2021.[1] • El Salvador's economy is mainly based on services, industry and agriculture sector.[3]
Policy enablers	• National Energy Council (CNE) is responsible for developing national energy strategy and policy. [4] • Renewables are supported by fiscal Incentives like VAT exemption, income tax exemption, reduction in import tax to 5%, and provision of certificates of reduced emissions (CERs).[3] • National Investment Fund for Electricity and Telephony (FINET) finances energy projects related to the improvement of energy infrastructure in rural areas.[5]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.92 kWh/ m²/ day and specific yield 4.80 kWh/ kWp, a very high technical feasibility is envisaged for solar projects in El Salvador.[7] • El Salvador's generation mix consisted of 32% fossil fuel-based power, while the share of RE was 40% in 2019.[8] • The 140 MW Capella solar project is connected to a 3 MW/ 1.5 MWh lithium ion battery storage capacity, one of the largest to be rolled out in Central America.[14]
Market Maturity	• El Salvador reached 100% electricity access levels for its population in 2019.[7] • Around 21.8% of electricity was imported from regional electricity market as of 2019.[3] • Share of solar in electricity generation mix stood at 5.66% in 2018.[9] • Superintendencia General de Electricidad y Telecomunicaciones (SIGET) regulates the power sector in El Salvador.[10]
Infrastructure	• El Salvador's power system consisted of 25 power plants interconnected with electricity transmission system across the country.[3] • El Salvador has not added any additional fossil fuel-based power plants since 2013.[6] • The country uses Central American Electrical Interconnection System, having a transfer capacity of 300 MW, to meet its demand through imports.[11] • The power system of the country comprises of 1,372 km of transmission network, consisting of 40 lines at 115 kV and four interconnection lines at 230 kV. [3]
Financing	• In 2018, Finnfund has approved loans for development of ten solar power plants that amounted to USD 15 Mn.[13] • In 2018, IDB provided a financial package of USD 28 Mn for the development of Capella solar project of 140 MW capacity.[14]
Energy Imperatives	• Total installed capacity in El Salvador was 2.25 GW in 2019.[15] • Per capita electricity consumption of 1.02 MWh is lower in comparison to the global average of 3.35 MWh in 2019.[8] • Installed solar PV capacity in El Salvador increased from 24.8 MW in 2016 to 429.5 MW in 2020.[9]

Equatorial Guinea

Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
626.0	0.1	0.1
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
3.7	4.2	41.1

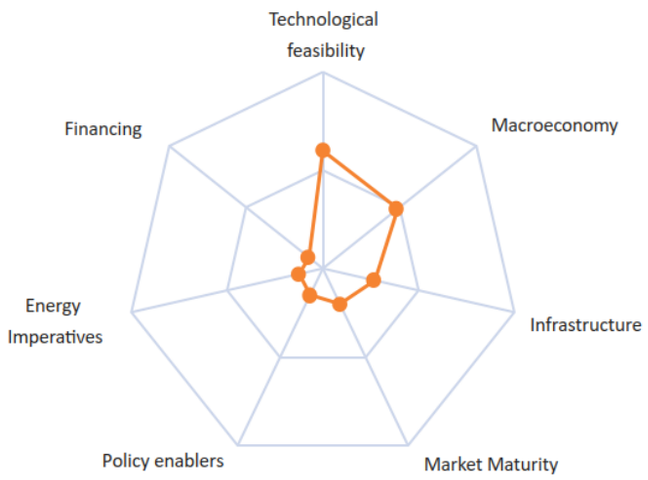
Cumulative Solar Installed Capacity (MW)



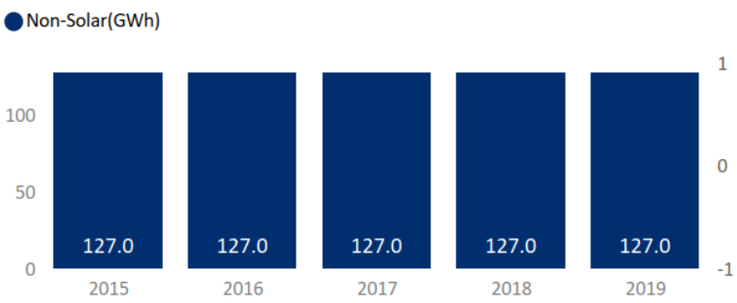
Ease of Doing Solar Classification

Potential

Performance against 7 drivers

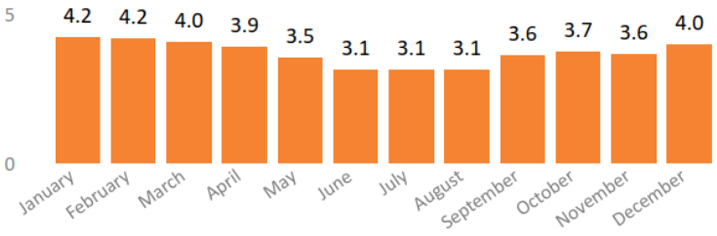


Renewable Energy Generation by Source

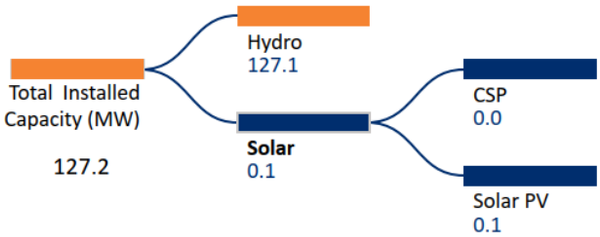


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

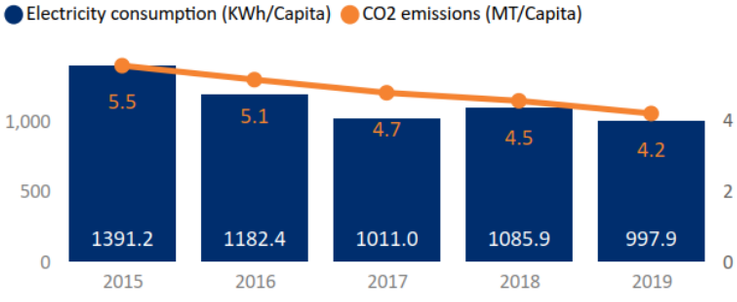
Monthly variation in PVout (kWh/kWp/day)



Installed Capacity by Source

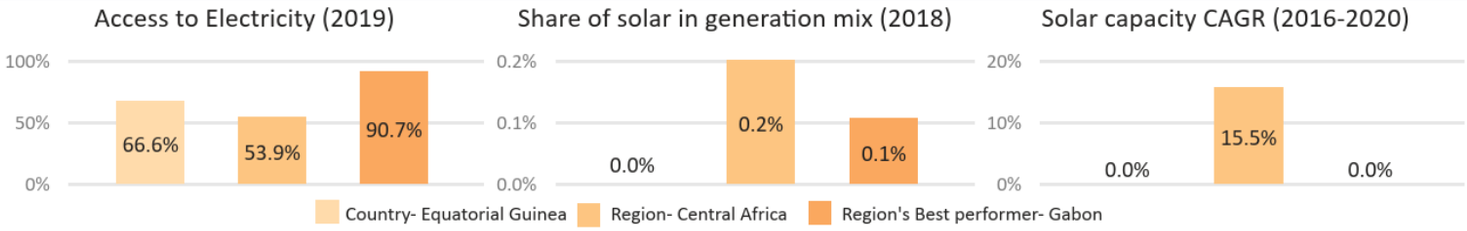


CO2 Emissions & Electricity Consumption



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Energy Imperatives

Key Insights

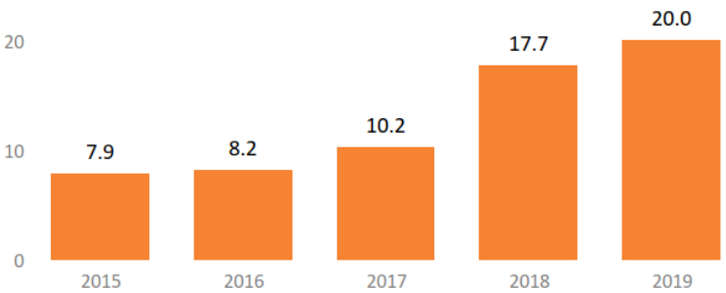
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, the Equatorial Guinea's GDP (Real) declined by 4.9% in 2020.[1] • The infla on rate (CPI) of Equatorial Guinea has risen in 2020 reaching 4.8% from 1.2% level in 2019.[1] • In 2020, the services sector was the major contributor to the GDP with 51.7% share followed by industrial and agricultural sector with 45.2% and 3.0% share respectively.[6] • As of 2019, the exports of minerals fuels, lubricants and related material dominated the total exports with a share of 89.5% followed by chemical and related products with 4.1% share.[6]
Policy enablers	• The country has been taking several steps such as harnessing of hydro and solar potential and drafting of Energy law with an aim to develop and attract investment for the renewable energy sector in the country.[8] • The Action Plan 2020 and Electricity for All initiative targets to develop an efficient and reliable electricity system in the country.[10]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 4.60 kWh/m²/day and specific yield 3.66 kWh/kWp, a strong technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• As of 2019, 69% of the popular on in the country had access to electricity.[3] • Equatorial Guinea is blessed with high solar irradiation index, however as of 2019, solar PV had no contribution in the genera on mix.[4] • The Electricity Energy Regulatory Agency regulates the power sector of the country.[7] • The generation transmission and distribution sectors in the country are controlled by the subsidiaries of Government owned Sociedad de Electricidad de Guinea Ecuatorial (SEGESA).[7]
Infrastructure	• Equatorial Guinea is a member country of the Central African Power Pool (CAPP) making its grid interconnected with the neighbours, thus improving reliability of the power supply.[7] • Solar Off-grids can be viable solution in the country for improving access to electricity. As of 2019, 80.0% of 0.45 Mn unelectrified population lived in rural and remote areas of the country where grid extension is not feasible in near future.[3] • To reduce dependence on fossil fuels, the country is in the process of developing a 200 MW hydroelectric power plant and 5 MW solar park.[8]
Financing	• The Government along with support from UNDP & GEF plans to invest USD 43 Mn to a project "Sustainable Energy for All: Promoting small-scale hydropower in Bioko and other clean energy solutions for remote islands". The project aims for development of clean energy policies, solar PV demonstrations, capacity building for renewable energy in the country.[9] • Despite liberalization of the banking system, corporate financing is limited. Fund grants to small and medium-sized enterprises are also limited in the country.[11]
Energy Imperatives	• Per capita consumption of 0.99 MWh is relatively low as compared to the global average of 3.35 MWh in 2019.[5] • In 2019, gas & oil based thermal power plants dominated the generation mix with 56.6% share in the generation mix followed by hydro power plants with 43.3% share.[4] • In the last decade, the total power demand in the country has risen at a CAGR of 10.0% reaching 1,353 GWh in 2019 from 576 GWh in 2010.[4]

Eritrea

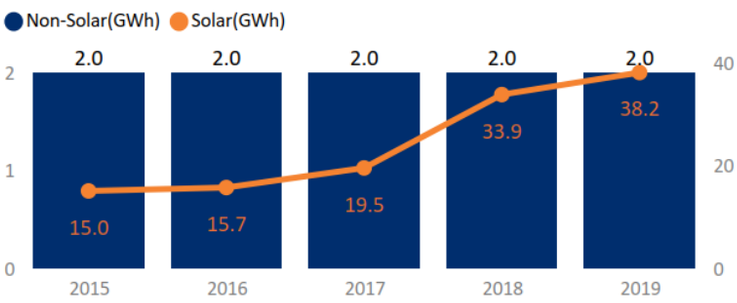
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
404.0	22.2	22.2
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.9	0.2	21.6

Cumulative Solar Installed Capacity (MW)

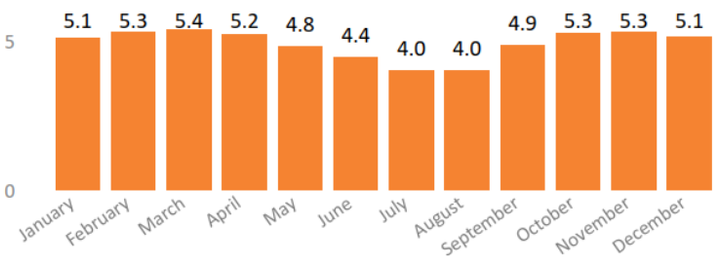


Renewable Energy Generation by Source

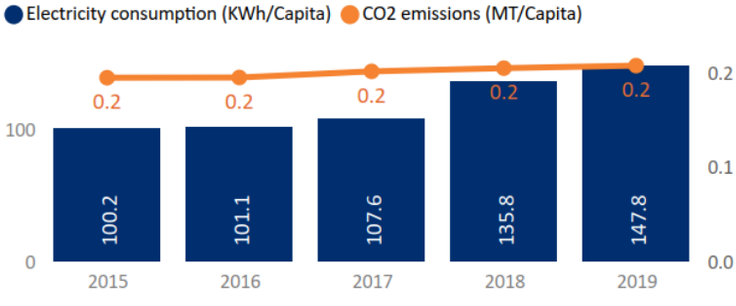


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



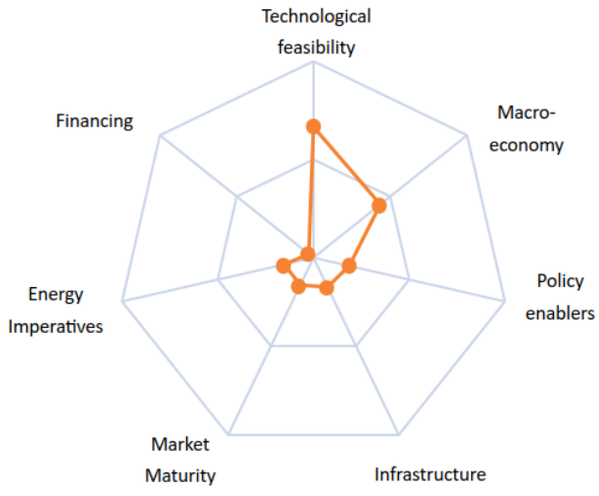
CO2 Emissions & Electricity Consumption



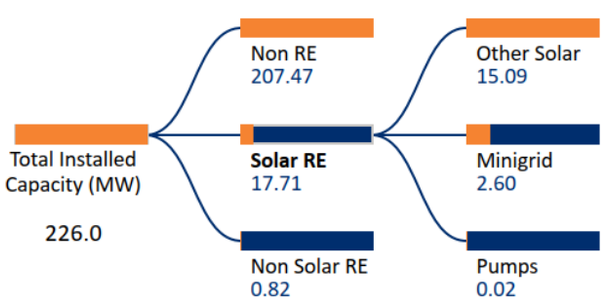
Ease of Doing Solar Classification

Potential

Performance against 7 drivers

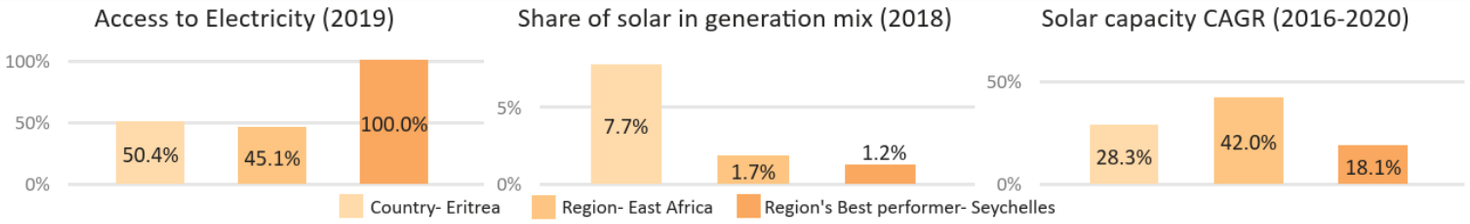


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Energy Imperatives

Key Insights

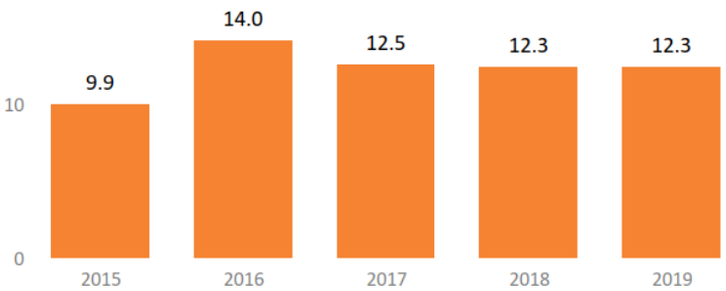
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, the GDP (Real) declined by 0.6% in 2020.[1] • The inflation rate (CPI) of Eritrea has risen to 4.9% in 2020 from -16.4% in 2019.[1] • As of 2019, the services sector is the major contributor to the GDP with 68.2% share followed by industrial and agricultural sector with 18.5% and 13.3% share respectively.[6] • As of 2019, the exports Crude materials dominated the total exports having a share of 48.2% followed by 'manufacturing goods' and 'machinery and transport equipment' having 19.1% and 17.1% share respectively.[6]
Policy enablers	• The country aims to achieves 100% electrification by 2030 through grid extension and development of mini grids across the country.[10] • Under the "Renewable Energy Policy and Development Framework 2010", the government has set a target to have 50% share of renewable energy in the generation mix by 2030.[10] • To catalyse the growth of renewable sector in the country, the renewable energy projects receive priority in dispatch of power.[11]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 6.07 kWh/m^2/day and specific yield 4.88 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• As of 2019, 50% of the population in the country had access to electricity.[3] • Eritrea is blessed with high solar irradiation index, however in 2019, solar PV has accounted for only 11.6% share in generation mix.[4] • The Department of Energy regulates the power sector of Eritrea. The Eritrean Electricity Company (EEC) dominated the generation, transmission, and distribution sectors in the country.[7]
Infrastructure	• The country has two independent and unconnected transmission systems namely Interconnected System (ICS) and Self-Contained Systems (SCS).[12] • Eritrea is expected to join the Eastern African Power Pool (EAPP) in coming years. This will enable the country to import renewable energy power from the member countries of the interconnection.[13] • Solar Off-grids are a viable solution in the country. As of 2019, 83.2% of 1.67 Mn unelectrified population lived in rural and remote areas of the country where grid extension is not feasible in near future.[3]
Financing	• Under the Development Cooperation Strategy for 2019/20, the European Commission plans to invest EUR 165 Mn in the country of which EUR 125 Mn will be invested for the development of infrastructure and energy sector.[8] • The EU has sanctioned EUR 200 Mn fund for development of various sectors including the energy sector by developing an efficient power infrastructure in the country.[9]
Energy Imperatives	• Per capita consumption of 0.14 MWh is substantially low to compared to the global average of 3.35 MWh in 2019.[5] • The total generation from solar PV has risen at a CAGR of 45.9% between 2010-19 reaching 60.0 GWh in 2019 from 2.0 GWh in 2010.[4] • In 2019, gas & oil based thermal power plants dominated the generation mix with 88.0% share in the generation mix followed by solar PV power plants having 11.6% share.[4] • In the last decade, the total power demand in the country has risen at a CAGR of 6.5% reaching 516.9 GWh in 2019 from 294.4 GWh in 2010.[4]

Ethiopia

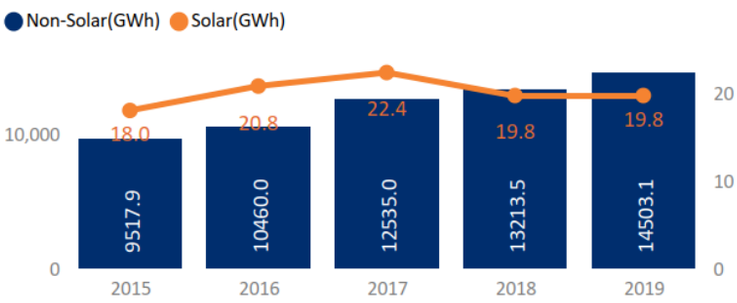
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
9,090.0	20.2	20.2
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.7	0.1	48.0

Cumulative Solar Installed Capacity (MW)

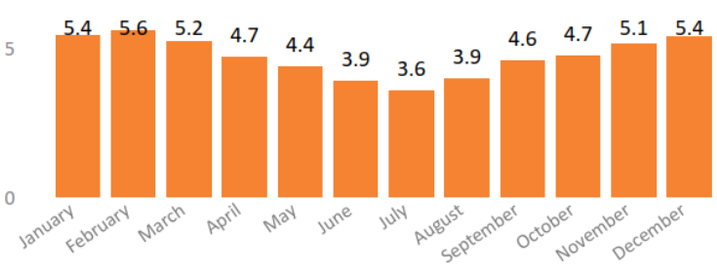


Renewable Energy Generation by Source

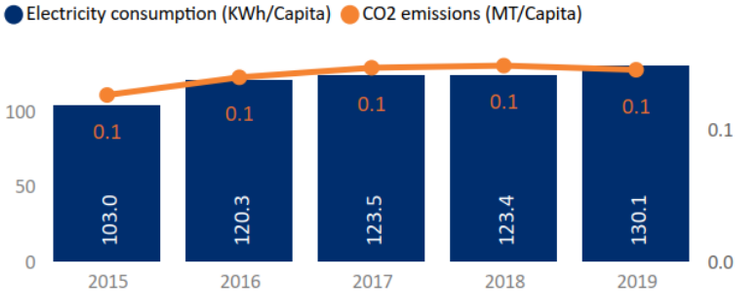


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



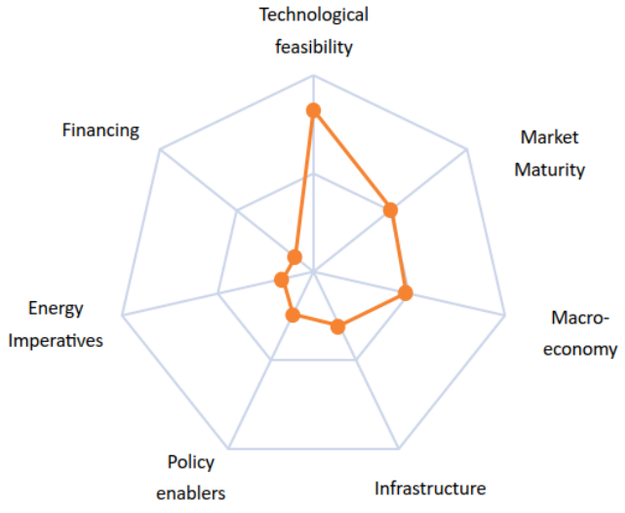
CO2 Emissions & Electricity Consumption



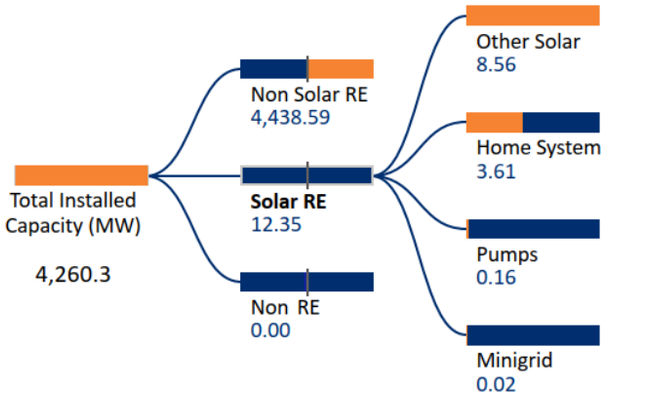
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers

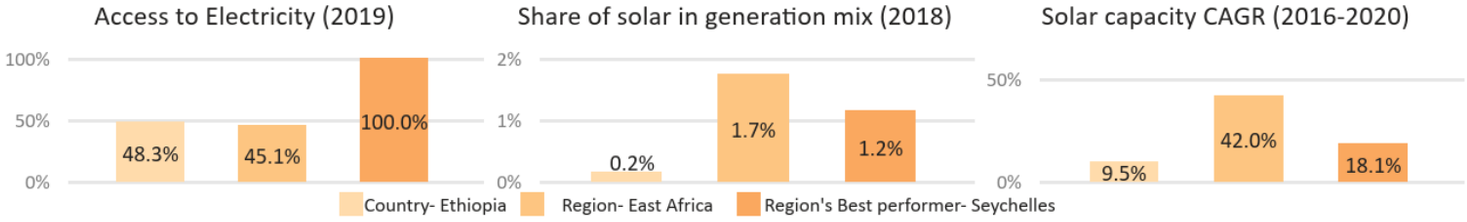


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Market Maturity

Areas of Improvement → Financing, Energy Imperatives

Key Insights

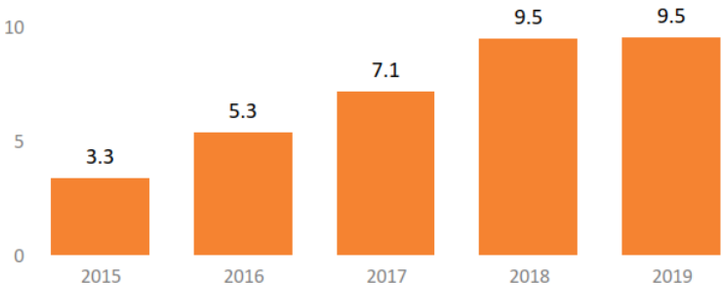
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, World's average GDP (Real) declined by 3.6% in 2020. However, in Ethiopia it grew by 6.1% making it one of the few countries in the world to have positive GDP growth in 2020.[1] • The inflation rate (CPI) of Ethiopia has risen at 20.4% in 2020 from 15.8% in 2019.[1] • In 2019, the services sector was the major contributor to the GDP with 38.7% share followed by agricultural and industrial sector with 33.3% and 28.1% share respectively.[6] • As of 2019, transport services dominated the total exports with a share of 47.3% followed by agricultural products and travel services with 31.1% and 9.4% share respectively.[6]
Policy enablers	• The Ethiopia Growth and Transformation plan II aims to add 13,817MW by 2019/20 with 300 MW capacity additions for solar. The project further aims to add additional 4,000 MW by 2022 to meet its growing power demand.[7,9] • To attract private investors in the country, the Government has developed mechanism like competitive bidding, IPP framework and regulations for Public Private Partnership (PPP) model.[7] • The country offers tax-free import privileges for the equipment related to off-grid solar PV technologies.[10]
Technological Feasibility	• Owing to very high levels of solar irradia on (GHI) of 5.85 kWh/m^2/day and specific yield 4.68 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• As of 2019, 48% of the population in the country had access to electricity.[3] • Ethiopia is blessed with high solar irradiation index, however in 2019, solar PV accounted for a mere of 0.13% share in genera on mix.[4] • The Power sector in the country is regulated by the Ethiopian Energy Authority (EEA).[7] • The generation sector has presence of Independent Power Producers (IPPs) while the transmission and distribution sectors are wholly controlled by Ethiopian Electric Power Company (EEPCo).[7,8]
Infrastructure	• The electricity demand in the country is growing a higher pace than the supply, due to which the country is facing shortages and load shedding.[7] • The country exports power up to 100 MW each to Djibouti and Sudan and PPA discussions for exporting to Kenya are underway.[7] • To increase the access to electricity in the country, the Government has been readily expanding its power infrastructure. The total length of transmission lines has reached 17,448 km in 2020 and expected to touch to 21,448 km by 2022.[7]
Financing	• The Sustainable Energy Fund for Africa (SEFA) managed by African Development Bank (AfDB), in 2017, sanctioned USD 995,000 for the developing the procurement framework for IPPs with an aim to catalyse private sector investments in the country.[11] • The World Bank in 2019 sanctioned USD 200 Mn Renewable Energy Guarantees Program (REGREP) with an aim to support the development solar and wind energy IPP projects with cumula ve capacity more than 1,000 MW.[12] • In 2020, the Clean Technology Fund sanctioned USD 20 Mn to the project "Enabling Access to Off-Grid Energy to the People of Ethiopia - Thema c Line of Credit to the Commercial Bank of Ethiopia".[13]
Energy Imperatives	• Per capita consumption of 0.13 MWh is rela vely low compared to the global average of 3.35 MWh in 2019.[5] • The total generation from solar PV has risen at a CAGR of 54.4% between 2010-19 reaching 20.0 GWh in 2019 from 0.4 GWh in 2010.[4] • In 2019, Hydro power plants dominated the generation mix with 96.0% share in the generation mix followed by wind power plants with 3.6% share.[4]

Fiji

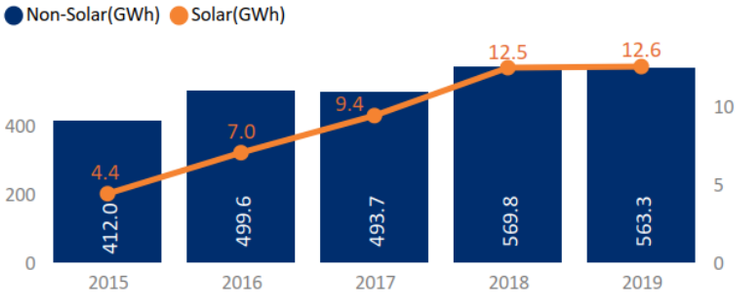
Asia & Pacific

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
907.0	9.7	4.6
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
3.6	2.5	61.5

Cumulative Solar Installed Capacity (MW)

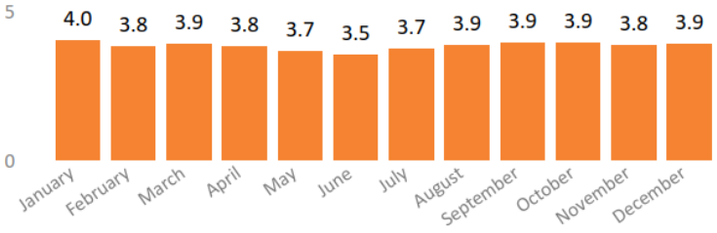


Renewable Energy Generation by Source

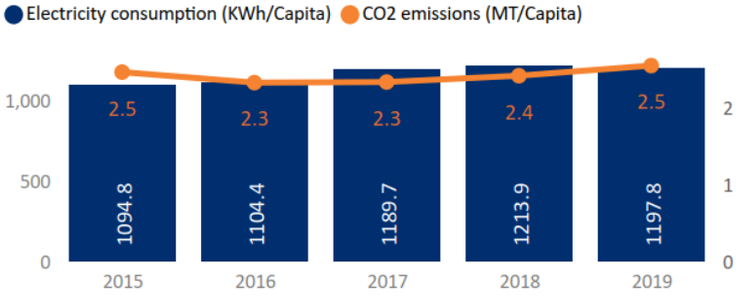


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



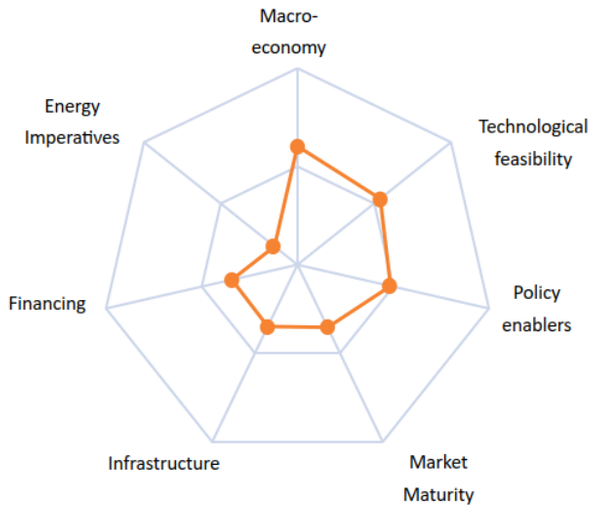
CO2 Emissions & Electricity Consumption



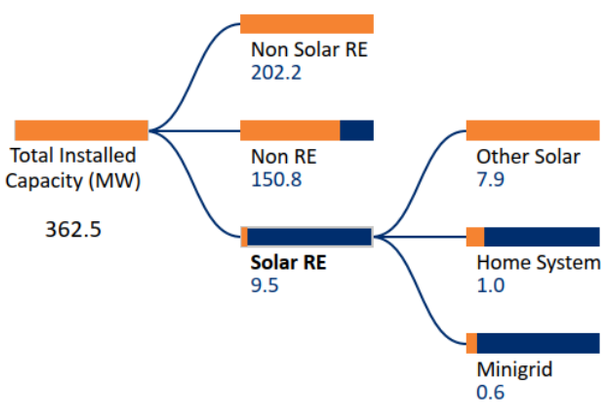
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

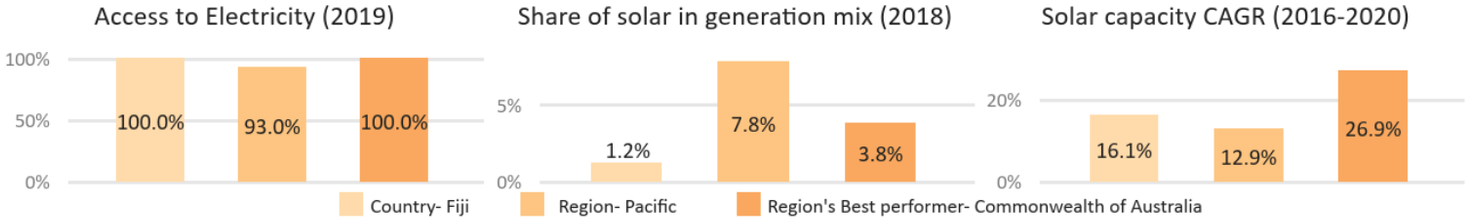


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Macroeconomy; Technological feasibility

Areas of Improvement → Energy Imperatives; Financing

Key Insights

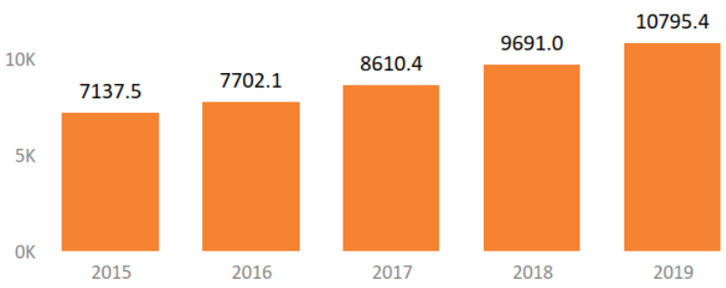
Drivers	Insights
Macro-economy	• Real GDP declined by 19% in 2020 and grew at a rate of 5% in 2021 from 2020 levels.[2] • Fiji has one of the most developed economies in the Pacific, with tourism as the dominant driver of economic activity and foreign direct investment.[1] • Prior to covid19, tourism contributed 38.9% of GDP and 35.5% of total employment.[3]
Policy enablers	• Fiji has set targets to reach 99% power generation through RE by 2030 and a 100% electrification rate by 2020.[4] • As of 2019, the Fiji government removed the minimum investment requirement of USD 117,647 (FJD 250,000) to encourage greater foreign investment.[6]
Technological Feasibility	• Fiji receives an average of 2529 hours of sunlight per year. The country is sunny 57.7% of daylight hours while the rest are likely cloudy or with shade, haze, or low sun intensity.[7] • Fiji receives relatively very high levels of solar irradiation of 4.32 kWh/m^2/day and specific yield of 3.56 kWh/ kWp, a very high technical feasibility is envisaged for solar projects in Country.[8] • As of 2019, renewables had 60.3% share in the electricity generation mix up from 59.3% in 2018.[9]
Market Maturity	• Fiji Electricity Authority (FEA) has sole statutory authority for the generation, transmission, distribution, and retail of electricity in Fiji.[10] • The Department of Energy (DOE) is responsible for energy policies and plans, energy efficiency and conservation, RE and rural electrification.[11] • Fiji Electricity Authority (FEA) has set out a process for regularly reviewing the efficient costs of electricity supply and setting tariffs and making all forms of electricity subsidy transparent to energy consumers.[5]
Infrastructure	• Fiji's electricity system needs significant investment over the next 10 years estimated at about F$1.5 bn, which is unlikely to be financed by the public sector.[10] • As of 2021, Energy Fiji Limited (EFL) has an ongoing USD 900 mn (FJ$1.97 bn) 10-year Power Development Plan (PDP) to invest in new generation, transmission and distribution.[12] • In 2019, human development index for Fiji was 0.74 score. Between 1990 and 2019, Fiji's HDI value grew from 0.662 to 0.743, an increase of 12.2%.[13]
Financing	• ADB anticipates an allocation of USD 600 mn in sovereign and non-sovereign resources to help Fiji overcome its key developmental challenges, including pandemic recovery.[1] • Since 1970, ADB has committed loans totalling USD 789.4 mn, grants of USD 6.4 mn, technical assistance worth USD 39.7 mn, and ADB-administered co-financing of USD 35.7 mn for the country.[1]
Energy Imperatives	• Access to electricity in Fiji reached 99% in 2018. As of 2019, 100% of population has access to electricity.[14] • As of 2019, per capita electricity consumption for the country was 1.12 MWh which is almost a third of the global level.[15] • As of 2020, cumulative solar off-Grid Capacity for the country was 4.56 MW that grew from 4.41 MW in 2019.[16] • The regulated domestic tariff set by the Commerce Commission is 34.01 cents/kWh.[17]

France

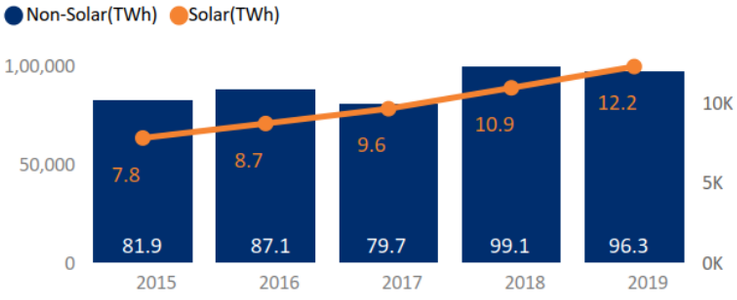
Europe

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in GW (2020)	Off-Grid Solar Capacity in MW (2019)
440.3	11.7	65.5
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
3.4	5.0	76.8

Cumulative Solar Installed Capacity (MW)

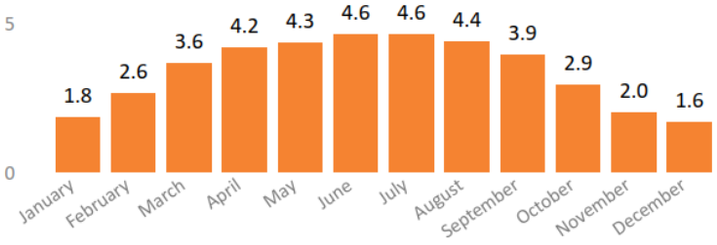


Renewable Energy Generation by Source

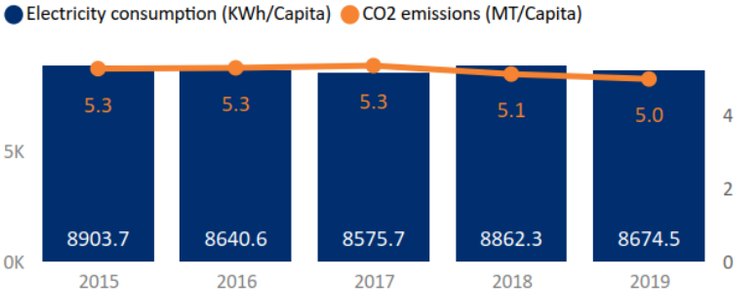


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



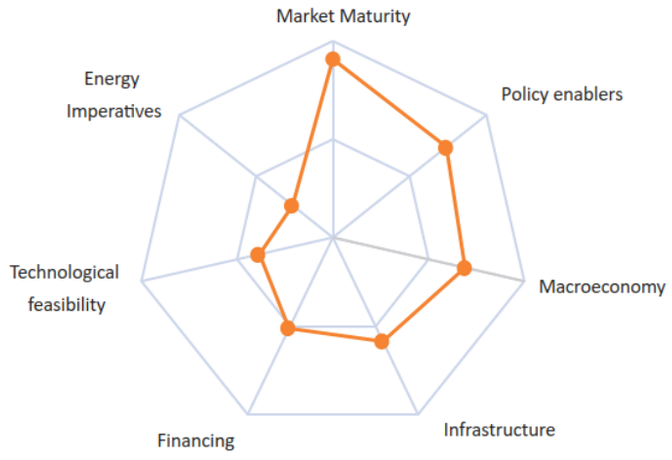
CO2 Emissions & Electricity Consumption



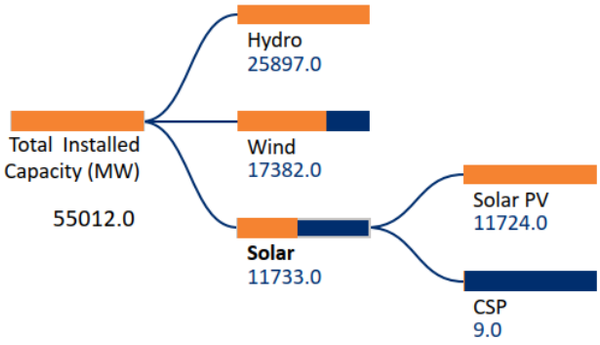
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers

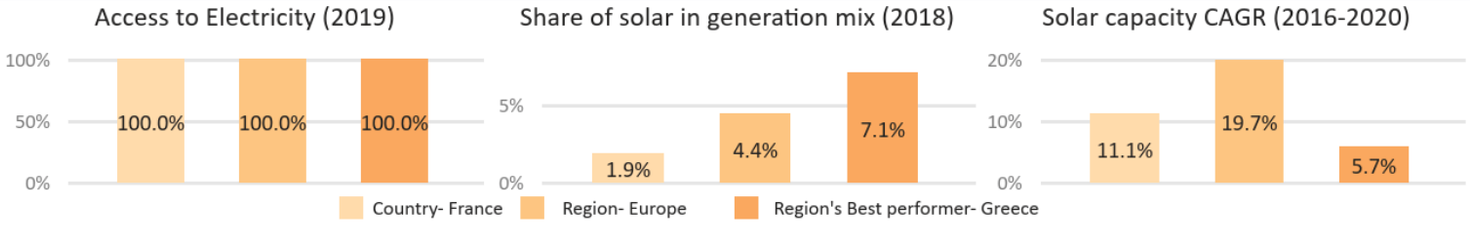


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Policy enablers

Areas of Improvement → Energy Imperatives, Technological feasibility

Key Insights

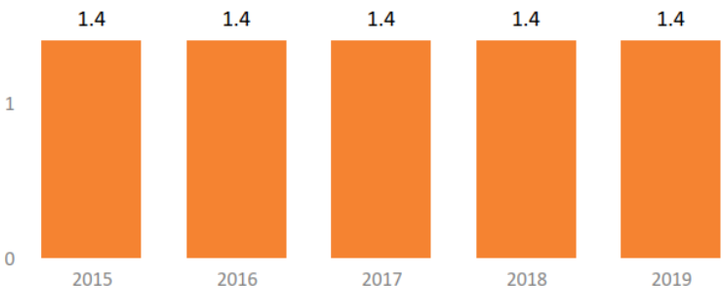
Drivers	Insights
Macro-economy	• GDP (Real) grew at an annual rate of 1.5% in 2019 and declined by 8.2% in 2020 due to pandemic impacts.[2] • France is among the leading industrial economies in the automotive, aerospace, railways sectors and power generation.[1] • Annual HICP inflation is expected to reach 1.6% in 2021, mainly due to the rise in energy and oil prices.[4]
Technological Feasibility	• France receives an average of 1840 hours of sunlight per year. It is sunny 42% of daylight hours while 58% of daylight hours are likely cloudy or with shade, haze or low sun intensity.[8] • France receives relatively high levels of solar irradiation of 3.48 kWh/m^2/day and specific yield of 3.39 kWh/ kWp, a high technical feasibility is envisaged for solar projects in Country.[9] • In 2020, Paris stipulated that only battery-electric and fuel cell vehicles will be permitted in its low emission zones by 2030.[10]
Policy enablers	• France legislated a net zero emissions target for 2050 in its 2019 Energy and Climate Act.[5] • In France, electricity from renewable sources is promoted through a feed-in tariff, a premium tariff as well as through tenders for the definition of the premium tariff level.[6] • FDI flows to France fell by 47% in 2020, from USD 34 bn recorded in 2019 to USD 21 bn due to covid19 crisis.[7]
Market Maturity	• CRE, the French Energy Regulatory Commission aims to ensure that the electricity and gas markets in France functions in line with energy policy objectives.[11] • RTE is France's transmission operator in charge of an impressive infrastructure of high and ultra-high-voltage lines spanning the whole country.[12] • The distribution system operators include Enedis (EDF subsidiary) that operates 95% of the territory of France with local distribution companies overseeing the remaining 5%.[13] • In France, EPEX SPOT operates as an electricity exchange market. The Company provides market spot to buy, sell, and trade electricity, secure transactions, and auctioning services.[14]
Infrastructure	• As of December 2019, France's transmission network comprised about 106,008 ckm of line length at the 45 kV and above voltage levels.[15] • France transmission network is interconnected with 6 European countries: Great Britain, Belgium, Germany, Italy, Spain and Switzerland.[16]
Financing	• As of 2019, the use of green bonds is rising across Europe with notable increases in France (up 113% to USD 30.1 billion).[10] • France is the leading beneficiary of EIB climate finance which has resulted in overall investment of almost €4.3 Bn for energy efficiency, renewable energies, and climate change mitigation.[18] • Financial partnership between the EIB, BPCE Energéco and the Banques Populaires and Caisse d'Epargne networks (€250 Mn) has been forged to support small renewable energy projects in France.[18]
Energy Imperatives	• As of 2019, Electricity Consumption per capita is 8674.5 kWh growing from 8575.7 kWh in 2017, which is more than double of the global average.[19] • As of 2020, cumulative solar PV Capacity for the country was 11724.45 MW growing from 8610.4 MW in 2017.[20] • Since 1990, 100% of the population in France had access to electricity.[21] • As of 2020, cumulative solar off-Grid Capacity for the country was 65.51 MW growing from 52.14 MW in 2018.[22]

Gabon

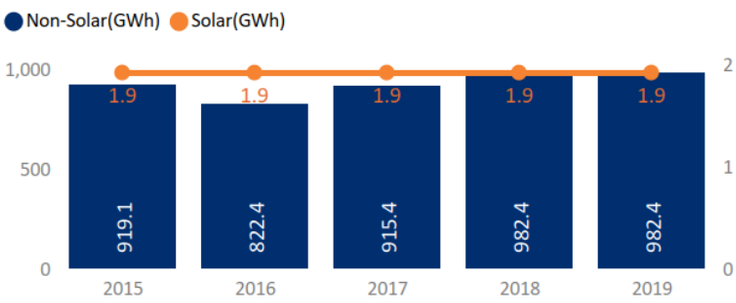
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
2,474.0	1.4	1.4
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
3.6	2.2	45.0

Cumulative Solar Installed Capacity (MW)

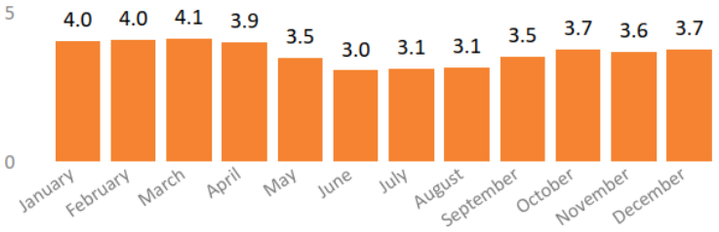


Renewable Energy Generation by Source

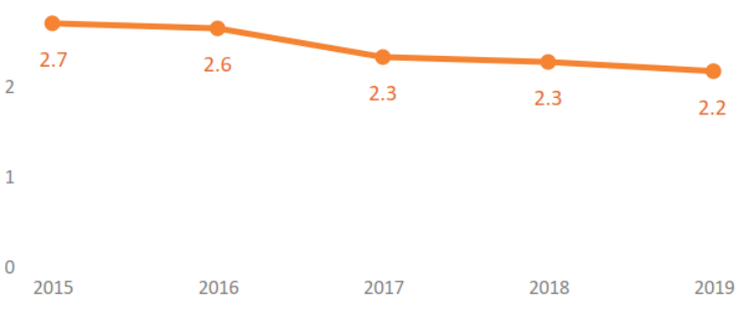


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



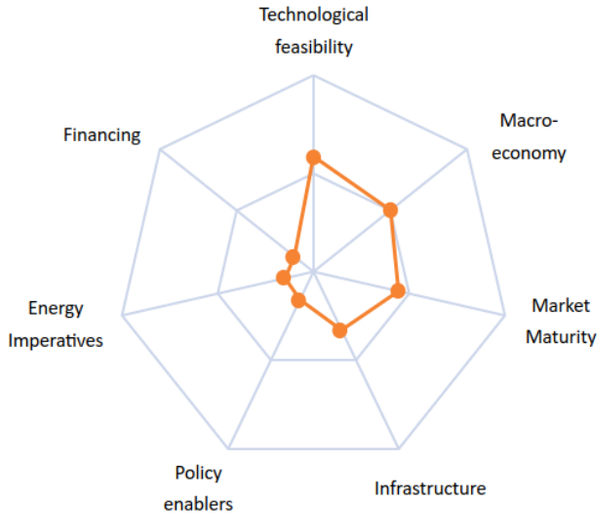
CO2 Emissions (Metric Tonnes/Capita)



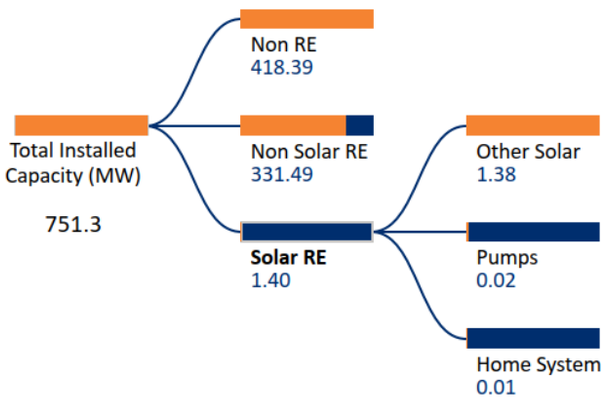
Ease of Doing Solar Classification

Potential

Performance against 7 drivers



Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
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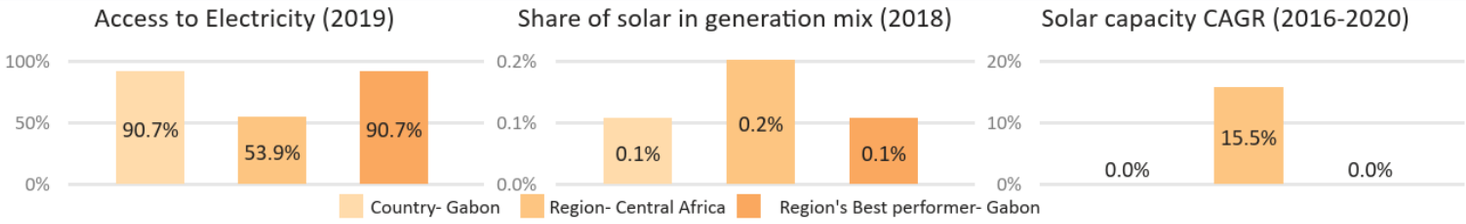
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Energy Imperatives

Key Insights

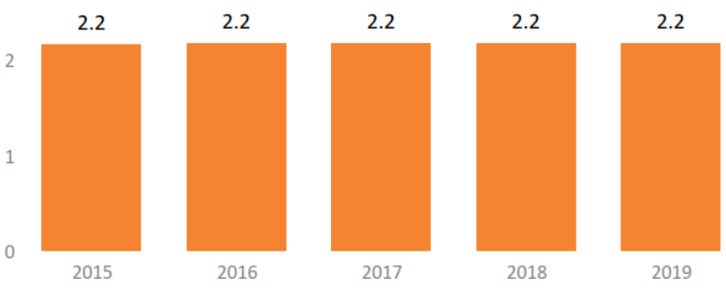
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, Gabon's GDP (Real) declined by 1.8% in 2020.[1] • The inflation rate (CPI) of Gabon has stabilized in 2020 reaching 1.3% in 2020 from 2.0% in 2019.[1] • As of 2020, the services sector was the major contributor to the GDP with 57.6% share followed by industrial and agricultural sector with 33.5% and 8.9% share respectively.[6] • As of 2020, the exports of fuel & mining products dominated the total exports with a share of 80.8% followed by agricultural and manufacturing products with 5.4% and 3.9% share respectively.[6]
Policy enablers	• Gabon's Energy Policy aims to reduce its dependence on fossil fuels, for electricity generation, by promoting renewable energy in the country.[11] • The Access to Basic Services in Rural Areas and Capacity Building Project aims to expand electricity access in the remote areas of the country through development of power infrastructure along with installation of mini grids and solar home systems.[14]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 4.54 kWh/m²/day and specific yield 3.60 kWh/kWp, a strong technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• As of 2019, 91% of the popula on in the country had access to electricity.[3] • Gabon is blessed with high solar irradiation index, however in 2019, solar PV accounted for a mere of 0.15% share in genera on mix.[4] • The Power sector in the country is regulated by the Water and Energy Sector Regulatory Agency). • The generation, transmission and distribution sectors are wholly controlled by The Société d'Electricité et d'Eaux du Gabon (SEEG).[7]
Infrastructure	• Country's utility SEEG has announced plans to invest EUR 2.3 Mn for upgradation of existing power infrastructure and development of new transmission and distribu on network.[10] • To meet the rising power demand, the Government with support from AfDB has been developing two hydro power plants with 73 MW and 15 MW capacity in the country.[12] • Gabon is a member country of the Central African Power Pool (CAPP) making its grid interconnected with the neighbours and thus improving reliability of the power supply.[13]
Financing	• In July 2021, the African Development Bank sanctioned EUR 39 Mn loan for the development of hydroelectric power to help Gabon reach 100% clean energy target.[8] • The World Bank is financing nine development energy projects across the nation, representing a net commitment of USD 626.7 Mn in 2019.[9]
Energy Imperatives	• Per capita consump on of 1.0 MWh is rela vely low as compared to the global average of 3.35 MWh in 2019.[5] • During 2013 to 2019, the total generation from solar PV in the country remained constant at 2.0 GWh each year.[4] • In 2019, gas based thermal power plants dominated the generation mix with 53.5% share in the generation mix followed by hydro plants with 40.0% share.[4] • In the last decade, the total power demand in the country has risen at a CAGR of 3.6% reaching 2,563 GWh in 2019 from 1,864 GWh in 2010.[4]

Gambia

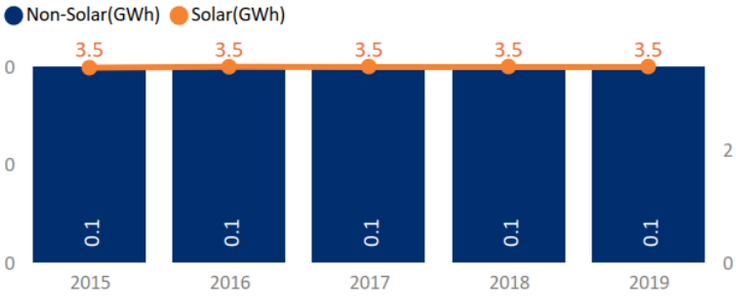
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
239.4	2.2	2.0
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.6	0.2	50.3

Cumulative Solar Installed Capacity (MW)

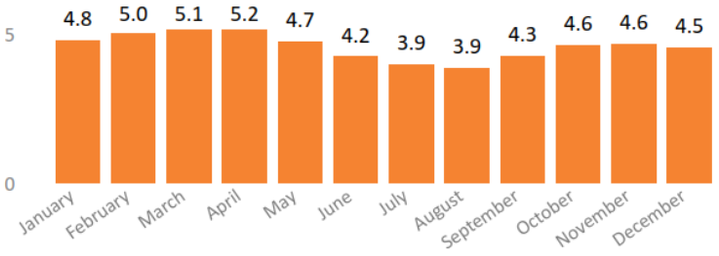


Renewable Energy Generation by Source

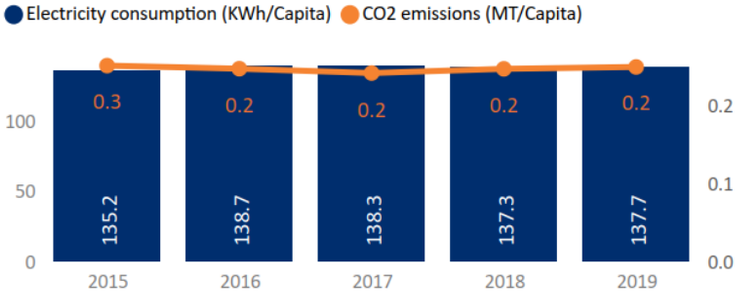


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



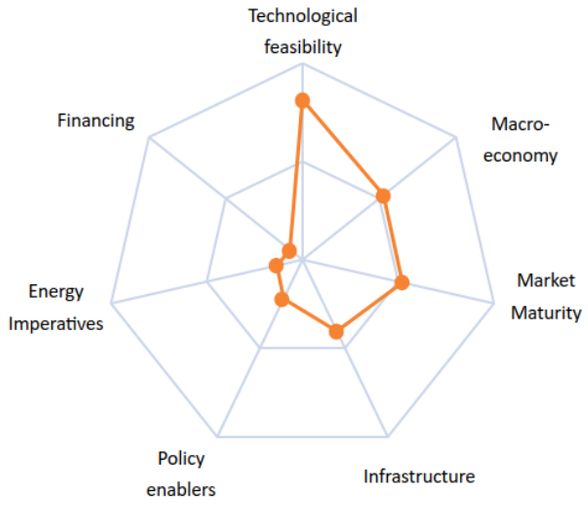
CO2 Emissions & Electricity Consumption



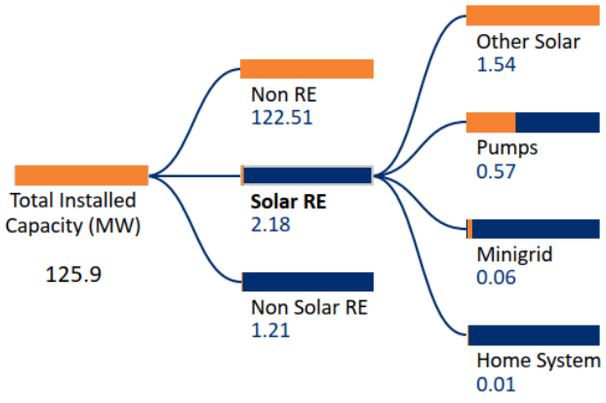
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers



Installed Generation Capacity by Source



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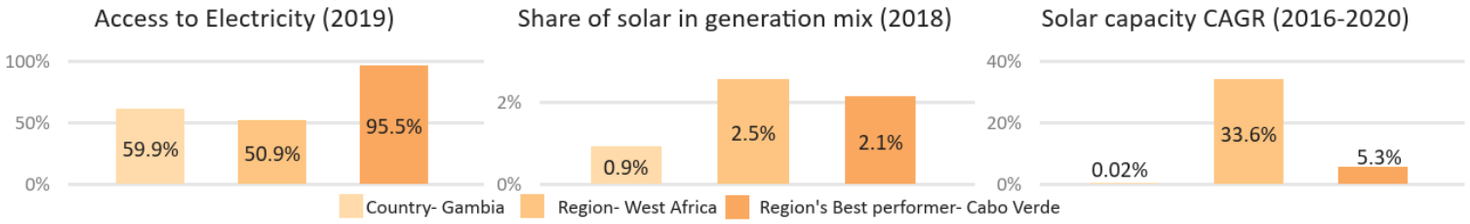
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Energy Imperatives

Key Insights

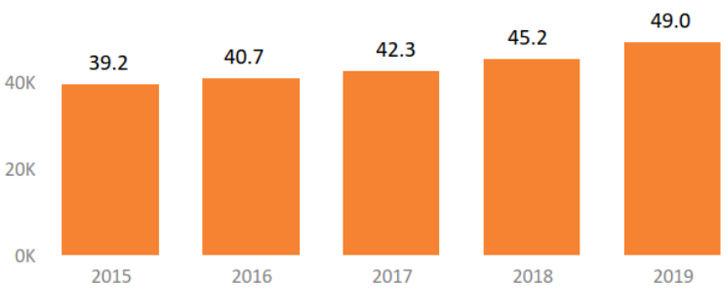
Drivers	Insights
Macro-economy	• Gambia has a mixed economic system with a heavy reliance on agriculture, combined with relatively weak centralized economic planning and government regulation. [1] • GDP (Real) has grown at an annual rate of 6.1% in 2019 and by 6% in 2021. [2] • In 2019, agriculture contributed 21.8% to the GDP, 15.8% came from the industry and 54.5% from the service sector. [3]
Policy enablers	• Gambia has set an ambitious climate goals, defined in NDC to the Paris Agreement, of achieving 60 MW solar capacity by 2025. [5] • Gambia has set a high target of having 48% renewable electricity in the overall generation mix by 2030.[6] • Public Utilities Regulatory Authority (PURA) certifies eligible renewable plant that can receive the FITs based on eligible renewable technology.[7]
Technological Feasibility	• Gambia receives an average of 2630 hours of sunlight per year.[9] • Gambia receives relatively very high levels of solar irradiation of 5.75 kWh/m²/day and specific yield of 4.57 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Country.[10] • Gambia relies heavily on imported fossil fuel for electricity generation mainly HFO for the main power plants and diesel for the provincial power stations.[11] • In 2017, Gambia's National Water and Electricity Company (NAWEC) issued a tender to conduct feasibility studies to assess the country's potential for solar and hybridized PV projects in mini grids.[12]
Market Maturity	• Ministry of Petroleum and Energy (MOPE) facilitate the development and implementation of national RE strategies and plans and improve the utilisation of RE technologies.[13] • The Public Utilities Regulatory Authority (PURA) is Gambia's independent multi-sector regulator established by the Parliament to regulate the Electricity sector.[14] • National Water and Electricity Co. Ltd (NAWEC) established as a Public Limited liability Company is engaged in the generation and provision of electricity.[15] • Gambia is the member of the West African Power Pool (WAPP), which aims to integrate the national power systems into a unified regional electricity market.[16]
Infrastructure	• Electricity is transmitted for distribution through five radial 11 kV feeders and three 33 kV feeders.[17] • Gambia has a plan to increase its solar capacity by 170 MW by 2025, with partial finance from the WB and the EIB.[20]
Financing	• In 2021, World Bank approved 'The new Regional Electricity Access and Battery-Energy Storage Technologies' (BEST) Project for $465 Mn to strengthen the WAPP's network operation with battery-energy storage technologies infrastructure.[21] • AFDB-managed Sustainable Energy Fund for Africa (SEFA) approved a USD 995,000-grant to The Gambia to implement a programme to facilitate private investments in Green Mini-Grids (GMG).[22]
Energy Imperatives	• As of 2019, Electricity Consumption per capita was 137.75 kWh which was 137.32 kWh in 2018, substantially lower than the global average.[23] • As of 2020, cumulative solar PV Capacity for the country stood at 2.18 MW growing marginally from 2.17 MW in 2015.[24] • 60% of the population in Gambia had access to electricity as of 2019.[25] • As of 2020, cumulative solar off-Grid Capacity for the country was 2.002 MW marginally growing from 2 MW in 2016.[26]

Germany

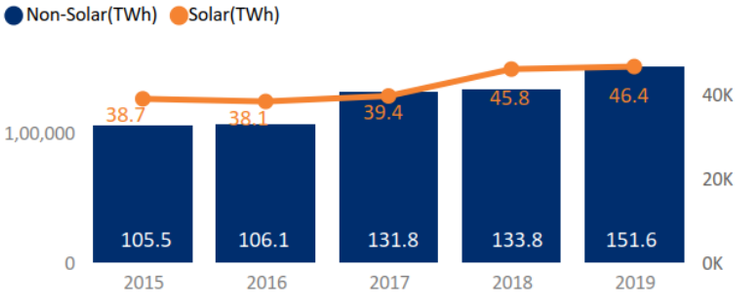
Europe

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in GW (2020)	Off-Grid Solar Capacity in MW (2019)
512.9	53.8	NA
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
3.0	8.4	79.7

Cumulative Solar Installed Capacity (GW)

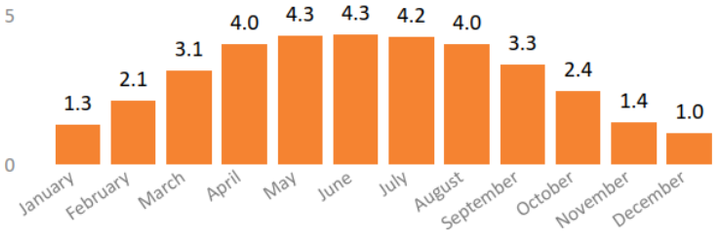


Renewable Energy Generation by Source

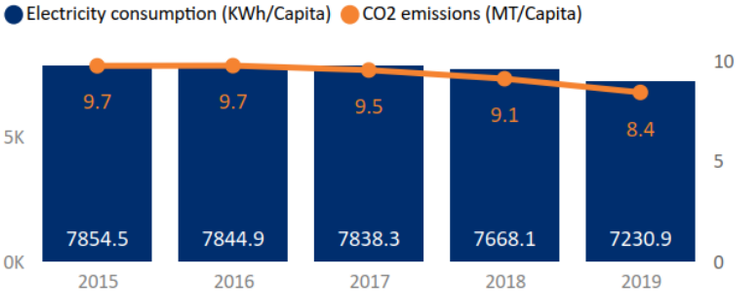


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



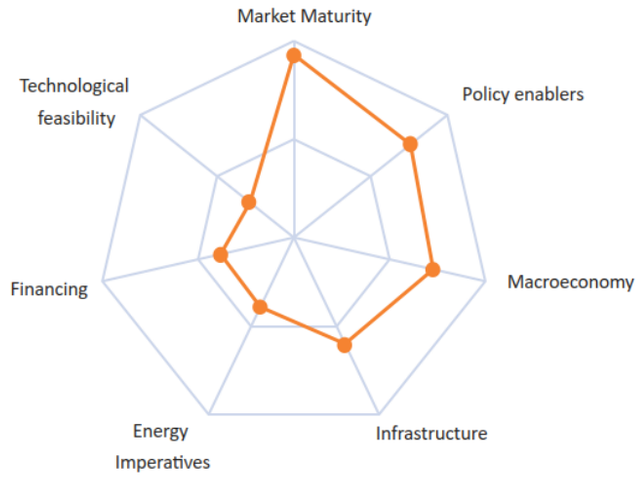
CO2 Emissions & Electricity Consumption



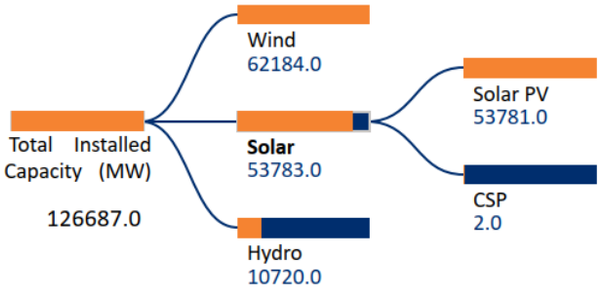
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers

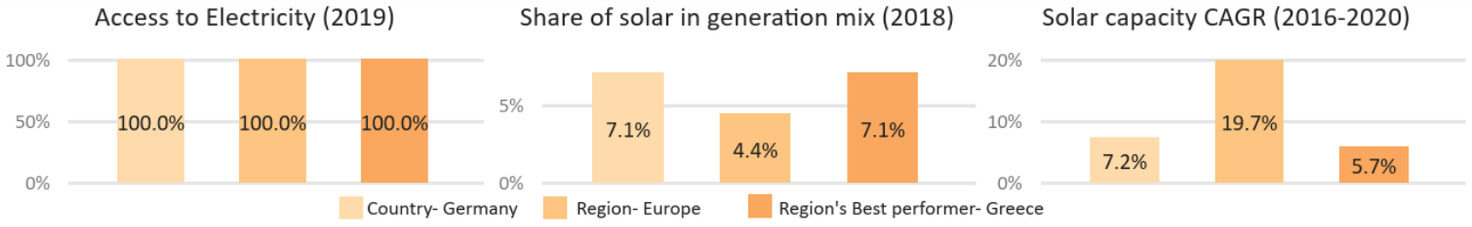


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Market Maturity; Policy enablers

Areas of Improvement → Technological feasibility; Financing

Key Insights

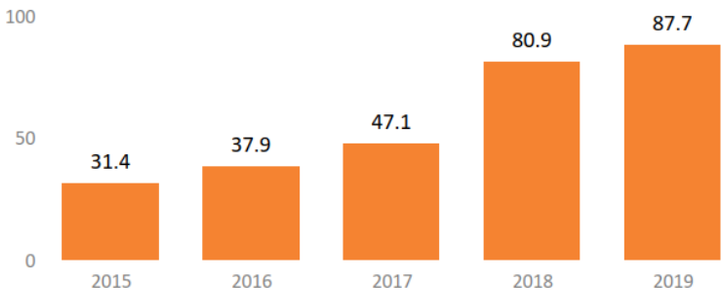
Drivers	Insights
Macro-economy	• GDP (Real) has grown at an annual rate of 0.6% in 2019 and declined by 4.9% in 2020 due to pandemic impacts.[1] • The German agricultural sector contributes 0.7% to the GDP, industrial sector amounts to 26.2% and service sector contributes to 63.6% in 2020.[2] • Rise in HICP Inflation is due to the rising energy prices, spurred by the phasing-in of carbon pricing in the country.[3]
Policy enablers	• The 2021 Renewable Energy Sources Act creates a legal framework necessary for Germany to be able to achieve its climate and energy targets for 2030 and 2050.[4] • The German government has set ambitious targets for increasing the share of renewables in electricity to at least 65% by 2030.[5] • Germany has adopted a carbon tax for emissions in non-ETS sectors (i.e. buildings and transport) starting with a fixed price of EUR 25/tonne in 2021 and raising it further to EUR 55 in 2025.[5]
Technological Feasibility	• Germany receives relatively moderate levels of solar irradiation of 2.98 kWh/m^2/day and specific yield of 2.95 kWh/kWp, a moderate to low technical feasibility is envisaged for solar projects in Country.[7] • Germany remains substantially dependent on fossil fuels and oil was still the most dominant source of energy providing almost one-third of total primary energy supply (TPES) as of 2018.[5] • Germany expects to have 14 Mn electric and plug-in hybrid vehicles on its roads by 2030.[8]
Market Maturity	• Since 1990, 100% of the population in Germany had access to electricity.[9] • The Federal Network Agency is an independent federal authority responsible for regulation of the gas and electricity networks in Germany.[10] • Four TSOs in Germany are TenneT, 50Hertz Transmission, Amprion and TransnetBW maintain the secure operations of the transmission infrastructure.[11] • In Germany, EPEX SPOT operates as an electricity exchange market. The Company provides market spot to buy, sell, and trade electricity, secure transactions, and auctioning services.[12]
Infrastructure	• The total length of the German transmission grid is around 37,000 kms. In the case of AC transmission, electricity is transmitted art a voltage level of 220 kV or 380 kV.[13] • Electricity is physically exchanged with nine direct neighbouring countries – Denmark, the Netherlands, Luxembourg, France, Switzerland, Austria, the Czech Republic, Poland, and Sweden (via a submarine cable).[14] • Germany's HDI value for 2019 is 0.947 placing the country in the very high human development category.[15]
Financing	• The EIB Group provides funding for innovative charging and energy management systems for EVs. In 2020, the EIB Group provided a total of €1.7 Bn in Germany for projects directly targeting climate action.[16] • The EIB and The Mobility House, a leading technology company and solution provider for charging services, have signed a €15 Mn financing agreement to promote the integration of EVs into the energy markets.[17]
Energy Imperatives	• As of 2020, cumulative solar PV Capacity for the country is 53,781 MW growing from 49,045 MW in 2019.[18] • EnBW is constructing Germany's Largest Solar Park "Weesow-Willmersdorf", with an installed output of 187 MW, expects to power 50,000 Households.[19] • In 2018, residential customers with an annual electricity consumption of between 2,500 kWh and 5,000 kWh paid a total average electricity price of 29.88 cents/kWh.[20]

Ghana

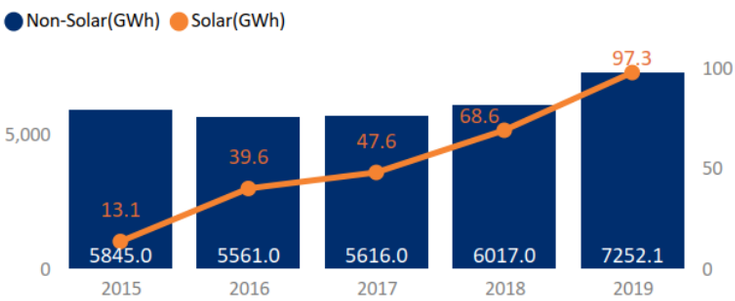
Africa

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
13.2	94.2	8.0
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.0	0.5	60.0

Cumulative Solar Installed Capacity (MW)

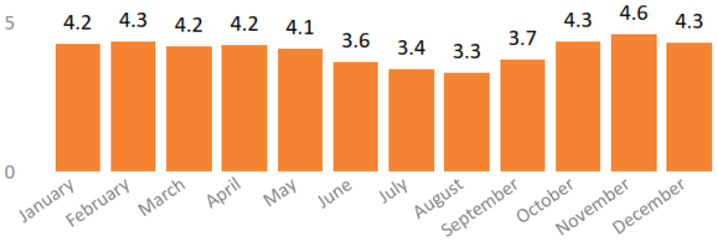


Renewable Energy Generation by Source

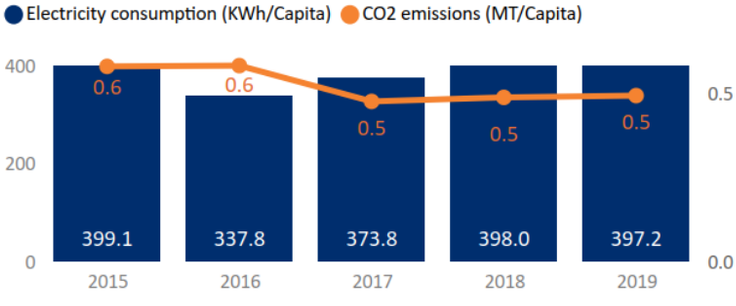


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



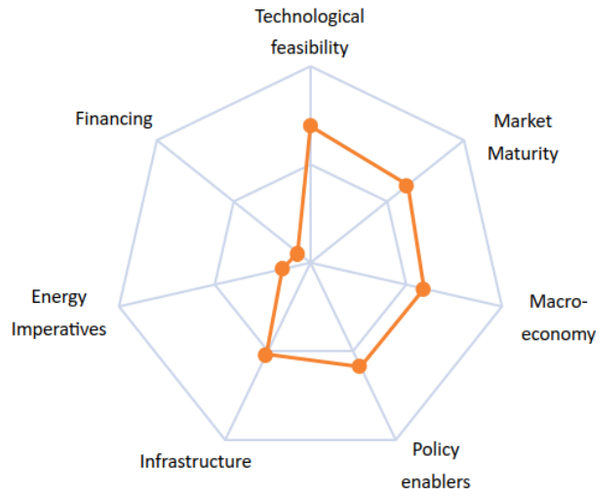
CO2 Emissions & Electricity Consumption



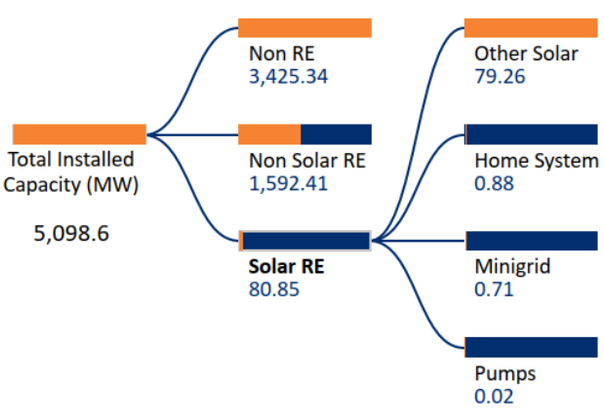
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

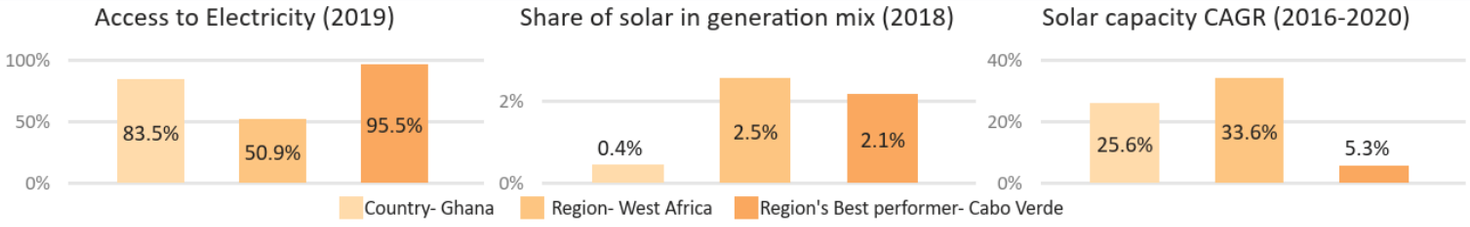


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Market Maturity

Areas of Improvement → Financing, Energy Imperatives

Key Insights

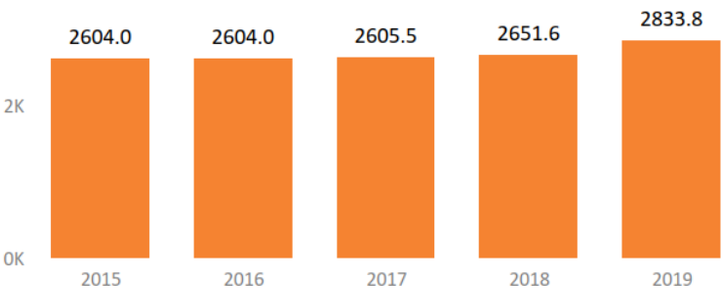
Drivers	Insights
Macro-economy	• Ghana is a middle-income status country and has one of the highest GDP per capita in Africa.[1] • Real GDP growth decelerated from 6.5% in 2019 to 1.7% in 2020 due to the degrowth in oil prices and weakened global economic activity.[2] • In 2020, agriculture contributed 18.24% to the GDP while 34.69% came from the industry and 42.63% from the service sector.[3]
Policy enablers	• The Ministry of Energy is responsible for energy policy formulation and coordination of activities of Energy Sector Agencies.[5] • The 2010 Ghana National Energy Policy encompasses that renewable energy development shall mainly focus on the vast mini hydro potential available in the country.[6] • The Government of Ghana enacted the Renewable Energy Act, 2011 to provide an enabling environment and foster the development of renewable resources in the country.[7] • Ghana Public Utilities Regulatory Commission established feed-in tariff rates for electricity generated from renewable energy sources.[8]
Technological Feasibility	• Ghana receives an average of 2377 hours of sunlight per year. It is sunny 54.2% of daylight hours while 45.8% of daylight hours are likely cloudy or with shade, haze, or low sun intensity.[9] • Ghana receives relatively very high levels of solar irradiation of 5.1 kWh/m²/day and specific yield of 4.02 kWh/ kWp, a very high technical feasibility is envisaged for solar projects in Country.[10] • In 2019, share of electricity production from renewables in the overall mix stood at 50.19% in Ghana.[12]
Market Maturity	• Ghana Grid company (GRIDCo) undertakes transmission of electricity from generating companies to bulk customers, which include the Electricity Company of Ghana (ECG), Northern Electricity Distribution Company (NEDCo) and the Mines.[13] • The Public Utilities Regulatory Commission (PURC) is a multi-sector regulator to regulate the provision of electricity and water utility services in Ghana.[15] • Ghana is the member of the West African Power Pool (WAPP), which aims to integrate the national power systems into a unified regional electricity market.[16]
Infrastructure	• GRIDCo's transmission system comprises approximately 4,000 ckm of lines and 38 primary substations, 75 km of 225 kV lines and 100 km of 69 kV line extensions in the Volta Region of Ghana.[17] • NEDCo's distribution network consists of 5,488 km of medium voltage lines and 7,832 km of low voltage (415V) lines connecting 24 Bulk Supply Points.[18] • A 161 kV double circuit line and a single circuit 225 kV transmission line provides interconnection to Togo and Benin in the East and Cote d'Ivoire to the West.[17]
Financing	• The African Development Bank has approved a USD 1.5 Mn grant from its Sustainable Energy Fund for Africa (SEFA) to assist Ghana's s renewable energy investment drive.[20] • The Government of Ghana has received financing from the African Development Bank in the form of a loan to cover the cost of Electricity Distribution System Reinforcement and Extension Project (EDSREP). [21]
Energy Imperatives	• As of 2019, Electricity Consumption per capita stood at 397.16 kWh which is significantly low in comparison to the global average.[22] • As of 2020, cumulative solar PV capacity for the country stood at 94.22 MW growing from 87.68 MW in 2019.[23] • 83.5% of the population in Ghana had access to electricity as of 2019.[24] • As of 2020, cumulative solar off-Grid Capacity for the country was 32.38 MW growing from 25.56 MW in 2018.[25]

Greece

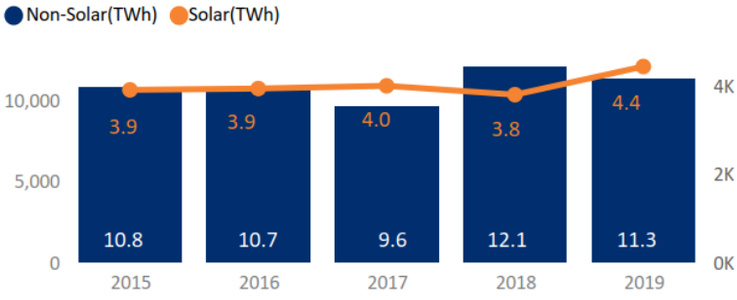
Europe

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in GW (2020)	Off-Grid Solar Capacity in MW (2019)
49.5	3.2	NA
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.1	6.4	68.4

Cumulative Solar Installed Capacity (MW)

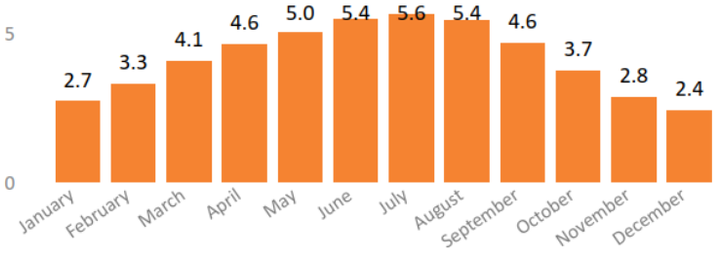


Renewable Energy Generation by Source

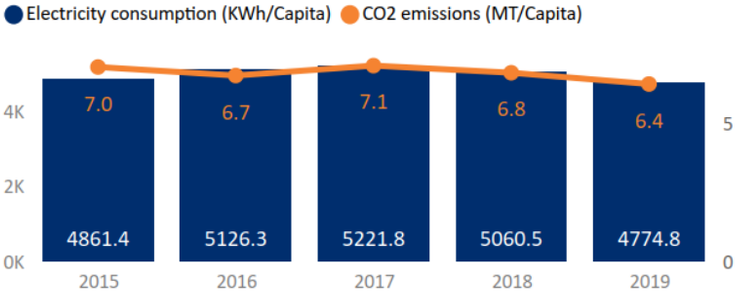


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



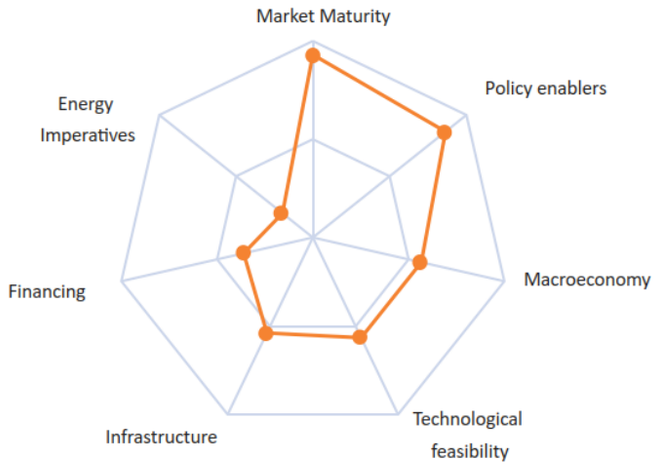
CO2 Emissions & Electricity Consumption



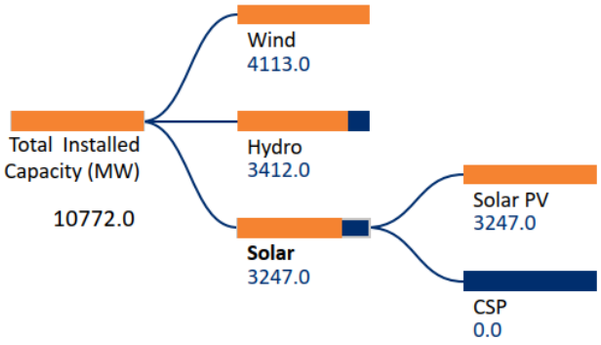
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers

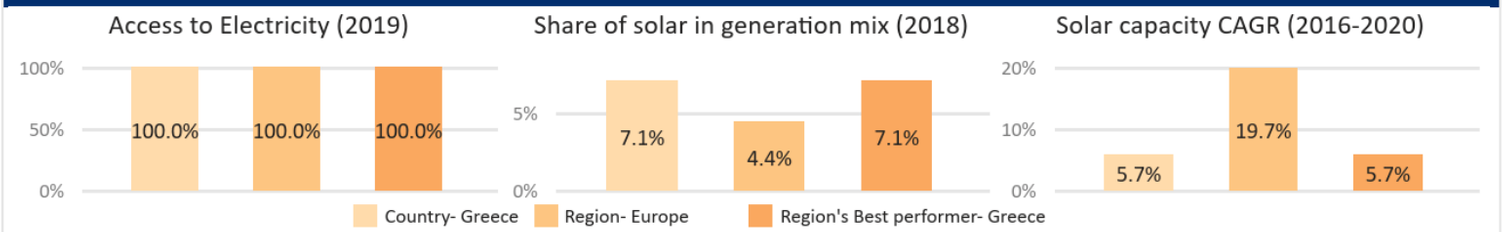


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Policy enablers

Areas of Improvement → Energy Imperatives, Financing

Key Insights

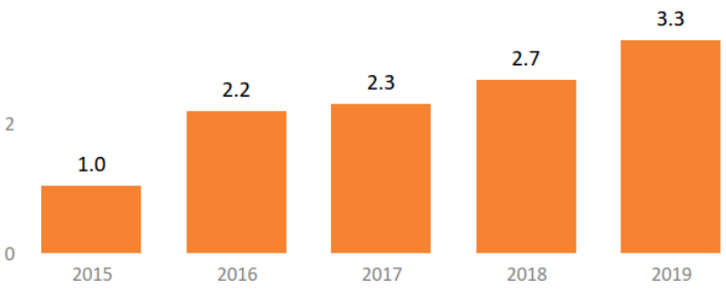
Drivers	Insights
Macro-economy	• GDP (Real) has grown at an annual rate of 1.9% in 2019 but declined by 8.2% in 2020 owing to pandemic impact.[1] • In 2020, agriculture contributed 4.1% to the GDP, 13.9% came from the industry and 69.8% from the service sector.[2] • Tourism, the public sector, and shipping dominate within the service sector. The public sector accounts for 40% of the GDP.[3]
Policy enablers	• The Ministry of Environment and Energy is responsible for environment, energy, and climate change policy within the government.[3] • Greece aims to meet 61% of its total electricity consumption from renewable sources (wind and solar PV) by 2030.[5] • Greece has set targets to reduce GHG emissions by more than 56% by 2030 compared to 2005 levels and to have a climate neutral economy by 2050.[6]
Technological Feasibility	• Greece receives an average of 2756 hours of sunlight per year. It is sunny 62.9% of daylight hours and 37.1% of daylight hours are likely cloudy or with shade, haze, or low sun intensity.[8] • Greece receives relatively very high levels of solar irradiation of 4.45 kWh/m^2/day and specific yield of 4.11 kWh/kWp, a very high technical feasibility is envisaged for solar projects in Country.[9] • Greece has a target to have at least 30% share of passenger electric light-duty vehicles (LDV) by 2030.[3]
Market Maturity	• The Centre for Renewable Energy Sources and Saving (CRES) is the Greek national entity for the promotion of renewable energy sources for promoting rational use of energy and energy conservation.[10] • The Regulatory Authority for Energy (RAE) is an independent regulatory authority empowered to monitor the operation of all sectors of the energy market.[11] • The Independent Power Transmission Operator S.A. (IPTO) performs the operation, control, maintenance, and development of the Hellenic Electricity Transmission System.[12]
Infrastructure	• In 2019, the Hellenic Electricity Transmission System included 11,972 kms of transmission lines with a total installed capacity of 17,799 MVA.[14] • The HEDNO has 112.622 km of Medium Voltage Network and 127.564 km of Low Voltage Network as of 2019.[15] • EIB to upgrade and expand 14,200 km of the national electricity distribution network and increase use of RE in the next few years in the country.[16]
Financing	• European Bank for Reconstruction and Development (EBRD) boosting renewables in Greece with €75 Mn investment in HELPE's bond issuance. The total funds of €100 million raised will enable HELPE to finance the construction of 18 solar photovoltaic (PV) plants with a total installed capacity of 204 MW.[18] • New investment to upgrade thousands of kms of power distribution lines and increase use of smart meters essential for future expansion of RE in Greece will be supported by EUR 330 Mn of new financing from the EIB.[16]
Energy Imperatives	• As of 2019, Electricity Consumption per capita was 4774.81 kWh much higher than the global average.[19] • As of 2020, cumulative solar PV Capacity for the country stood at 3,247 MW growing from 2833 MW in 2019.[20] • Since 1990, 100% of the population in Greece had access to electricity.[21]

Grenada

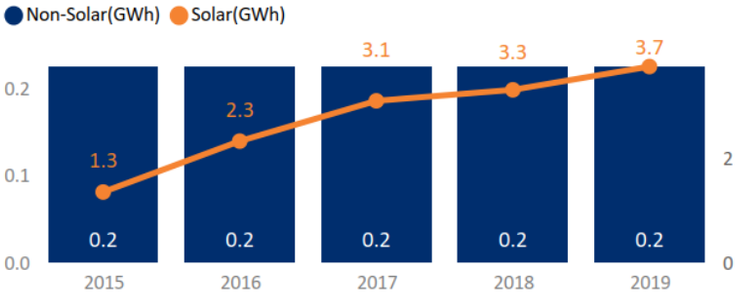
Latin America & Caribbean

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
208.0	3.3	NA
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.4	2.6	53.4

Cumulative Solar Installed Capacity (MW)

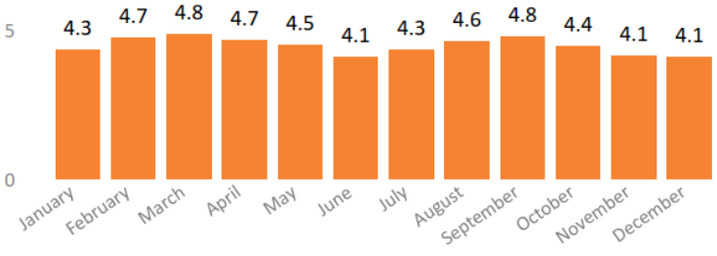


Renewable Energy Generation by Source

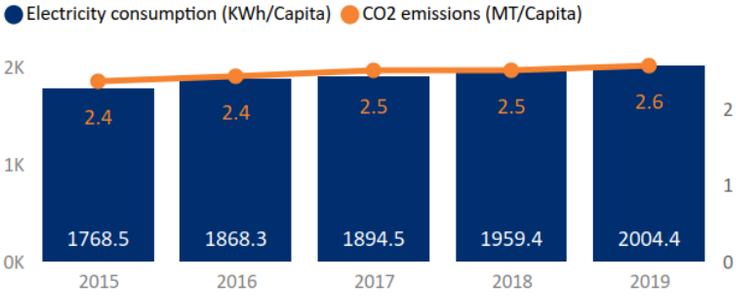


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



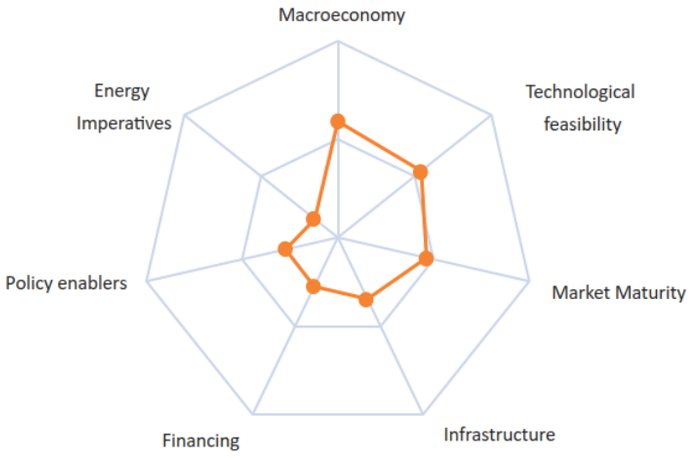
CO2 Emissions & Electricity Consumption



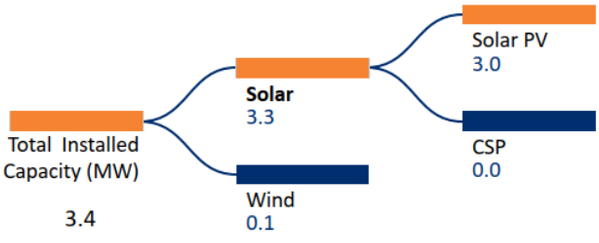
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers

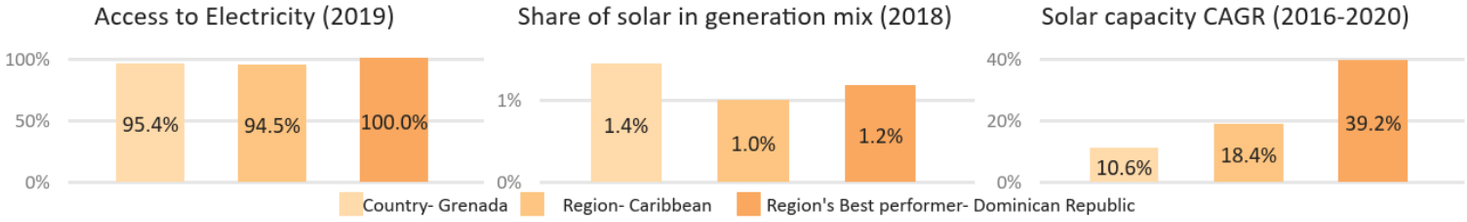


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Macroeconomy, Technological feasibility

Areas of Improvement → Energy Imperatives, Policy enablers

Key Insights

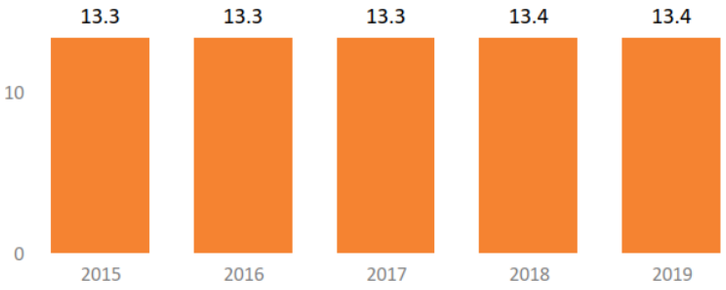
Drivers	Insights
Macro-economy	• Grenada, a Small Island Developing State (SIDS), is an upper-middle-income economy[2] with a GDP per capita (PPP) at USD 15,385 in 2021.[1] • The GDP (Real) growth is expected to recover from -13.5% in 2020 to -1.5% in 2021 as the pandemic impact is decreasing.[1] • The country's economy is mainly based on tourism.[3]
Policy enablers	• 'Department of Energy and Sustainable Development' is the designated authority for the development of renewable in the country.[4] • The 'Grenada Vision 2030' sets a target to establish 100% renewable for both the electricity and transport sectors by 2030.[6] • Exemption of 15% VAT is provided as tax incentive for renewable and energy efficiency projects.[7]
Technological Feasibility	• Owing to rvery high levels of solar irradiation (GHI) of 5.41 kWh/ m^2/ day and specific yield 4.42 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Grenada.[9] • According to NREL, Grenada has a Solar Potential of 25-50 MW.[4] • Grenada has restructured its electricity sector to facilitate renewable deployment.[12]
Market Maturity	• 95% of the popular on in Grenada had access to electricity as of 2019.[11] • Grenada Electricity Services Limited (GRENLEC), a private-public utility, holds control on the generation, transmission, distribution of electricity.[5] • Launched in 2019, the Public Utilities Regulatory Commission (PURC) regulates the electricity sector in the country.[13]
Infrastructure	• Total installed power generation capacity in Grenada was 53 MW in 2019.[10] • With an Average System Availability Index (ASAI) of 99.92% in 2019, power supply in the country is very reliable.[13] • The installed Solar PV capacity in Grenada was 3.27 MW in 2020.[18] • In 2020, Grenada has allowed self-generation for electricity consumers and sell electricity to the national power utility.[14]
Financing	• The Government of Grenada had secured funding of about USD 300,000 to develop off grid solar PV projects under the GEF ESD Caribes Project.[15] • A separate revolving fund was created to provide loans for solar PV under Nationally Appropriate Mitigation Action (NAMA) project.[7] • International Climate Initiative (IKI) is supporting the "Reform of the Electricity Sector to support Climate Policy in Grenada" (G-RESCP) with a funding of Euro 1.39 Mn.[16]
Energy Imperatives	• Per capita electricity consumption of 2 MWh is lower in comparison to the global average of 3.35 MWh as of 2019.8 • Electricity prices in Grenada rank among the highest in the World.[17] • In 2019, GRENLEC sanctioned 9 grid-connected systems amounting to 301.52 kWp and commissioned 18 systems adding 618.91 kWp to the installed capacity.[13]

Guinea

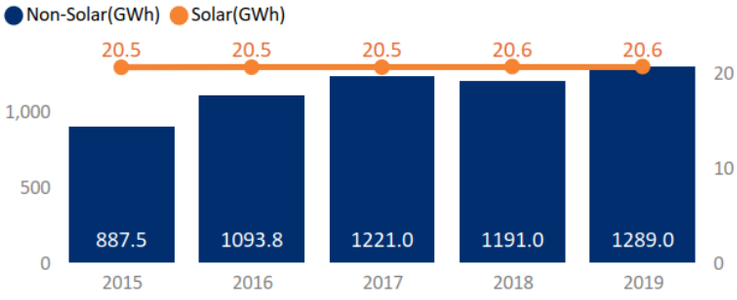
Africa

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
1.6	13.4	13.3
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.4	0.2	49.4

Cumulative Solar Installed Capacity (MW)

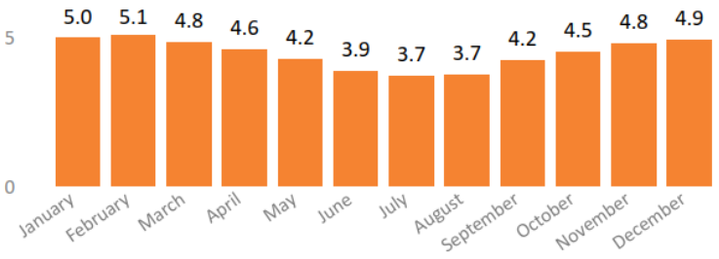


Renewable Energy Generation by Source

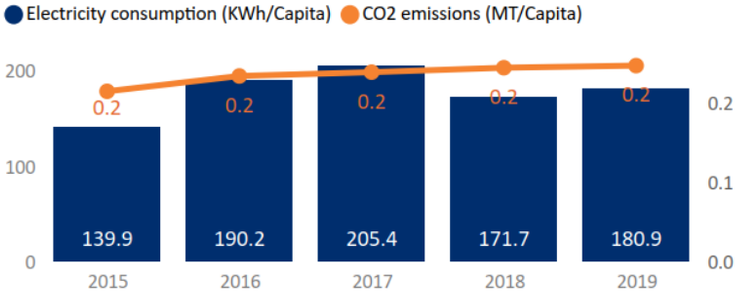


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



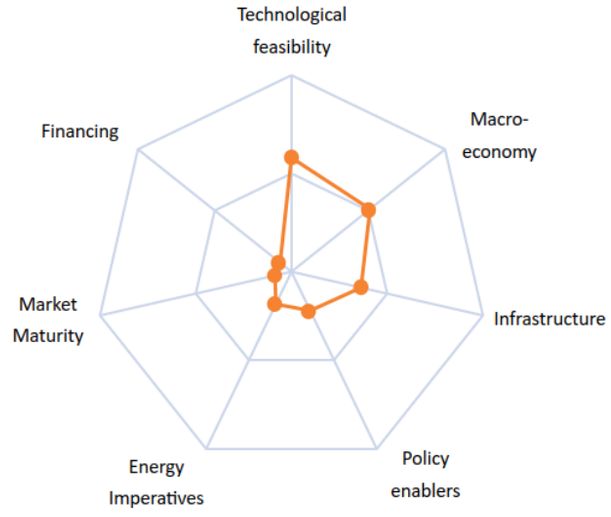
CO2 Emissions & Electricity Consumption



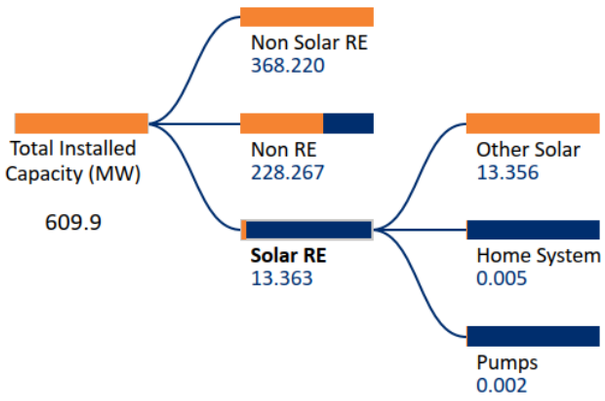
Ease of Doing Solar Classification

Potential

Performance against 7 drivers

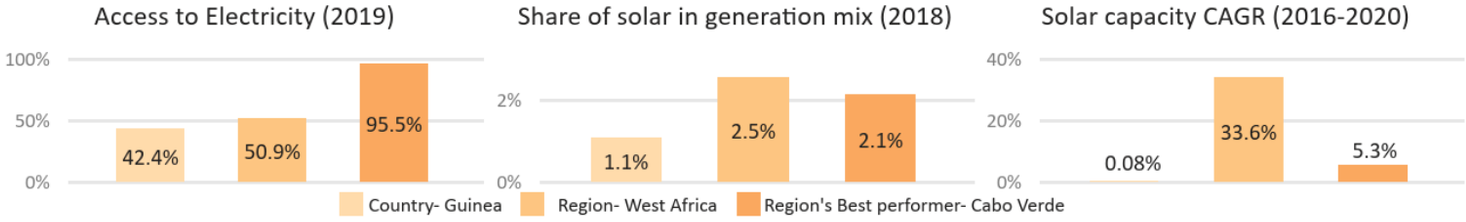


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Market Maturity

Key Insights

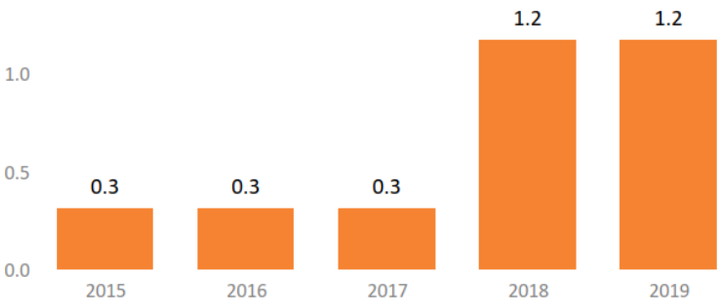
Drivers	Insights
Macro-economy	• Guinea is a low-income status country [1] and its economy is mainly based on the mining sector (26% of GDP, including processing bauxite into alumina) and agriculture (20%).[2] • GDP (Real) has grown at an annual rate of 5.2% in 2020 and by 5.6% in 2021.[3] • In 2020, agriculture contributed 23.67% to the GDP while 32.73% came from the industry and 36.19% from the service sector.[4]
Policy enablers	• The Ministry of Energy and Hydraulics (MEH) supervises energy policies and National Directorate of Energy (DNE)and is responsible for facilitating energy access planning.[6] • The Government of Guinea (GOG) had set a target to increase access to electricity from 18.1% in 2017 to 36% by 2020.[7] • The 2012 National Energy Policy sets an objective to reduce the dependency on fossil fuel and promote renewable energy and energy efficiency programs.[8]
Technological Feasibility	• Guinea receives an average of 1,783 hours of sunlight per year. It is sunny 40.7% of daylight hours while 59.3% of daylight hours are likely cloudy or with shade, haze, or low sun intensity.[9] • Guinea receives very high levels of solar irradiation of 5.57 kWh/m^2/day and specific yield of 4.44 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Country.[10] • In 2019, Share of electricity production from renewables is 30.97% in Guinea.[12]
Market Maturity	• 42.4% of the population in Guinea had access to electricity as of 2019.[13] • The Electricity Corporation of Guinea (EDG) is the sole generator, transmitter, and distributor of electric energy.[11] • Guinea is the member of the West African Power Pool (WAPP), which aims to integrate the national power systems into a unified regional electricity market.[14]
Infrastructure	• Guinea's transmission infrastructure comprises of two separate grid systems: Grid of Greater Conakry (known as RIC) and the central zone grid (known as Tinkisso system).[6] • Conakry's system connects four main cities in Maritime Guinea and four other cities in Middle Guinea with an infrastructure comprising 116 km of 225kV lines, 601 km of 110 kV lines and 82 km of 60 kV lines.[6] • The government's vision included in the master plan is to extend HV lines to reach approximately 1,543 km with a budget of USD 479 Mn budget.[6]
Financing	• In 2019, The World Bank approved USD 50 Mn International Development Association (IDA) financing for the Guinea Electricity Access Scale Up Project to help increase access to electricity in selected areas of the country.[16] • The Green Climate Fund has approved USD 170.9 Mn in financing for AfDB's Leveraging Energy Access Finance Framework (LEAF) program. Guinea is among the six countries where LEAF aims to unlock commercial and local-currency financing for decentralized renewable energy (DRE) projects.[17]
Energy Imperatives	• As of 2019, Electricity Consumption per capita stood at 180.85 kWh growing from 171.74 kWh in 2018.[18] • As of 2020, cumulative solar PV Capacity for the country was 13.363 MW.[19] • The cumulative solar off-Grid Capacity for the country was 13.28 MW in 2020.[20] • Electricity tariffs for households are one of the lowest in West Africa currently between USD 0.01-0.03 per kWh.[6]

Guinea-Bissau

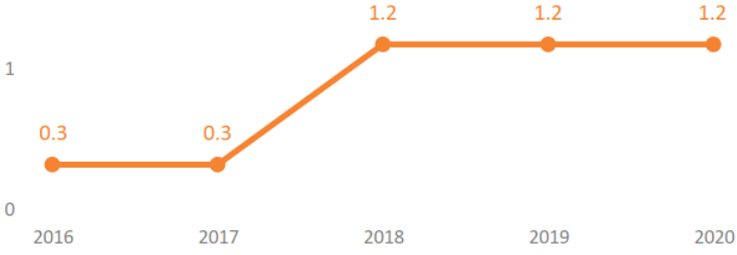
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
86.6	1.2	1.2
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.5	0.2	43.2

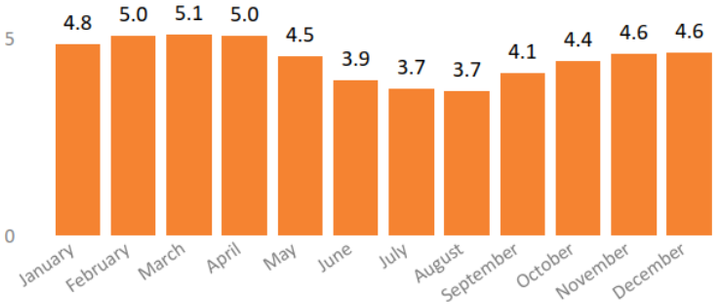
Cumulative Solar Installed Capacity (MW)



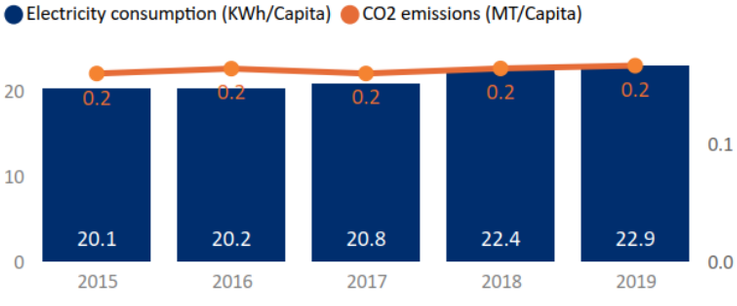
Cumulative Solar Off-grid & On-grid Capacity



Monthly variation in PVout (kWh/kWp/day)



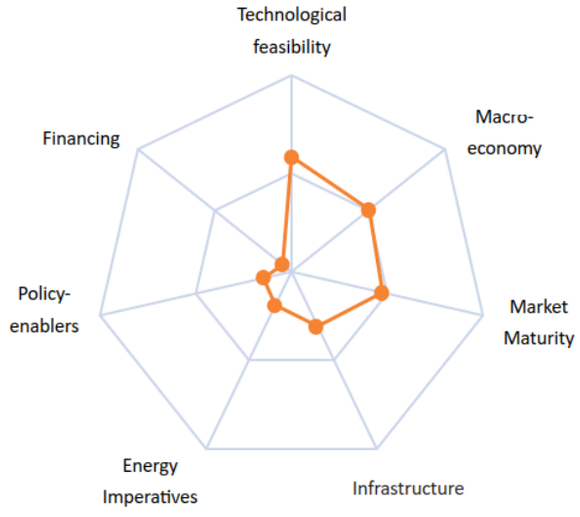
CO2 Emissions & Electricity Consumption



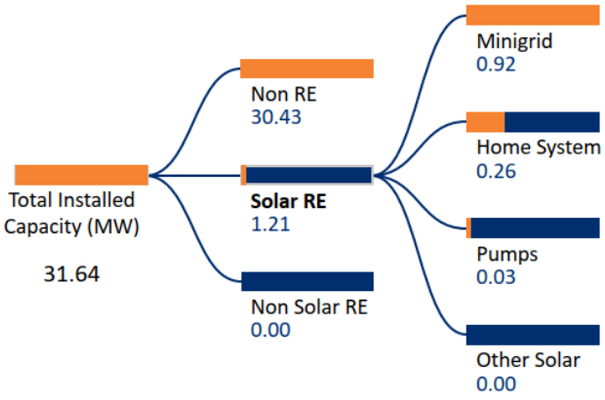
Ease of Doing Solar Classification

Potential

Performance against 7 drivers



Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
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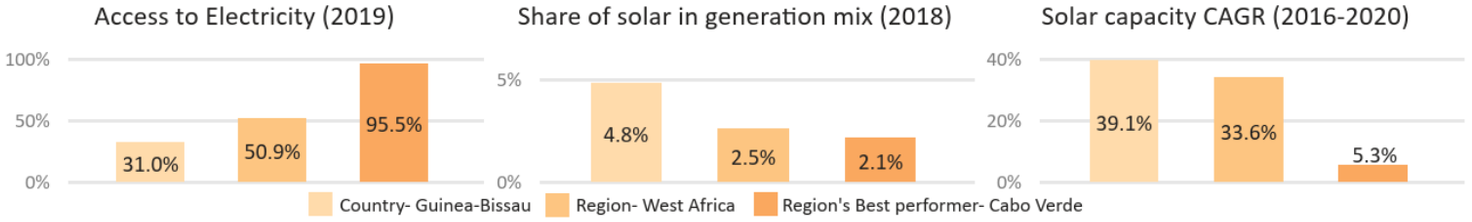
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Policy enablers

Key Insights

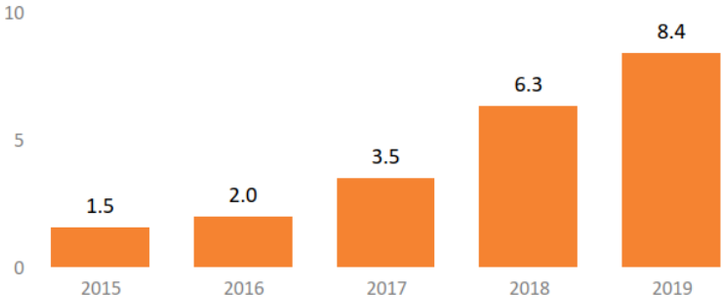
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, the Country's GDP (Real) declined by 1.4% in 2020.[1] • The inflation rate (CPI) of Guinea Bissau has risen to 1.5% in 2020, from 0.3% in 2019.[1] • In 2019, the services sector was the major contributor to the GDP with 50.4% share followed by agricultural and industrial sector with 34.3% and 15.4% share respectively.[6] • As of 2019, the exports of food & live animals dominated the total exports with a share of 92.6% followed by minerals fuels, lubricants and related material with 4.4% share.[6]
Policy enablers	• To promote private sector investments, the Government guarantees the protection of assets resulting from private sector investments.[9] • The country aims to achieve a target of 80% share of renewable energy in the generation mix and 100% electrification by 2030.[8]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.60 kWh/m^2/day and specific yield 4.46 kWh/kWp, a strong technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• As of 2019, only 31% of the population in the country had access to electricity.[3] • Guinea-Bissau is blessed with high solar irradiation index, however in 2019, solar PV accounted for a mere of 4.54% share in genera on mix.[4] • The Ministry of Energy and Industry regulates the power sector of the country.[7] • The generation, transmission, and distribution sectors in the country are controlled by National Electricity and Water Corpora on (EAGB).[7]
Infrastructure	• Guinea-Bissau is a member country of the Western African Power Pool (WAPP), making its grid interconnected with the neighbours, thus improving reliability of the power supply.[7] • High AT&C losses of 47% and power outages are the key challenges that are being faced by the power sector in the country.[11] • Solar Off-grids can be viable solution in the country to improve access to electricity. In 2019, 71.2% of 1.32 Mn unelectrified population lived in rural and remote areas of the country where grid extension is not feasible in near future.[3]
Financing	• The Guinea-Bissau Sustainable Energy Investment plan aims to attract USD 700 Mn investments to bring in energy transformations by 2030.[10] • In 2018, the African Development Bank sanctioned USD 20.2 Mn to the government with an aim to improve the reliability of power infrastructure in the country. The project targets to achieve this by reducing electricity outages, energy losses and installation of prepaid energy meters across the country.[11]
Energy Imperatives	• Per capita consumption on of 0.2 MWh was substantially low as compared to the global average of 3.35 MWh in 2019.[5] • The total generation from solar PV has risen at a CAGR of 0.3% between 2014-19 reaching 2.0 GWh in 2019 from 0.3 GWh in 2014.[4] • In 2019, gas & oil based thermal power plants dominated the generation mix with 95.4% share in the generation mix.[4] • In the last decade, the total power demand in the country has risen at a CAGR of 4.3% reaching 44.0 GWh in 2019 from 30.0 GWh in 2010.[4]

Guyana

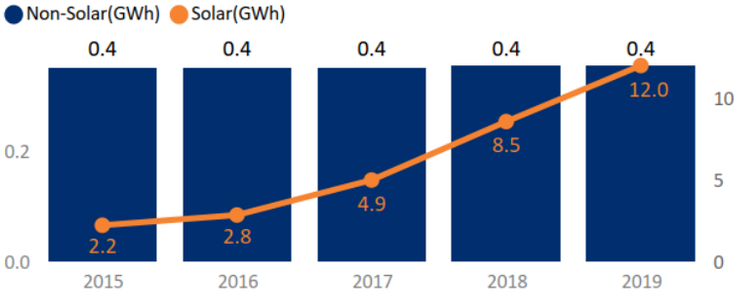
Latin America & Caribbean

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
867.9	8.4	1.8
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.1	3.1	55.5

Cumulative Solar Installed Capacity (MW)

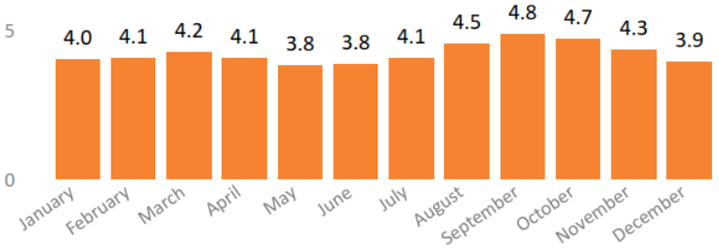


Renewable Energy Generation by Source

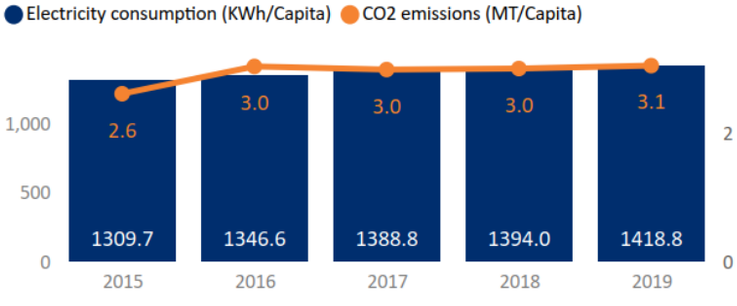


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



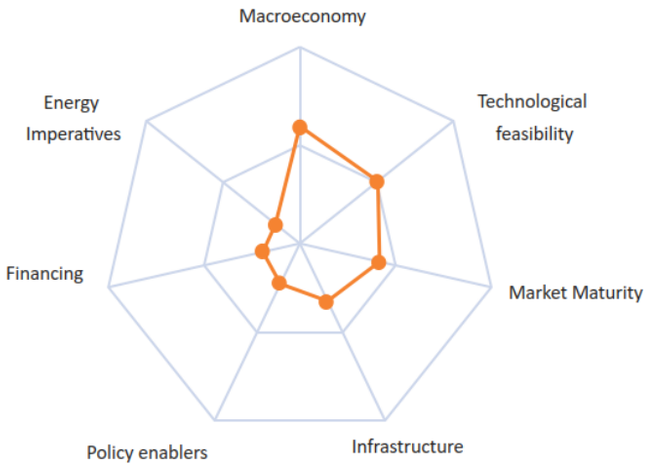
CO2 Emissions & Electricity Consumption



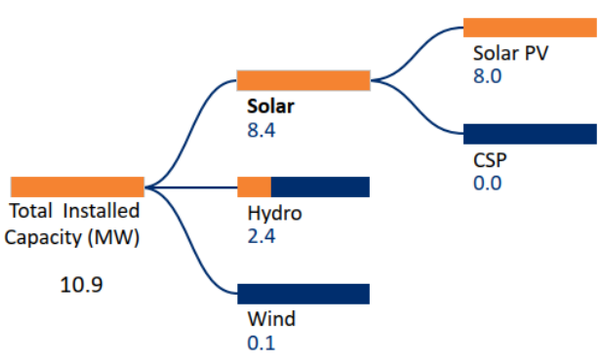
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers

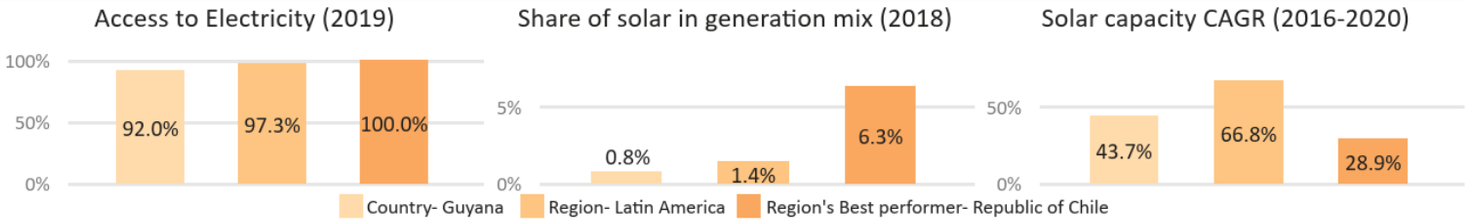


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Macroeconomy; Technological feasibility

Areas of Improvement → Energy Imperatives; Financing

Key Insights

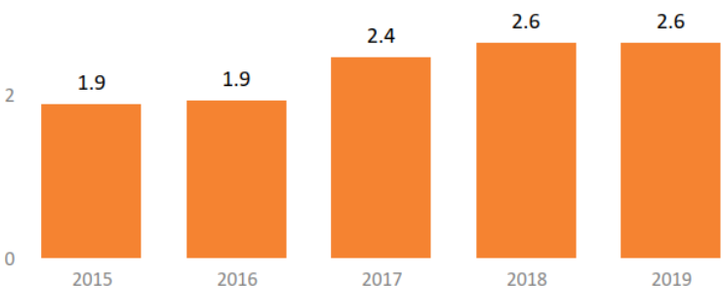
Drivers	Insights
Macro-economy	• Guyana is an upper-middle income economy[2] with a GDP per capita (PPP) at USD 23,258 in 2021.[1] • The GDP (Real) growth is expected to decline from 43.4% in 2020 to 16.4% in 2021.[1] • The economy of Guyana has been dominated by natural resources extraction and agriculture.[11]
Policy enablers	• The Ministry of Public Infrastructure oversees the power sector in the country, while Guyana Energy Agency (GEA) is responsible for the development of renewables in the country.[5] • Guyana has a target of achieving 28% and 47% RE generation (in the overall generation mix) by 2022 and 2027 re-spectively.[4] • VAT and import duty are exempted for RE equipment including solar lights, water heaters and cookstoves.[7]
Technological Feasibility	• Owing to very high levels of solar irradiation (GHI) of 5.21 kWh/ m^2/ day and specific yield 4.13 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Guyana.[6] • Guyana is currently dependent on imported petroleum-based fuels as its main source of electricity.[11] • Guyana Power and Light Inc. (GPL) has developed a Grid Code for the integration of distributed generation and establishment of the commercial and technical frameworks for grid connected renewable system.[12]
Market Maturity	• The Public Utilities Commission regulates the power sector of Guyana.[5] • GPL is a state-owned vertically integrated power utility, which operates generation, transmission, and distribution of electricity in the country.[12] • 92% of the population in Guyana had access to electricity as of 2019.[9] • Share of solar electricity in generation mix stood at around 1% in 2018.[5]
Infrastructure	• Total installed capacity in Guyana was 347.7 MW in 2018.[6] • Wind and solar projects are covered under the Public-Private Partnership Framework published by the Ministry of Finance.[14] • GPL intends to integrate a total of 29 MW of Solar PV generation capacity into the generation portfolio by 2025.[16]
Financing	• Guyana has tax concessions and capital write offs available for investments in Solar and Wind projects.[14] • Guyana REDD + Investment Fund (GRIF) was created in 2010 to channelize international financing for renewables.[4] • In 2019, Norway approved the financing (of Guyana Dollar 16 bn) for 30 MW solar plus storage project.[11]
Energy Imperatives	• Per capita electricity consumption of 1.41 MWh is much lower in comparison to the global average of 3.35 MWh in 2019.[11] • In 2017 & 2018 under its Green Public Sector programme, the Government installed total 3 MW Solar Plants on the rooftops of 175 Public or Government establishments.[7] • Installed solar PV capacity in Guyana was 8 MW in 2020.[14]

Haiti

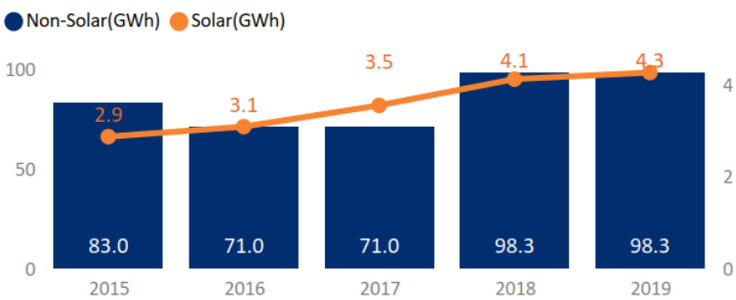
Latin America & Caribbean

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
429.0	2.6	1.4
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.6	0.3	40.7

Cumulative Solar Installed Capacity (MW)

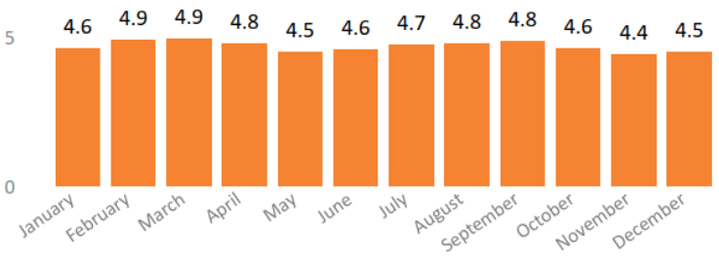


Renewable Energy Generation by Source

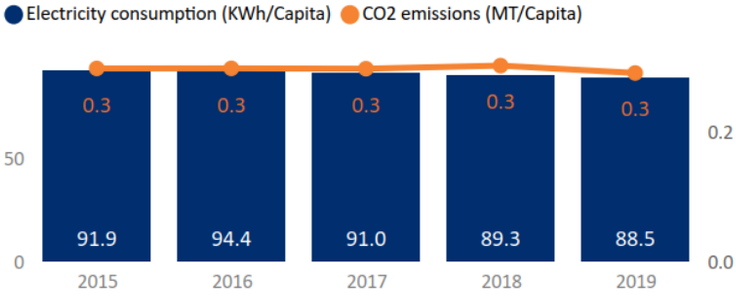


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



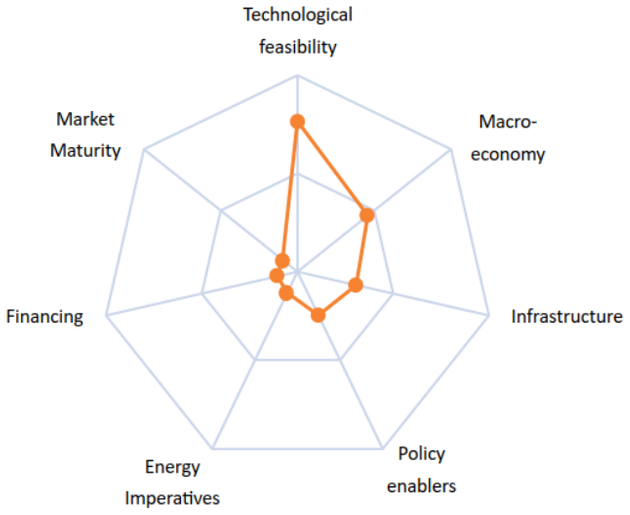
CO2 Emissions & Electricity Consumption



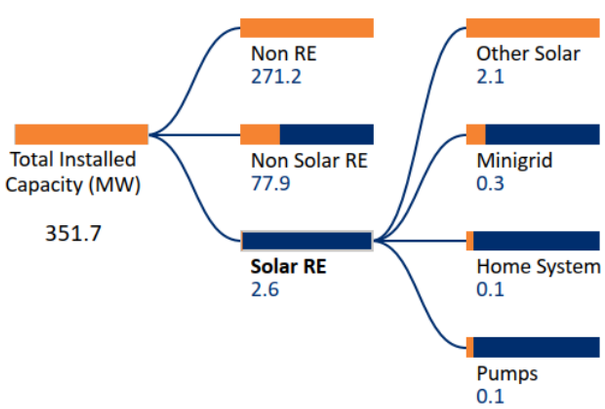
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers



Installed Generation Capacity by Source



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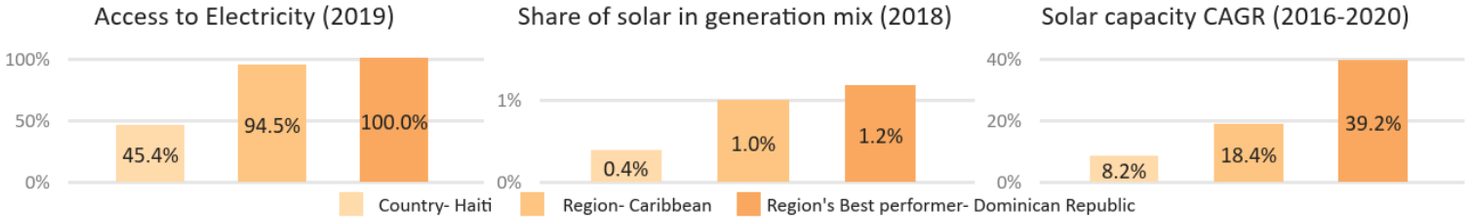
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Market Maturity, Financing

Key Insights

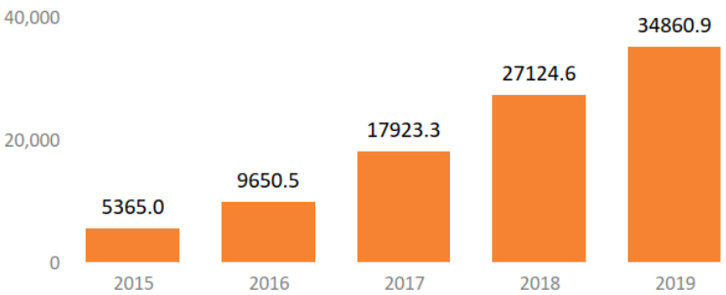
Drivers	Insights
Macro-economy	• Haiti is a Small Island Developing State (SIDS) having a lower-middle income economy[2] with GDP per capita (PPP) of USD 2,962 in 2021.[1] • The GDP (Real) growth is expected to recover from -3.7% in 2020 to 1% in 2021.[1] • The Haitian economy majorly depends on its agricultural, construction, and commerce sectors as well as on the export-oriented apparel industry.[3]
Policy enablers	• The Ministry of Public Works, Transport and Communications and Energies oversees the energy sector in the country.[4] • Haiti targets to achieve 47% electricity from RE by 2030 including 30 MW solar PV capacity.[4] • In 2017,the country abolished custom duties on imports for all renewable and energy efficiency equipment.[16] •In 2020,the government announced its plans to add 190 MW of generating capacity including 130 MW of solar projects.[5]
Technological Feasibility	• Owing to very high levels of solar irradiation (GHI) of 5.54 kWh/ m²/ day and specific yield 4.60 kWh/ kWp, a strong technical feasibility is envisaged for solar projects in Haiti.[14] • Haiti is highly dependent on imported fossil fuels for its power generation[4] that have represent 76.57% share in power generation as of 2019.[8]
Market Maturity	• Autorité nationale de régulation du secteur énergétique (ANARSE) regulates the power sector in Haiti .[7] • The electric system in Haiti is owned, operated, and maintained by Electricite d'Haiti (EDH).[16] • Grid instability and lack of available electricity continues to be a major problem in 2020.[5] • According to a 2018 World bank report, EDH supplies nine hours or less of electricity per day on most circuits.[5]
Infrastructure	• Haiti has an installed capacity of 352 MW[6] but only 60% of it is reliable as many genera on units and grid elements need rehabilitation and repair.[5] • Haiti has ten isolated grids and only one integrated T&D network which supplies power to Port-au-Prince (PAP) metropolitan area.[16] • Electricity service outside PAP area is scarce, with 9 regional grids operated by EDH and one major micro grid operated by National Rural Electric Cooperative Association International Limited (NRECA).[16] • The outdated performance and lack of reliability of the Péligre transmission line that serves cities in the central region is the major problem in Haiti's Transmission sector.[9]
Financing	• In 2018, Taiwan government provided a USD 150 Mn loan primarily for repairs and upgrades to the metropolitan grids.[5] • In 2019, Haiti and the World Bank established the Off-Grid Electricity Fund with USD 17 Mn funding from the global Clean Technology Fund to support access to electricity in remote areas.[8] • In 2020, Inter-American Development Bank (IADB) and the Caribbean Development Bank (CDB) approved a total of USD 20 Mn funding for development of Mini Grids in Haiti .[10] • n 2020, Green Climate Fund (GCF) approved a USD 9.9 Mn debt finance for two mini grid developers in Haiti.[17]
Energy Imperatives	• 45% of the population in Haiti had access to electricity in 2019.[11] • Per capita consumption of 0.08 MWh is extremely below compared to the global average of 3.35 MWh in 2019.[12] • The installed Solar PV capacity was 3 MW in 2020.[13] • The Ministry of Finance Technical Operating Unit are implementing 2 Solar projects totalling to 12 MW in Haiti.[15]

India

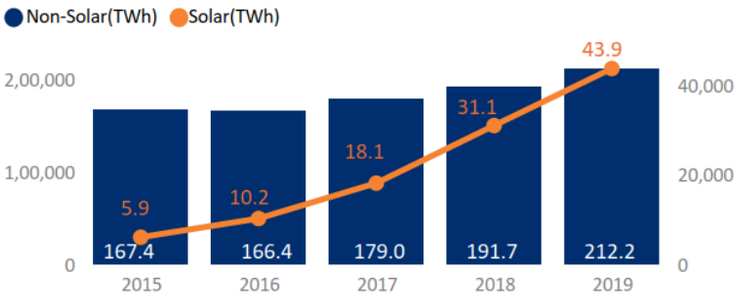
Asia & Pacific

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in GW (2020)	Off-Grid Solar Capacity in GW (2019)
1,158.3	38.9	1.13
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.3	1.9	71.0

Cumulative Solar Installed Capacity (MW)



Renewable Energy Generation by Source



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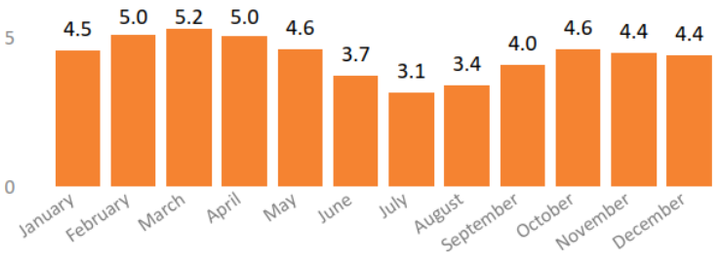
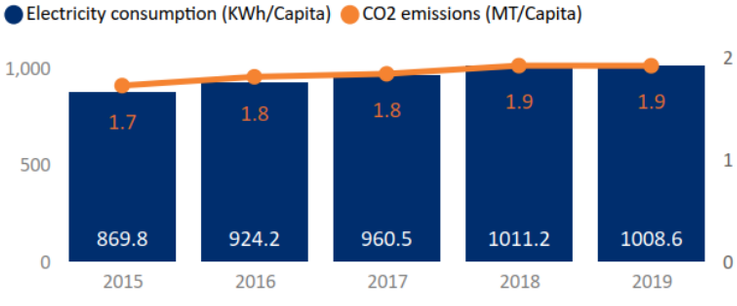
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



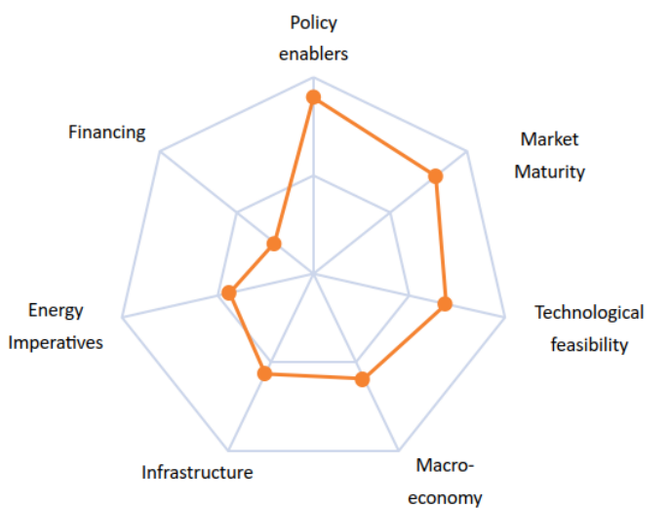
CO2 Emissions & Electricity Consumption



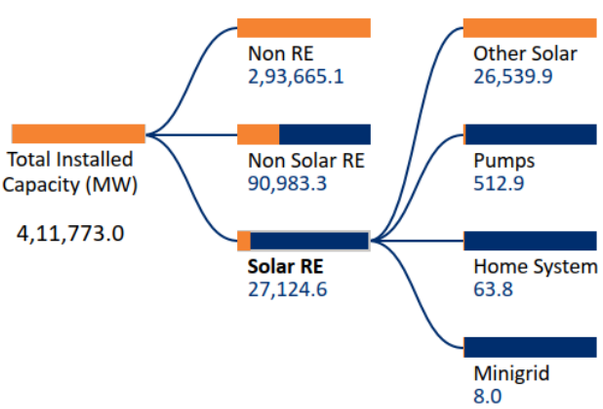
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers



Installed Generation Capacity by Source



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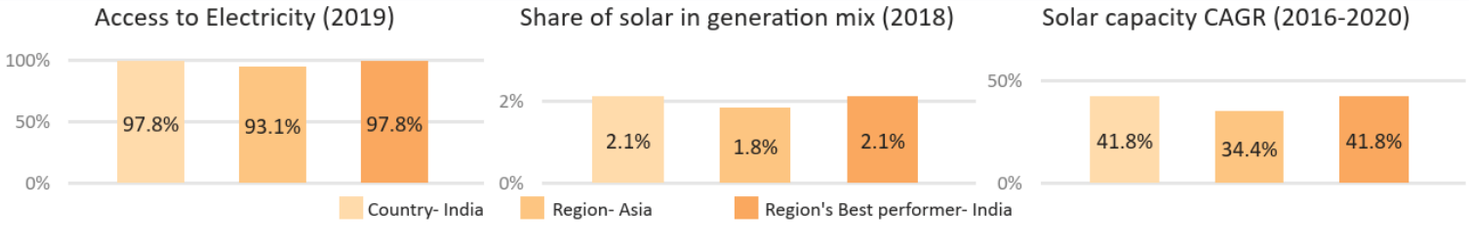
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Policy enablers, Market Maturity

Areas of Improvement → Financing, Energy Imperatives

Key Insights

Drivers	Insights
Macro-economy	• India has witnessed sound economic growth to emerge as one of the fastest-growing economies in the world.[1] • Real GDP grew at a rate of 4% in 2019 and declined by 8% in 2020 on account of Covid pandemic. In 2021, the economy is expected to bounce back and grow by 10% in 2021 from 2020 levels.[2] • Service sector contribute to major share of GDP and accounted for 55.39% of the total GVA in FY21.[3]
Policy enablers	• The Ministry of New and Renewable Energy (MNRE) is the nodal Ministry of Government of India (GoI) which aims to develop and deploy RE to meet country's growing energy requirements.[4] • The GOI has set a target of installing 175 GW of RE capacity by the year 2022, which includes 100 GW from solar, 60 GW from wind, 10 GW from bio-power and 5 GW from small hydropower.[5] • The GoI has also committed to achieve 450GW of RE capacity including 300 GW solar capacity by 2030.[5] • Several incentives are offered by MNRE including waiver of transmission charges for trading of electricity generated/supplied from solar, wind, Battery Energy Storage system (BESS) in Green Term Ahead Market (GTAM) up to 2023.[7] • Under Atal Jyoti Yojana (AJAY), Solar LED Street Lights in rural, semi-urban and urban areas are being installed in various States through 75% cost support from MNRE.[8]
Technological Feasibility	• India receives relatively very high levels of solar irradiation of 5.098 kWh/m²/day and specific yield of 4.31 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Country.[9] • About 2.37 lakh solar pumps have been installed in the country under various Government backed programs.[10] • More than 0.65 million solar streetlights including 0.3 million streetlights under Atal Jyoti Yojana have been installed across the country and 1.7 million solar home lights have been set up at homes and hamlets in villages.[10]
Market Maturity	• Indian Government has announced that it will come up with green hydrogen project in immediate future.[11] • In 2018, MNRE adopted the National Wind-Solar Hybrid Policy to provide a framework for the promotion of large grid-connected wind-solar PV hybrid system for efficient utilization of transmission infrastructure and land.[13] • Indian Energy Exchange has commenced the Green Market which is a delivery-based market for trade in RE through Term-ahead Contracts in both solar and non-solar segment.[12]
Infrastructure	• India has a well-developed power infrastructure not just in the country but also in the region. For instance, India trades power to Bangladesh through a 400 kV D/C lines along with 2x500 MW HVDC back-to-back terminal.[14] • India's HDI value for 2019 is 0.645, which puts the country in the medium human development category.[15]
Financing	• ADB recently committed energy loans to five projects. Among these, three projects aim to improve the quality and reliability of electricity supply in Maharashtra (USD 346 Mn), Uttar Pradesh (USD 300 Mn) and Meghalaya (USD 132.8 Mn).[1] • IREDA provides direct discounting of GBI Claims payable to RE Developers under MNRE Scheme for Generation Based Incentive (GBI) for grid interactive Wind and Solar power projects.[16]
Energy Imperatives	• Access to electricity in India (for urban households) was reported at 99.2 % in 2019.[17] • As of 2019, Electricity Consumption per capita is 1008.60 kWh which is lower in comparison to the global average. But this number is growing at a healthy pace due to rapid urbanisation and increasing penetration of electrical appliances.[18] • India achieved 100 GW RE capacity in August 2021. India stands at 4th position in the world in terms of installed RE capacity, 5th in solar and 4th in wind in terms of installed capacity as of August 2021.[20] • As of 2020, cumulative solar off-Grid Capacity for the country is 1130.38 MW which was 1098.63 MW in 2018.[19]

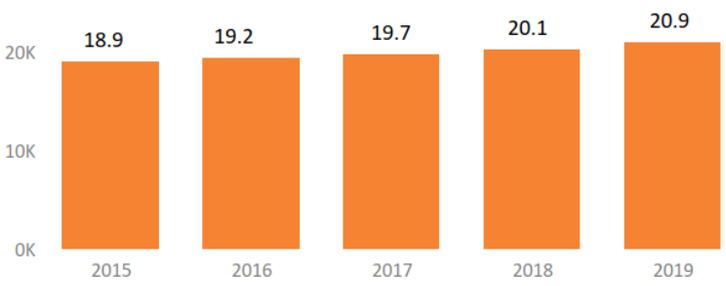
Electricity Consumption in BU (2018)	Cumulative Solar Capacity in GW (2020)	Off-Grid Solar Capacity in MW (2019)
293.1	21.7	NA

Italy

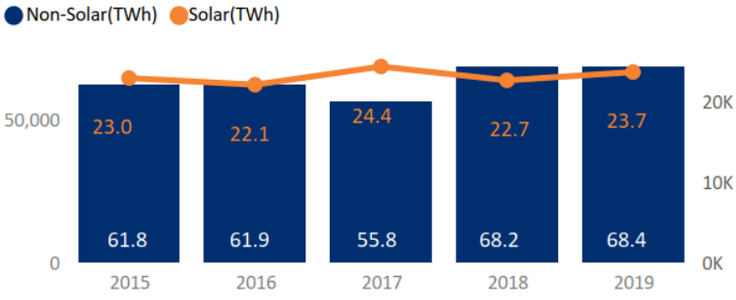
Europe

Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
3.9	5.6	72.9

Cumulative Solar Installed Capacity (GW)

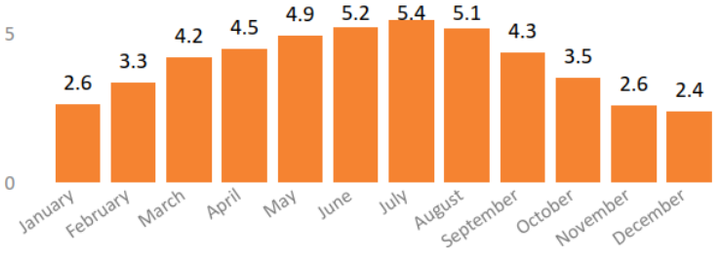


Renewable Energy Generation by Source

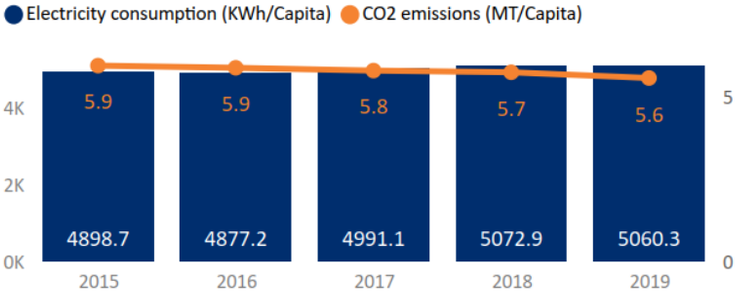


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



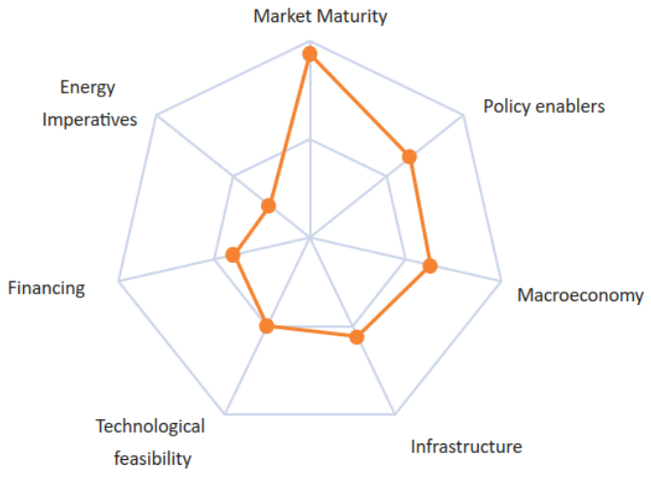
CO2 Emissions & Electricity Consumption



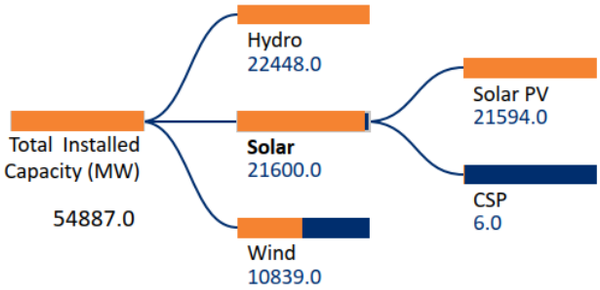
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers

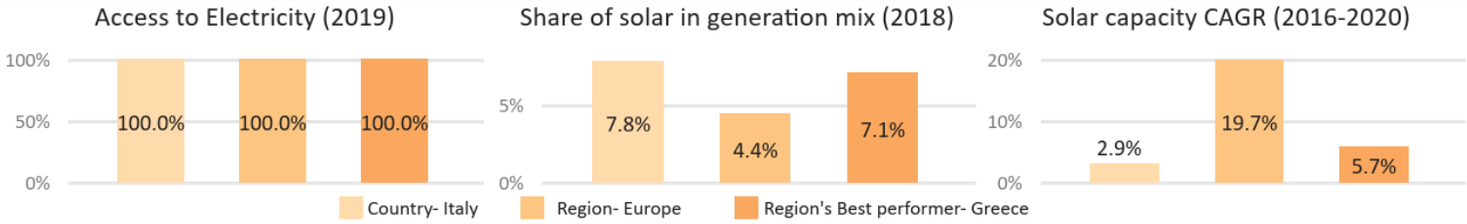


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Policy enablers

Areas of Improvement → Energy Imperatives, Financing

Key Insights

Drivers	Insights
Macro-economy	• GDP (Real) has grown at an annual rate of 0.3% in 2019 and declined by 8.9% in 2020.[1] • In 2020, agriculture contributed 2% to the GDP, 21.5% came from the industry and 66.8% from the service sector.[2] • HICP inflation turned positive and increasing oil prices are set to raise consumer prices by 1.4% in 2021.[4]
Policy enablers	• Gestore dei Servizi Energetici S.p.A. (GSE) is responsible for managing and monitoring the support mechanisms for renewable energies in the electricity sector.[5] • The national energy & climate plan has set a very ambitious target for renewables by 2030; it aims to have 30% RE share in total energy consumption and 55% share in electricity generation.[6] • In Italy, RES-E producers can make use of net-metering ("Scambio Sul Posto") if plant capacity is lower than 20 kW.[7]
Technological Feasibility	• Italy receives an average of 1900 hours of sunlight per year. It is sunny 43.3% of daylight hours and 56.7% of daylight hours are likely cloudy or with shade, haze, or low sun intensity.[9] • Italy receives relatively high levels of solar irradiation of 4.072 kWh/m^2/day and specific yield of 3.91 kWh/ kWp, a high technical feasibility is envisaged for solar projects in Country.[10]
Market Maturity	• The Italian Regulatory Authority for Energy, Networks and Environment (ARERA) carries out regulatory and supervisory activities in the sectors of electricity, gas, and water.[13] • Terna is the TSO , responsible for transmitting electricity to the high and extra-high voltage power grid all over Italy.[14] • GME/Italian Power Exchange operates a forward physical market (MTE), a market for the trading of daily products (MPEG) with continuous trading mode, a day ahead auction market (MGP), and an intraday auction market (MI).[15]
Infrastructure	• Terna, the TSO manages 74,723 km of high-voltage lines and has 26 cross-border interconnection lines.[16] • Terna, plans to invest €8.9bn over the 2021-2025 period. It intends to spend €5.4bn on the regulated activities to develop the national electricity grid.[17] • In addition to the two submarine cables with Greece and Corsica, Italy is also connected along the northern border through France, Switzerland, Austria, and Slovenia.[18] • Italy's HDI value for 2019 is 0.892 which places the country in the very high human development category.[19]
Financing	• In 2021, EIB and ENI SpA signed a EUR 75 Mn Framework Loan (FL) for the implementation of several renewable energy (RE) plants (solar photovoltaic and onshore wind) schemes in Italy.[20] • The EIB and Dolomiti Energia Group have signed a €100 Mn finance contract to support the company's 2021-2024 development plan which includes modernisation and upgrading of the electricity distribution network.[21]
Energy Imperatives	• As of 2019, Electricity Consumption per capita stood at 4,791 kWh marginally higher than 4,740 kWh in 2018.[22] • As of 2020, cumulative solar PV Capacity for the country stood at 21,594 MW growing from 19,682 MW in 2017.[23] • Since 1990, 100% of the population in Italy had access to electricity.[24] • The price of electricity for household consumers in Italy is EUR 0.2153/kWh in 2020.[25]

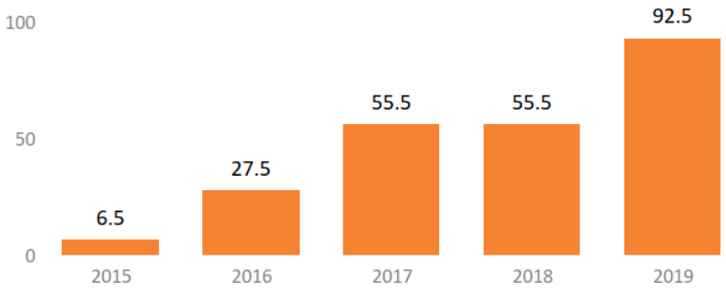
Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
3.3	92.5	NA

Jamaica

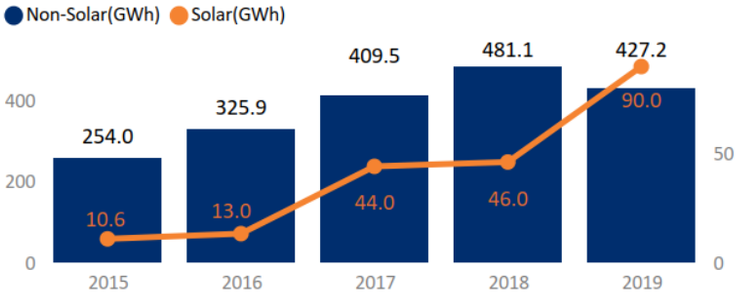
Latin America & Caribbean

Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
4.3	2.7	69.7

Cumulative Solar Installed Capacity (MW)

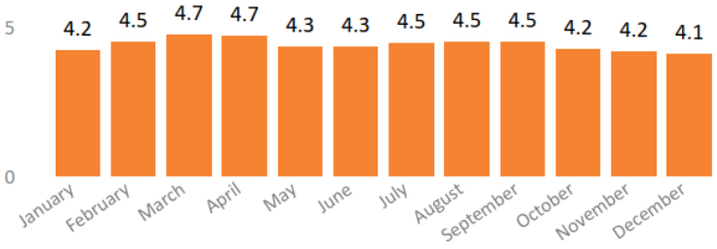


Renewable Energy Generation by Source

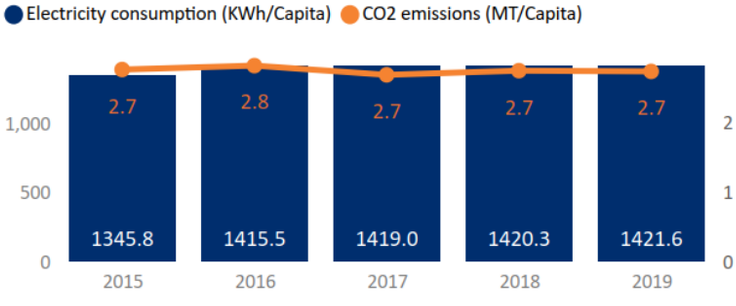


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



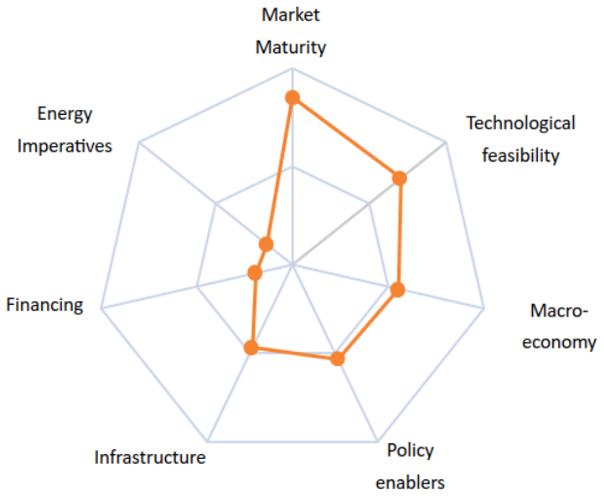
CO2 Emissions & Electricity Consumption



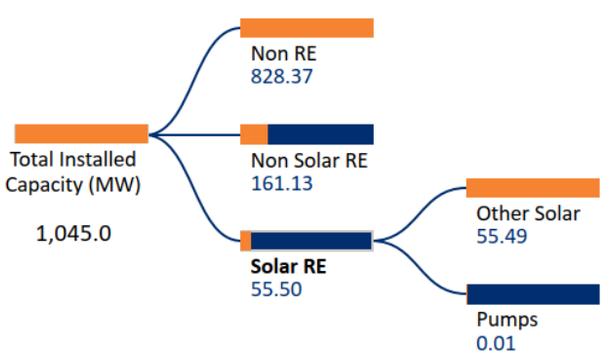
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

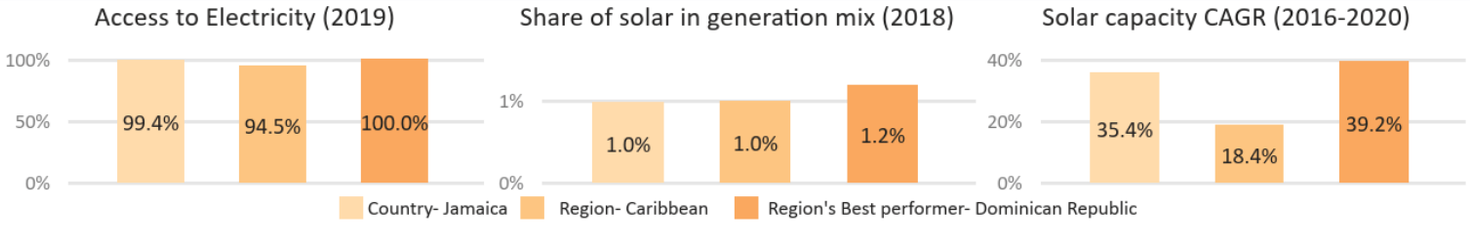


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

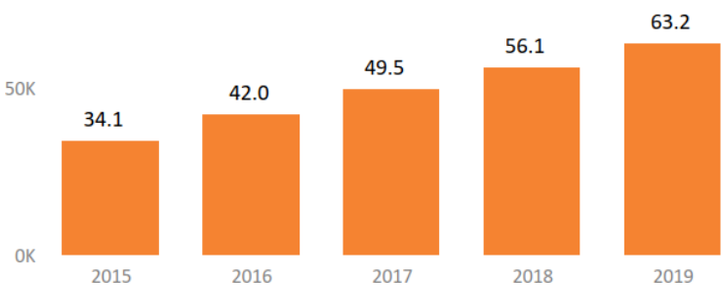
Areas of Improvement → Energy Imperatives, Financing

Key Insights

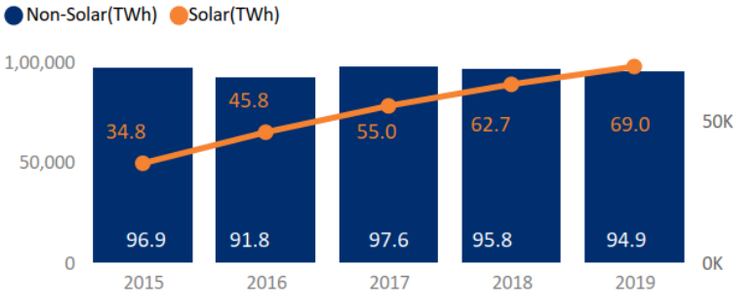
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, the GDP (Real) declined at a rate of 10.2% in 2020. In 2021, it is expected to bounce back and grow at 1.5% from 2020 level.[1] • Jamaica is an upper middle-income country with a GDP per capita (PPP) USD 9,975 in 2020. [4,1] • The inflation rate (CPI) of Jamaica has risen to 5.2% in 2020 from 3.9% in 2019.[1]
Policy enablers	• To encourage Solar PV installations net metering policy has been implemented in the country.[8] • The Government of Jamaica has set a target to supply 50% of the power demand by 2037 from RE generation.[9] • Several incentives such as tax exemptions, tax credits are already established in the country for promoting RE.[11] • To achieve the target set for RE, the Government has launched initiatives such as auctions and green public procurement for capacity additions.[3,11]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.42 kWh/m^2/day and specific yield 4.50 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Country.[5] • In 2019, 12% of the country's power demand was met through RE sources.[9] • Jamaica depends heavily on fossil fuels for its electricity generation, thus making it vulnerable to fluctuating prices of crude oil.[10]
Market Maturity	• 99% of the population in Jamaica had access to electricity as of 2019.[4] • Between 2010-18, Jamaica has recorded USD 0.3 billion investment in clean energy with solar PV alone attracting USD 127 mn.[9] • The Power sector in Jamaica is regulated by office of utilities regulation. The transmission and distribution sector is controlled by Jamaica Public Services Company Ltd (JPSCO) while the generation sector has presence of a few Independent Power Producers.[3,8]
Infrastructure	• The distribution sector has been facing challenges with transmission and distribution losses of 26.5%.[11] • The national grid operates at frequency of 50 Hz with voltage levels of 12kV to 138 kV.[12] • The National Energy Policy (2009-30) aims to address the supply & demand issue and modernize the power infrastructure in the country.[3] • For Jamaica, challenges associated with RE variability can be minimized by upgrading the grid infrastructure with higher-voltage transmission lines and better operations and forecasting.[13]
Financing	• National Commercial Bank of Jamaica (NCB) and the USAID have partnered in 2019 to provide USD 25 mn loan to encourage RE projects in the country.[13] • The Development Bank of Jamaica (DBJ) manages several credit lines with the aim of enabling private banks to offer loans for RE projects.[3] • Loans, through the DBJ, cover up to 90% of RE project costs for small and medium-sized enterprises and up to 70% for large companies.[3]
Energy Imperatives	• Per capita consumption of 1.42 MWh is relatively low to the global average of 3.35 MWh as of 2019.[6] • The total solar installed capacity was 93 MW in 2020 and is expected to reach 246 MW by 2030.[7,3] • In 2018, Jamaica's total installed capacity was 4.4 GW of which 76.8% came from oil based thermal power plants alone.[10] • In Jamaica, the small commercial sector accounts for 43% of the total power demand followed by the residential and industrial sector with 37% and 17% share respectively.[11]

Japan	Electricity Consumption in BU (2018)	Cumulative Solar Capacity in GW (2020)	Off-Grid Solar Capacity in MW (2019)
	945.5	68.7	NA
Asia & Pacific	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
	3.4	8.7	78.0

Cumulative Solar Installed Capacity (GW)

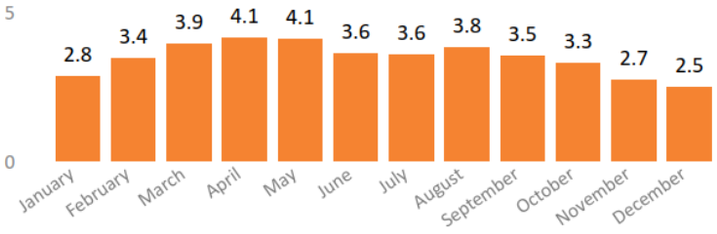


Renewable Energy Generation by Source

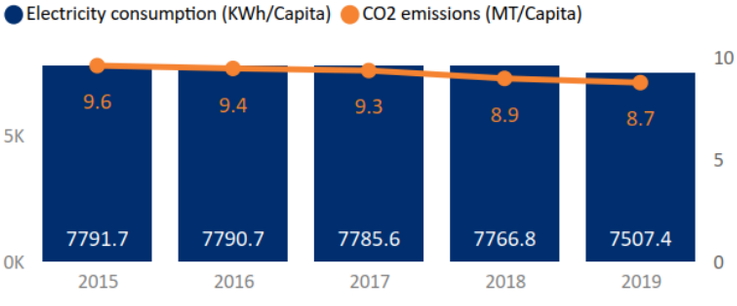


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



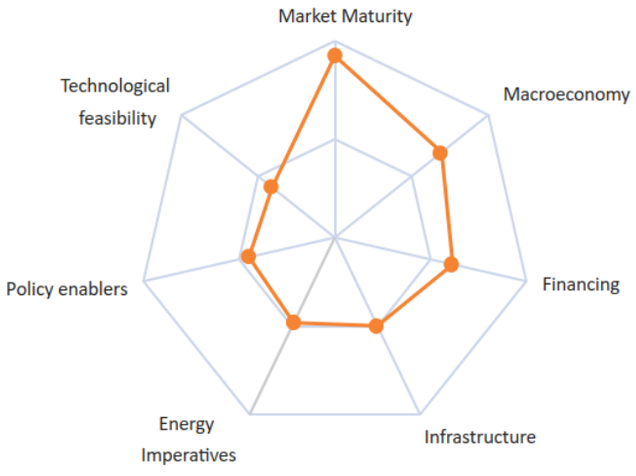
CO2 Emissions & Electricity Consumption



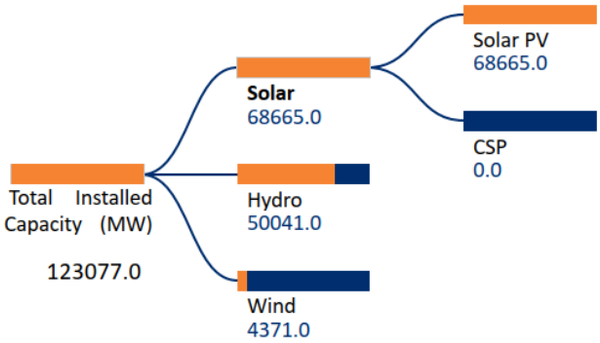
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers

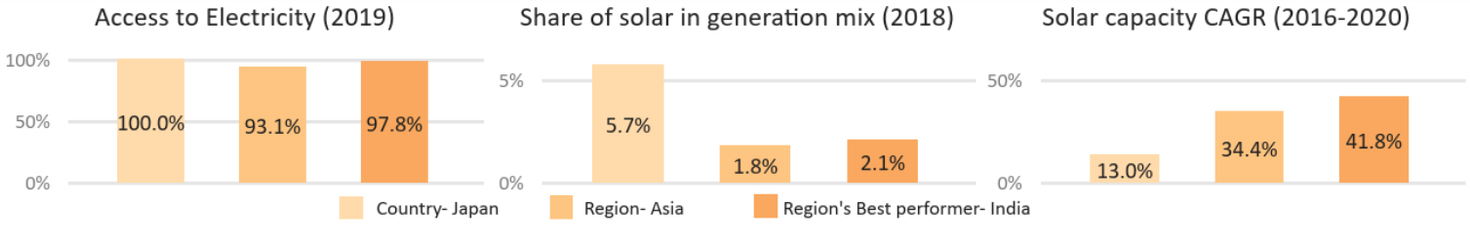


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Macroeconomy

Areas of Improvement → Technological feasibility, Policy enablers

Key Insights

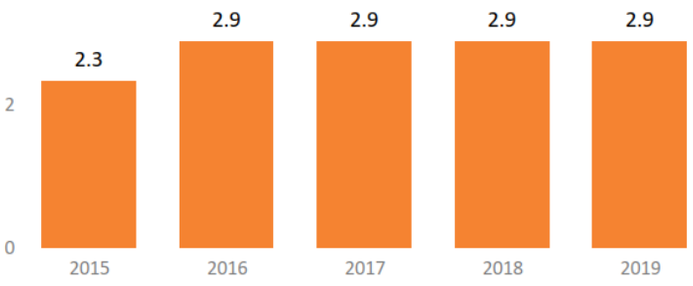
Drivers	Insights
Macro-economy	• Japan is one of the most developed economies in the world with its energy requirements primarily fuelled by fossil and nuclear based energy.[1] • GDP (Real) has grown at an annual rate of 0.3% in 2019 and declined by 4.8% in 2020 owing to the pandemic.[2] • In 2018, agriculture contributed around 1.14% to Japan's GDP; 29.07% came from the industry and 69.31% from the service sector.[3]
Policy enablers	• Japan's Nationally Determined Contribution (NDC) under the Paris Agreement, aims to reduce GHG emissions by 26% in 2030 compared to 2013 levels.[5] • Japan introduced the tax for climate change mitigation as a direct carbon tax in 2012 and increased its level in 2016 to reach a rate of JPY 289 (USD 2.65) per tonne of CO2.[5]
Technological Feasibility	• Japan receives high levels of solar irradiation of 3.61 kWh/m²/day and specific yield of 3.39 kWh/ kWp, a high technical feasibility is envisaged for solar projects in Country.[6] • Japan remains heavily reliant on imported fossil fuels. In 2019, fossil fuels accounted for 88% of total primary energy supply (TPES).[5] • In addition to EVs, Japan is a frontrunner in the development of hydrogen-based transport. In 2019, Japan had almost 3700 fuel cell electric vehicles (FCEVs) and about 130 charging stations.[5]
Market Maturity	• Japan Electric Power Exchange (JEPX) operates physical short-term electricity markets in Japan.[7] • JEPX provides three types of markets- a spot day-ahead market, forward fixed-form market, and a forward bulletin board market as a place for free transactions.[8] • TEPCO Power Grid is responsible for nearly one-third of all the power supplied in Japan.[9]
Infrastructure	• At the end of 2020, Japan's transmission network comprised about 38,315 km of transmission lines ranging between the 110 kV to 500 kV and 250 kV DC voltage levels.[10] • Japan is not electrically interconnected to other countries, thus does not import or export electricity.[5]
Financing	• Shinsei Bank is among the licensed financial institutions in Japan.[12] • It is stepping up its efforts to arrange financing in Solar, Wind, Biomass, Geothermal power generation. It has arranged many large-scale project financing deals for the solar power generation businesses.[13] • In 2015, Tokyo Stock Exchange (TSE) established an infrastructure fund market to list funds that invest in infrastructure facilities such as solar power plants.[14] • The fund will facilitate more projects accessible to a greater number of investors.[15]
Energy Imperatives	• As of 2019, country's electricity consumption per capita was 7.51 MWh, more than double of the global average.[16] • As of 2020, cumulative solar PV Capacity for the country went up to 68.67 GW from 63.19 GW levels in 2019.[17] • Since 1990, 100% of the population in Japan had access to electricity.[18]

Kiribati

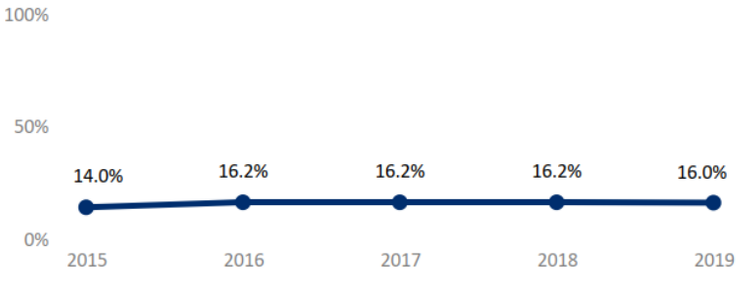
Asia & Pacific

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
24.2	2.9	1.4
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.9	0.6	46.9

Cumulative Solar Installed Capacity (MW)

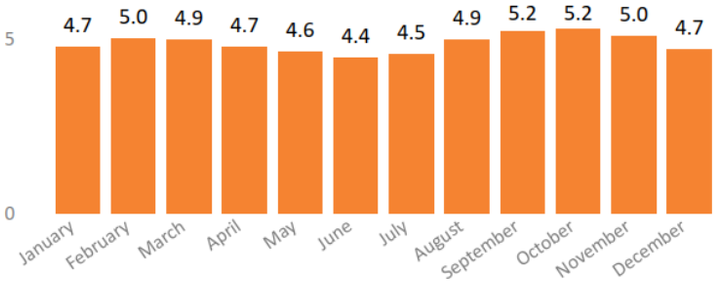


Share of electricity production from RE

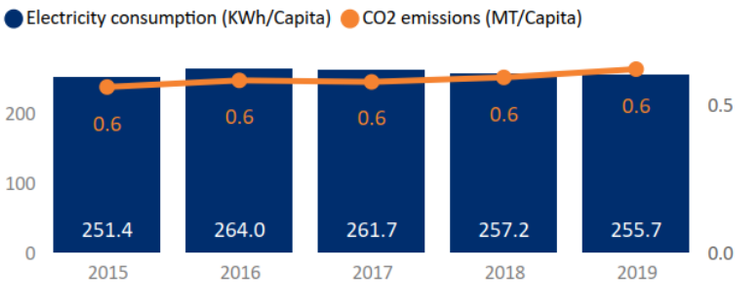


Renewables include electricity production from hydropower, solar, wind, biomass. and waste, geothermal, wave and tidal sources.

Monthly variation in PVout (kWh/kWp/day)



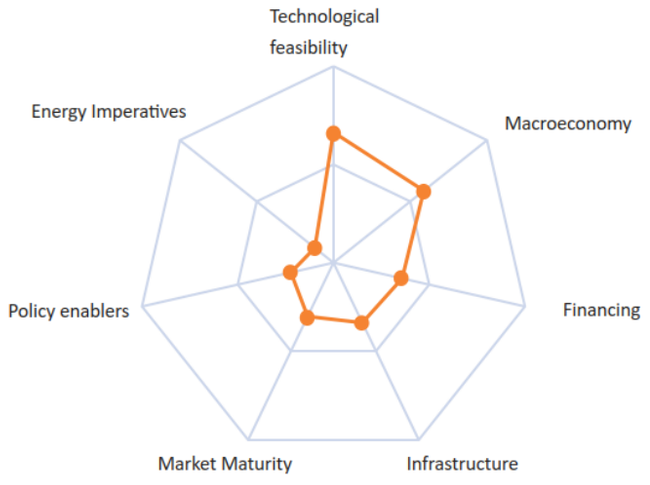
CO2 Emissions & Electricity Consumption



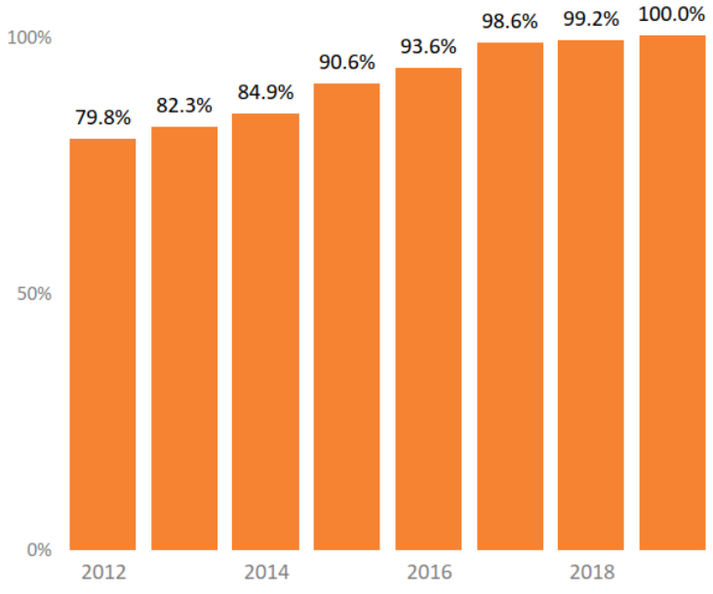
Ease of Doing Solar Classification

Progressive

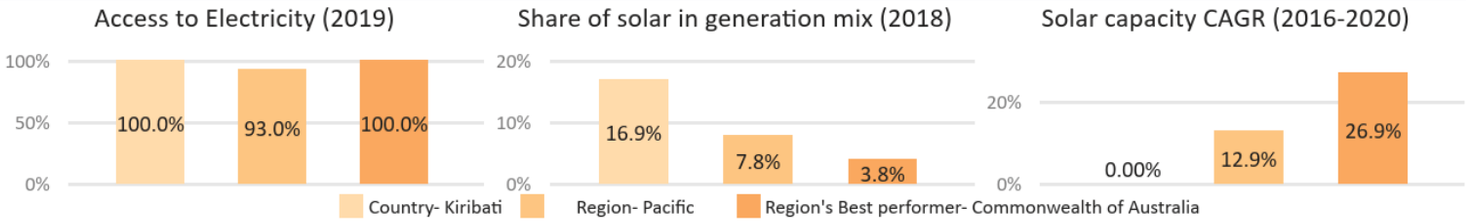
Performance against 7 drivers



Access to Electricity



Country's regional performance and characteristics

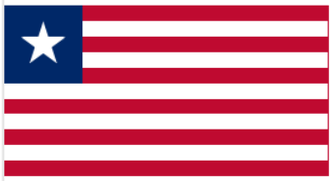


Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Energy Imperatives, Policy enablers

Key Insights

Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, the GDP (Real) of the country has declined by 0.5% in 2020.[1] • Kiribati is a small island nation with a GDP per capita (PPP) USD 2,199 in 2020. [13,1] • The inflation rate (CPI) of Kiribati has risen to 2.5% in 2020 from -1.8% in 2019.[1] • The economy is mainly dependent on Tourism and fishery industry as majority of the population is employed in these sectors.[13]
Policy enablers	• Launched in 2021, the Promoting Outer Island Development through the Integrated Energy Roadmap' (POIDIER) Project is a 4-year project that aims to build workforce of technical experts of RE technologies and development of RE implementation plans in the outer islands.[11] • As per the Kiribati Integrated Energy Roadmap (KIER), the 2025 goals for Tarawa is a 45% reduction in fossil fuels (23% through development of RE); for Kiritimati it is 60% reduction in fossil fuels (40% through deployment of RE); for the outer islands, it is a 60% reduction in fossil fuels use in all rural public infrastructure.[6] • The climate change policy 2018 has set an objective to promote and enhance the transition towards RE sources and strengthening of the technical and institutional capacities of the power sector using the most innovative technologies available.[7]
Technological Feasibility	• Owing to very high levels of solar irradiation (GHI) of 6.13 kWh/m²/day and specific yield 4.85 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[2] • Kiribati is vulnerable to fluctuating prices of fossil fuels because of its dependence on them for electricity generation.[4]
Market Maturity	• 100% of the population in Kiribati had access to electricity as of 2019.[3] • Solar PV accounted for 16% share in generation mix in 2019.[4] • The Public Utilities Board of Kiribati has monopoly over the power sector in the country with some IPPs operating alongside.[6]
Infrastructure	• The Kiribati Electricity system is divided into 3 parts, i.e., South Tarawa, Kiritimati Island and Outer Islands having several isolated grids being in operation. The South Tarawa has majority of the electricity demand followed by Kiritimati and Outer Islands.[6] • The government has taken various initiatives to improve the power sector in the country. Some of the initiatives are installation of SCADA, purchase of high efficiency generators, reduction in tariff by improving financial performance of PUB.[7,8]
Financing	• In 2020, The Asian Development Bank (ADB) sanctioned USD 14.7 mn for the development of RE projects in the country to reduce its dependence on the fossil fuels for electricity generation.[10] • Launched in 2021, the Promoting Outer Island Development through the Integrated Energy Roadmap' (POIDIER) aims to set up a grant fund for financing of equipment used in solar PV grids.[11] • Establishment of the Climate Finance Division for coordination of climate-change-related expenditure funded through the budget or by donors is an encouraging step forward.[12]
Energy Imperatives	• Per capita consumption of 0.25 MWh is substantially low in comparison to the global average of 3.35 MWh in 2019.5 • The total generation from solar PV has risen at a CAGR of 24.0% between 2010-19, reaching 4.83 GWh in 2019, from 0.7 GWh in 2010.[4] • As of 2019, Oil & Gas based thermal power plants dominated the generation mix having 84.0% share in the generation mix.[4]



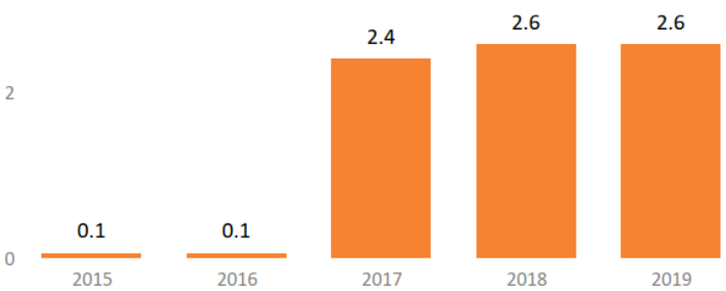
Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
300.0	2.6	2.6

Liberia

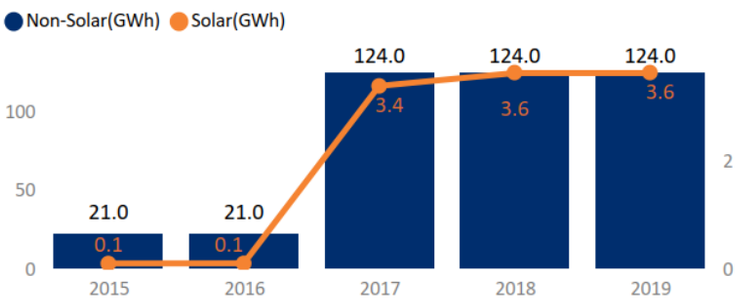
Africa

Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
3.9	0.3	43.2

Cumulative Solar Installed Capacity (MW)

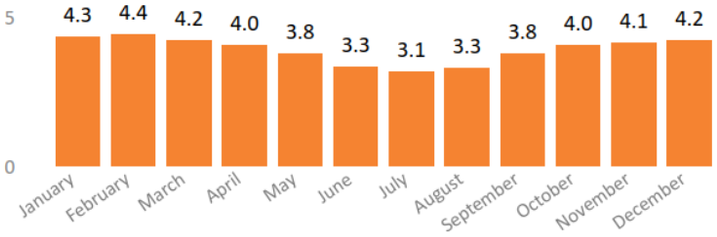


Renewable Energy Generation by Source

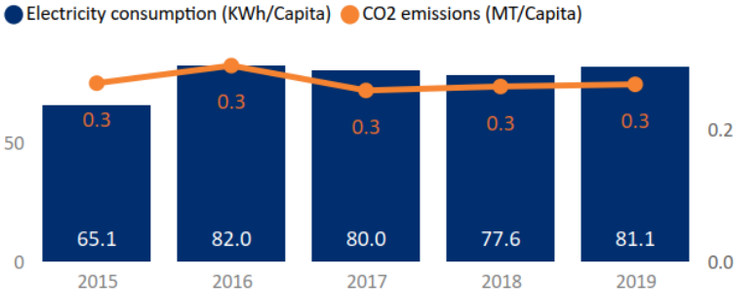


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



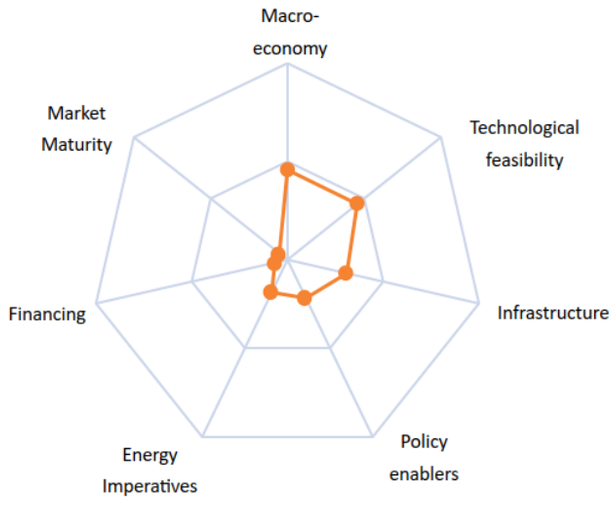
CO2 Emissions & Electricity Consumption



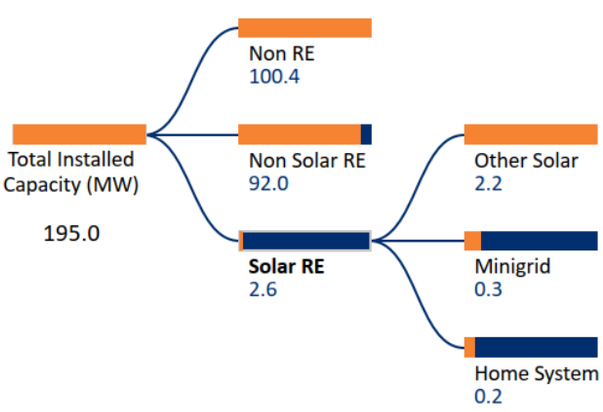
Ease of Doing Solar Classification

Potential

Performance against 7 drivers

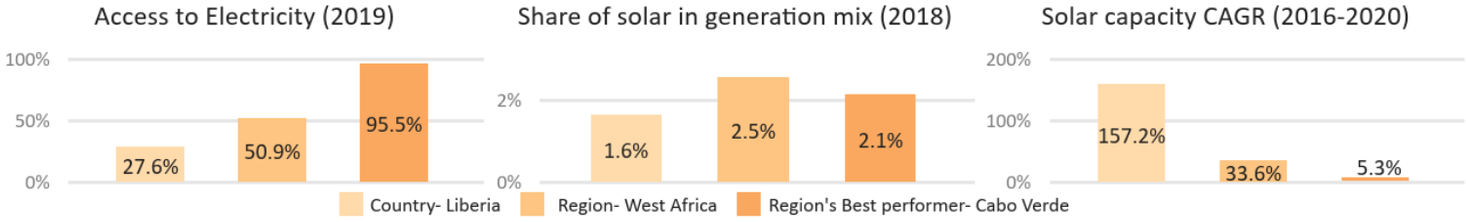


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Macroeconomy; Technological feasibility

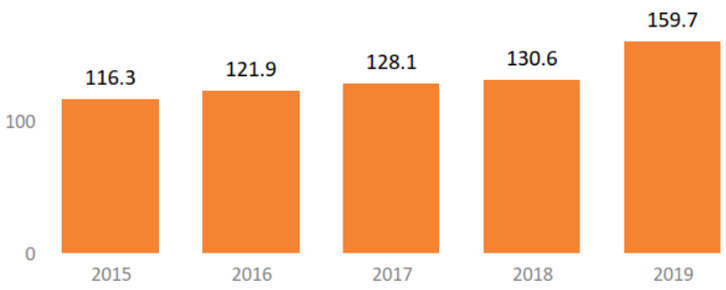
Areas of Improvement → Market Maturity; Financing

Key Insights

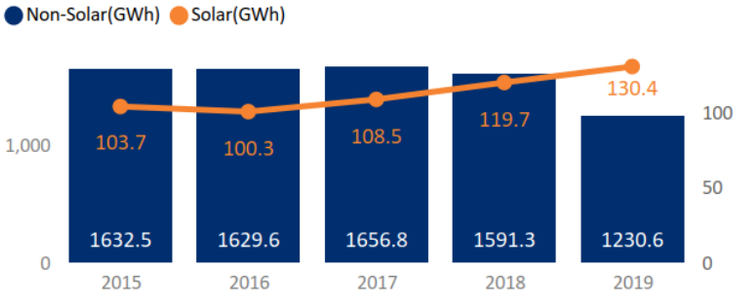
Drivers	Insights
Macro-economy	• Liberia is a low-income status country[1] and its economic growth is severely constrained by an insufficient supply of reliable and affordable electricity.[2] • GDP (Real) has declined by 3% in 2020 and bounced back to grow at an annual rate of 3.6% in 2021.[3] • In 2020, agriculture contributed 42.59% to the GDP while 11.66% came from the industry and 49.69% from the service sector.[4] • As of 2020, General government gross debt to GDP was 52.60% growing from 46.66% in 2019.[5]
Policy enablers	• The Ministry of Mines & Energy (MME) is the statutory agency which functions in the area of policy formulation for the energy sector of the country.[6] • Liberia targets to reduce GHGs by at least 10% by 2030.[7] • Under Paris climate Agreement, Liberia targets to raise share of RE to at least 30% of electricity production and 10% of overall energy consumption by 2030.[7] • The '2015 Electricity Law of Liberia' established the legal and regulatory framework for the generation, transmission, distribution, and sale of electricity within Liberia.[8]
Technological Feasibility	• Liberia receives an average of 1662 hours of sunlight per year. It is sunny 37.9% of daylight hours while 62.1% of daylight hours are likely cloudy or with shade, haze, or low sun intensity.[9] • Liberia receives relatively moderate levels of solar irradiation of 4.88 kWh/m^2/day and specific yield of 3.89 kWh/kWp, a moderate technical feasibility is envisaged for solar projects in Country.[10]
Market Maturity	• The Liberia Electricity Corporation (LEC) is a public utility entity with a mandate to produce and supply electric power to the entire nation.[11] • The Rural and Renewable Energy Agency (RREA) is an independent agency of the Government of Liberia to facilitate and accelerate the economic transformation of rural Liberia by promoting the commercial development and supply of modern energy products and services to rural areas.[12] • Liberia Electricity Regulatory Commission (LERC) func ons as regulator to issue licenses, approve tariffs, ensure liber-alization of the sector, and ensure a vibrant electricity sector.[13] • Liberia is the member of the West African Power Pool (WAPP), which aims to integrate the national power systems into a unified regional electricity market.[14]
Infrastructure	• In Liberia West Africa Power Pool (WAPP) is responsible for construction of the Ivory Coast – Liberia – Sierra Leone – Guinea interconnection (CLSG project) 225 kV transmission line.[2] • Liberia Accelerated Electricity Expansion Project (LACEEP-AF) financed the construction of a transmission line at 66 kV level, distribution lines at 33 kV and 220 kV and the upgradation of several substations in the Monrovia-Bomi-Grand Cape Mount Corridor.[16]
Financing	• The Liberia Electricity Sector Strengthening and Access Project (LESSAP) is the first project of a Multi-phase Programmatic Approach (MPA) where USD 180 Mn in IDA support is planned with the first phase commitment of USD 44 Mn in IDA credit and IDA grant of USD 15 Mn, USD 2.5 Mn from the ESMAP and USD 2.7 Mn from Japan PHRD.[18]
Energy Imperatives	• As of 2019, Electricity Consumption per capita stood at 81.09 kWh growing from 77.61 kWh in 2018.[19] • As of 2020, cumulative solar PV Capacity for the country was 2.58 MW growing from 2.41 MW in 2017.[20] • 27.6% of the population in Liberia had access to electricity as of 2019.[21] • As of 2020, cumulative solar off-Grid Capacity for the country was 2.583 MW growing from 2.406 MW in 2017.[22]

	Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
	6.4	194.7	NA
Luxembourg	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
Europe	2.9	15.9	69.6

Cumulative Solar Installed Capacity (MW)

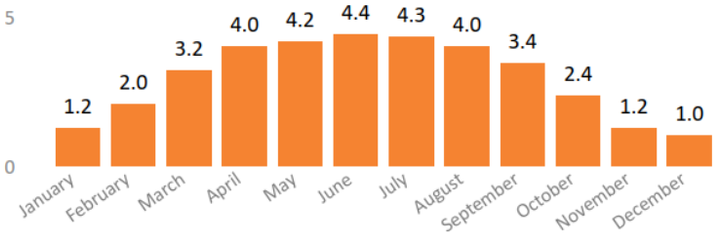


Renewable Energy Generation by Source

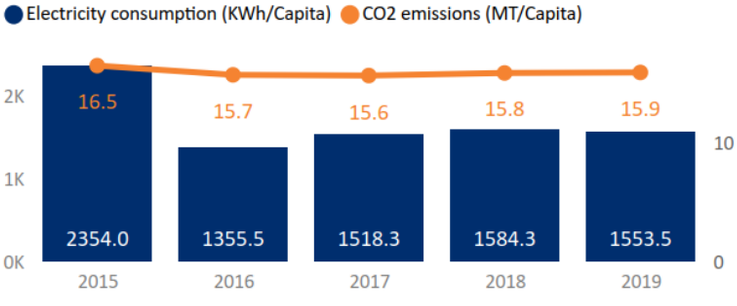


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



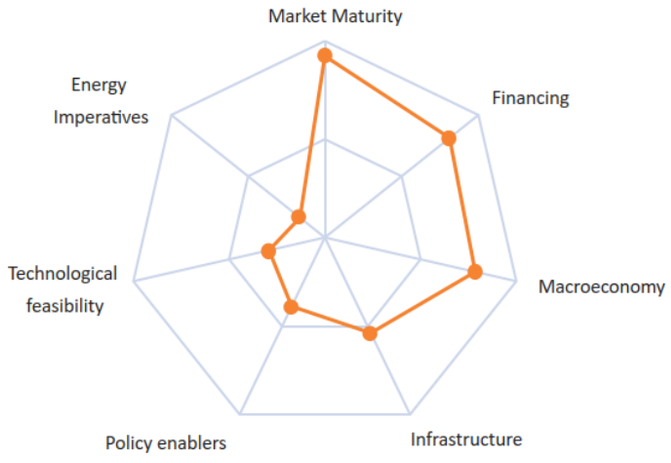
CO2 Emissions & Electricity Consumption



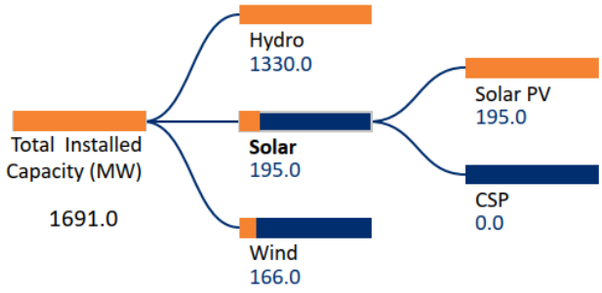
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

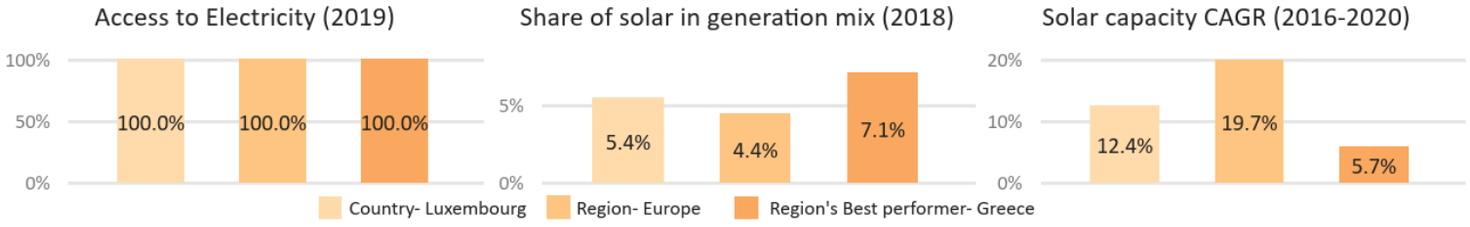


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Financing

Areas of Improvement → Energy Imperatives, Technological feasibility

Key Insights

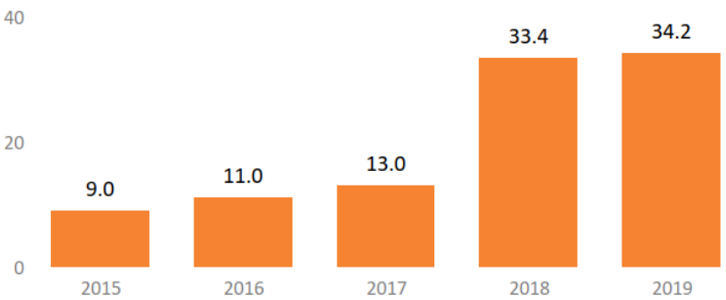
Drivers	Insights
Macro-economy	• GDP (Real) grew at an annual rate of 2.3% in 2019 and declined by 1.3% in 2020 owing to pandemic impact.[1] • Luxembourg's economy is driven by information and communication exports and the financial services sector.[2] • HICP (Harmonised Index of Consumer Prices) inflation is projected to rise to 2.5% in 2021 due to oil price increases, the introduction of a carbon tax and the rebound in consumption.[2]
Policy enablers	• The Ministry of Energy and Spatial Planning and the Ministry of the Environment, Climate and Sustainable Development are the key institutions that formulate and implement Luxembourg's energy policy.[4] • The government of Luxembourg has adopted an ambitious target to reduce GHG emission by 50-55% by 2030 from 2005 levels and has proposed legislation aiming for a carbon neutral economy by 2050.[5] • The government provides support for renewables through feed-in tariff and premium tariff for electricity generated from renewables, as well as investment subsidies supporting deployment of RE projects.[4]
Technological Feasibility	• Luxembourg receives relatively moderate levels of solar irradiation of 3.02 kWh/m^2/day and specific yield of 2.94 kWh/ kWp, a moderate technical feasibility is envisaged for solar projects in Country.[6] • Luxembourg's energy system is characterised by high import dependence and reliance on fossil fuels. In 2018, 95% of its energy supply (86% of electricity) were imported.[4]
Market Maturity	• Since 1990, 100% of the population in Luxembourg had access to electricity.[7] • The ILR (Luxembourg Regulatory Institute) regulates transmission and distribution system operators, electricity, and natural gas suppliers.[4] • The electricity grid is jointly managed by Creos Luxembourg S.A, five distribution system operators (DSOs) and one industrial system operator (ISO).[8] • In Luxembourg, EPEX SPOT operates as an electricity exchange market which provides market spot to buy, sell, and trade electricity, secure transactions, and auctioning services.[9]
Infrastructure	• The electric transmission network managed by Creos Luxembourg SA is integrated into the European interconnected networks by two 220 kV double lines.[10] • The Luxembourg electricity network is connected to the German network and the power is delivered to Heisdorf and Flebour through two 220 kV dual high voltage lines.[11] • In Luxembourg, average duration of interruption in the electricity supply in minutes per customer was 23.4 in 2018.[4]
Financing	• Luxembourg established the world's first legal framework for green covered bonds to finance the generation of renewable energies in 2018.[13] • The Luxembourg-EIB Climate Finance Platform provides 'Access to Clean Power Fund' which supports small companies that provide renewable energy solutions by offering working capital to finance inventory and receivables, and project debt to finance specific project assets.[14]
Energy Imperatives	• As of 2019, Electricity Consumption per capita is 1553.4 kWh.[15] • As of 2020, cumulative solar PV Capacity for the country is 194.7 MW growing from 159.7 MW in 2019.[16] • For projects commissioned in 2019, feed-in tariffs were EUR 91-92 per MWh for wind, EUR 151-165 per MWh for PV, EUR 124-179 per MWh for hydro and EUR 80-162 per MWh for biomass.[17]

Madagascar

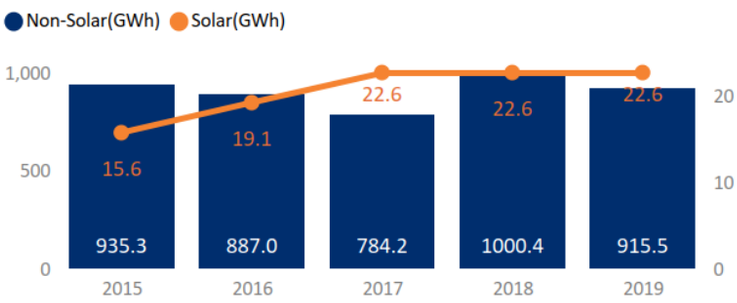
Africa

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
1.9	33.0	17.1
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.7	0.1	47.7

Cumulative Solar Installed Capacity (MW)

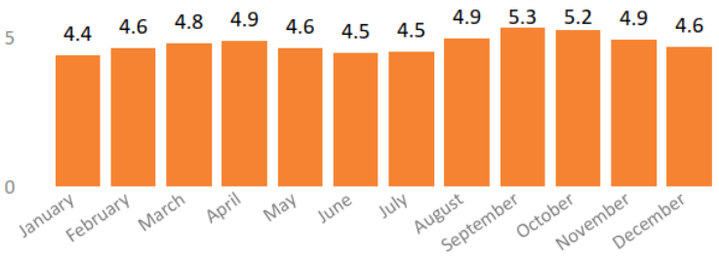


Renewable Energy Generation by Source

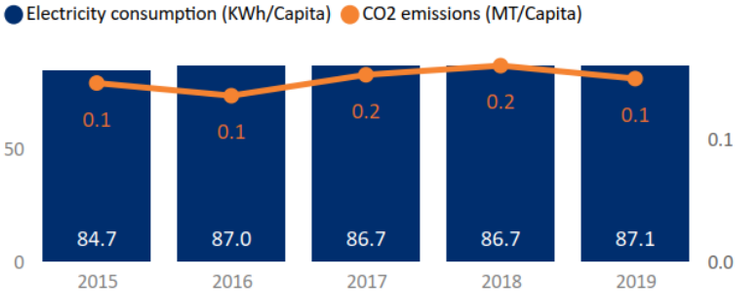


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



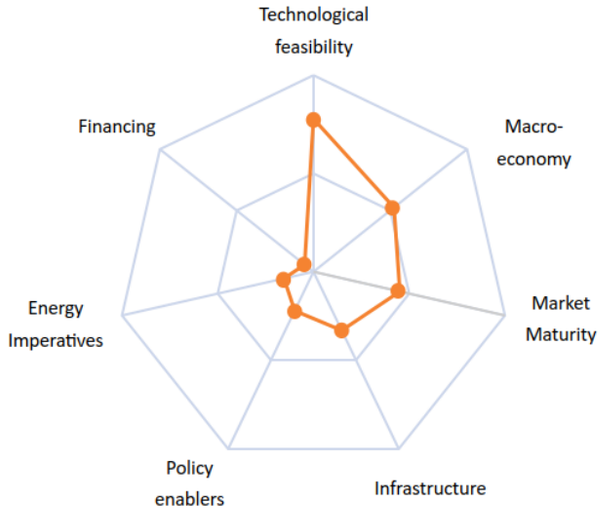
CO2 Emissions & Electricity Consumption



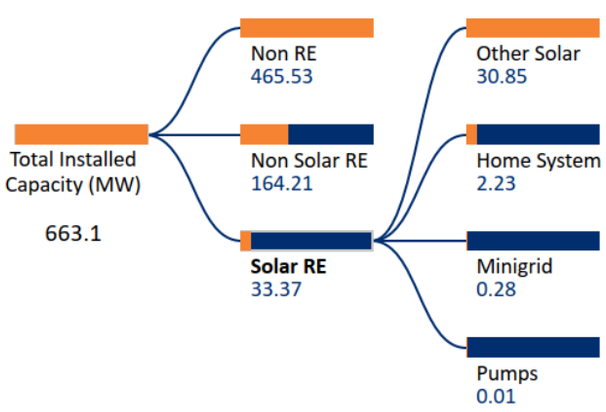
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers

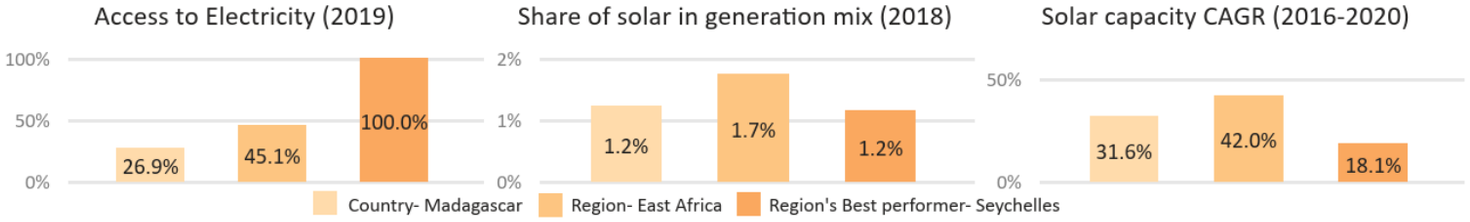


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Energy Imperatives

Key Insights

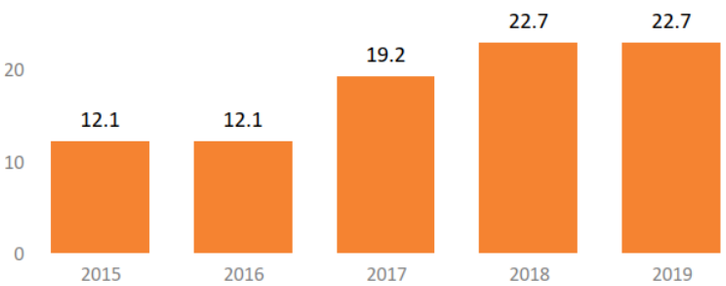
Drivers	Insights
Macro-economy	• Madagascar is a low-income status country[1] and its economy is majorly driven by Agriculture, including fishing and forestry.[2] • GDP (Real) has declined by 4.2% in 2020 and is expected to grow at an annual rate of 3.2% in 2021.[3] • In 2020, agriculture contributed 24.12% to the GDP while 13.32% came from the industry and 57.04% from the service sector.[4]
Policy enablers	• The New Energy Policy (NEP) of 2015 gives the framework and the objectives of deployment of renewable energies.[6] • The NEP has set energy targets that also include increasing the energy access rate to 70% by 2030.[7] • The NEP aims to produce 85% of power from renewable sources by 2030 (75% hydro, 5% wind, and 5% solar).[7] • National Sustainable Energy Fund (FNED) contributes to fund rural and suburban electricity infrastructure development projects based on RE and energy efficiency.[8]
Technological Feasibility	• Madagascar receives an average of 2690 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] • Madagascar receives relatively high levels of solar irradiation on of 5.63 kWh/m^2/day and specific yield of 4.72 kWh/kWp, a strong technical feasibility is envisaged for solar projects in Country.[10] • In 2019, share of electricity production from renewables stood at 43.53% in Madagascar.[11]
Market Maturity	• The Ministry of Water, Energy and Hydrocarbons (MEEH) develops and implements policies for the provision of adequate and reliable power supply in Madagascar.[7] • JIRAMA (Jiro sy rano Malagasy) is the vertically integrated state-owned water and electricity operator.[6] • The Electricity Regulatory Authority (ORE) is the regulatory body of the electricity sector.[7] • The Rural Electrification Agency (ADER) focuses to promote access to electricity for the rural population primarily through renewable energy sources.[7]
Infrastructure	• The Madagascan electrical system has 3 HV interconnected grids (RI): Antananarivo-Antsirabe (RIA), Toamasina (RIT) and Fianarantsoa (RIF) operated by JIRAMA.[8] • Transmission grid coverage in Madagascar is very limited. The network is comprised mainly of 35 kV, 63 kV and very few 138 kV transmission lines.[7] • The Power Transmission Network Reinforcement and Interconnection Project in Madagascar (PRIRTEM-II) includes the construction of a 135-km, 220 kV interconnection line between the capital Antananarivo and the central industrial city of Antsirabe.[12]
Financing	• 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] • The AfDB approved USD 43 Mn loan to finance second phase of power transmission project (PRIRTEM-II) in Madagascar. The financing comprises 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.[14]
Energy Imperatives	• As of 2019, Electricity Consumption per capita was at 87.07 kWh growing from 86.66 kWh in 2018.[15] • As of 2020, cumulative solar PV Capacity for the country stood at 33 MW growing from 13 MW in 2017.[16] • 26.9% of the population in Madasgascar had access to electricity as of 2019.[17] • As of 2020, cumulative solar off-Grid Capacity for the country stood at 13 MW declining from 14.24 MW in 2019.[18]

Malawi

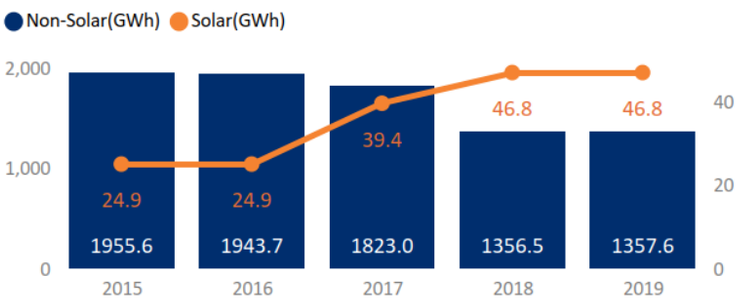
Africa

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
1.5	24.0	23.2
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.6	0.1	60.9

Cumulative Solar Installed Capacity (MW)

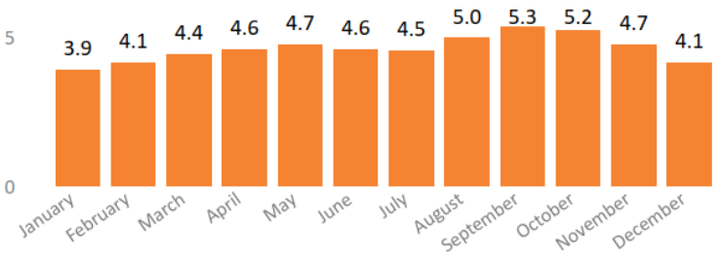


Renewable Energy Generation by Source

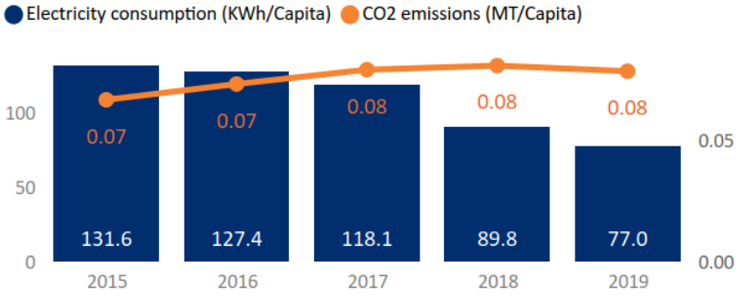


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



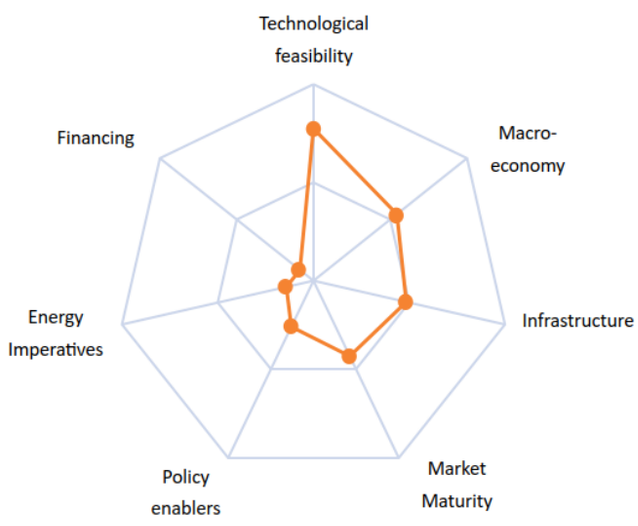
CO2 Emissions & Electricity Consumption



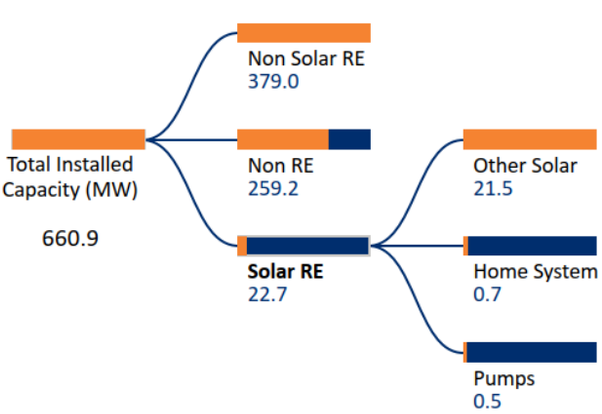
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



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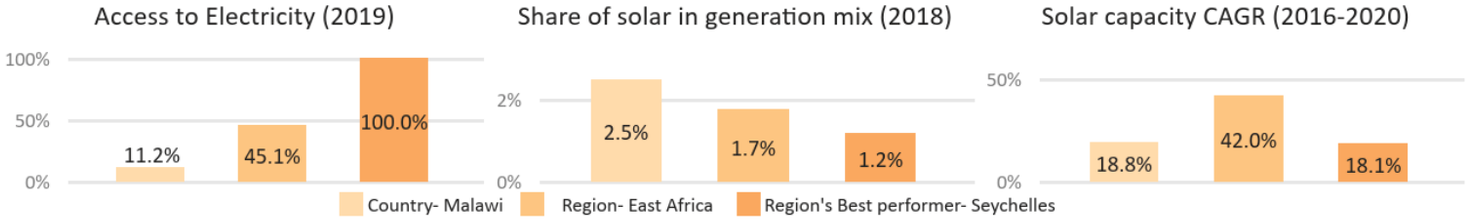
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Energy Imperatives

Key Insights

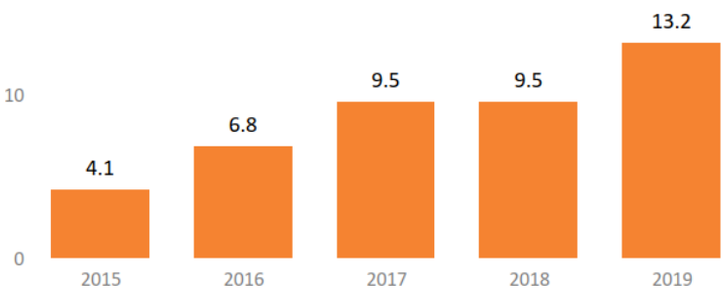
Drivers	Insights
Macro-economy	• Growth in Malawi's economy decelerated in 2020 to 1.7% from 5.7% level in 2019. The slowdown in GDP growth was driven by the outbreak of COVID–19.[3] • The inflation rate (CPI) of Malawi has improved in 2020 reaching 8.6% in 2020 from 9.4% level in 2019.[12] • The fiscal deficit was es mated at 7.7% in 2020, a deterioration from 4.7% levels in the previous year.[3]
Policy enablers	• As per the National Energy Policy, Malawi aims to promote use of renewable technologies and manufacturing of renewable energy products such as solar panels.[7] • In 2012, the regulator introduced feed-in tariff and power purchase agreement documents, which identified the national utility as the single/sole buyer.[9] • The country has set targets to achieve renewable share in electricity consumption mix to be 7% by 2020 and 10% by 2050.[9]
Technological Feasibility	• Owing to very high levels of solar irradiation (GHI) of 5.59 kWh/ m²/ day and specific yield 4.60 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Malawi.[5] • Malawi has plans to increase their total generation capacity from 364 MW to 5,000 MW and is willing to further increase the Solar share in the mix.[10] • Most of the large-scale solar plants are built along the riverbank due to favourable terrain.[10]
Market Maturity	• As on March 2021, energy shortages are standing out with about 11.4% of the population having access to electricity.[4] • Off-Grid Solar Lighting Sales in Malawi also increased significantly to 94,000 units in the second half of 2020, 151% more than the volumes in the first half of 2020.[1] • Malawi had signed nine PPAs totalling to a potential 290 MW of new generation capacity which also represents 82% of the current installed capacity.[8]
Infrastructure	• Malawi's energy sector has gone through important sectoral reform efforts recently including the unbundling of the national utility. The restructuring of Power Market is underway with strong investor interest and political will for IPPs to enter the market.[5] • Moving forward, there is high potential for solar and new hydro technologies to enter into the power market.[5] • Electricity Transmission Capacity constraints are prevalent in the country as evidenced by overloading of transmission lines and transformers.[7]
Financing	• The banking system remains well capitalized, liquid, and profitable but non-performing loans (NPLs) have risen recently from 4.8% at end-June 2019 to 6.6% at end-June 2020.[2] • To ease banking system liquidity constraints during the pandemic, the Reserve Bank of Malawi has implemented several measures —including lowering reserve requirements and a moratorium on debt service for small and medium enterprises (SMEs) un l end-2020.[2]
Energy Imperatives	• The Malawi Energy Policy indicates that approximately 85% of energy comes from biomass. Imported petroleum account for 3.5% of the energy and electricity produced and hydro power accounts for 2.3% of all energy.[6] • Electricity generation in the country is inadequate to meet the current demand. There is very less private sector participation in electricity generation to assist Government in filling the supply-demand gap.[7] • Currently, there are 4 operational mini grids. UNDP is collaborating with the Malawi Electricity Generation Agency for tariff setting of more Solar Mini Grids.[10]

Maldives

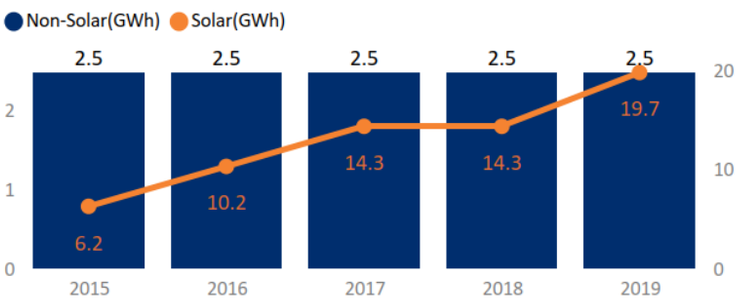
Asia & Pacific

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
730.0	15.2	15.2
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.4	3.1	53.3

Cumulative Solar Installed Capacity (MW)

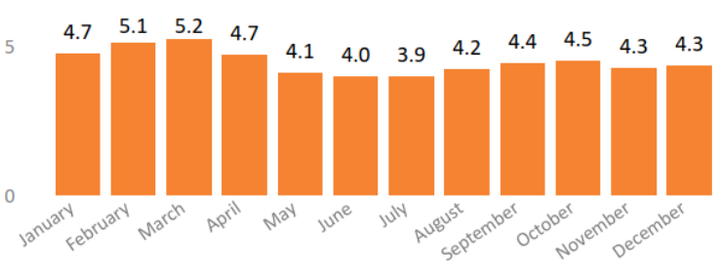


Renewable Energy Generation by Source

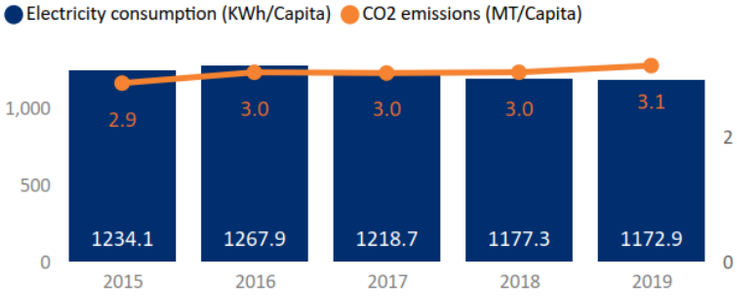


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



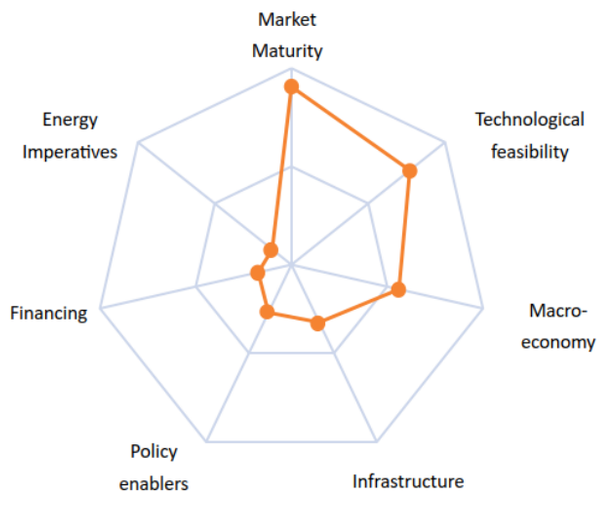
CO2 Emissions & Electricity Consumption



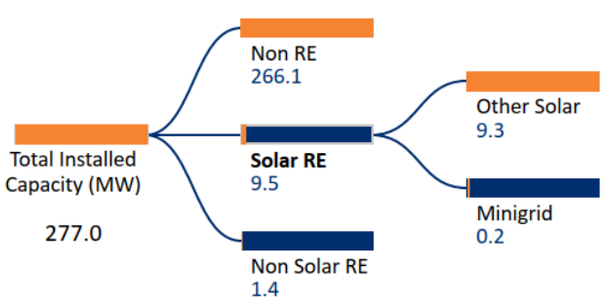
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
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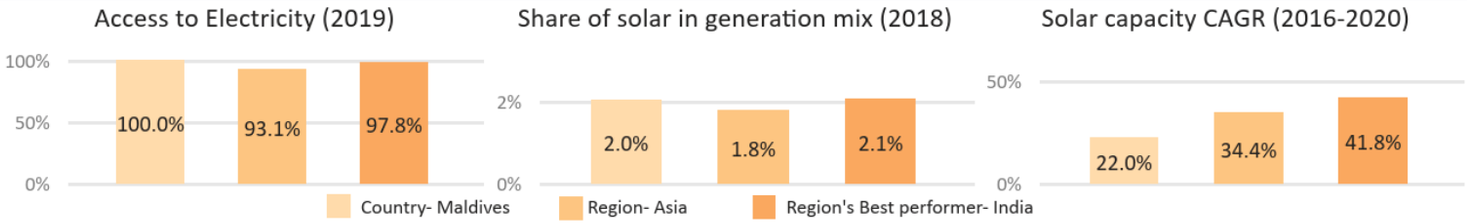
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

Areas of Improvement → Energy Imperatives, Financing

Key Insights

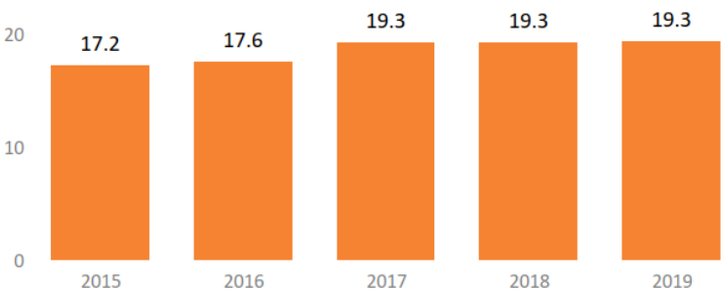
Drivers	Insights
Macro-economy	• Maldives' economy contracted by 28% in 2020 as tourism and construction activity slumped due to the covid19 effect.[1] • GDP (Real) had grown at an annual rate of 7% in 2019 which signifies the huge impact Covid had on the tourism driven economy.[2] • As of 2020, General government gross debt to GDP is 61.4% which was 61.6% in 2017.[3] • Net Foreign Direct Investment (FDI) for the country is 0.96 USD Bn in 2019.[4]
Policy enablers	• Ministry of Environment and Energy formulates policies & regulations related to environment, climate change and manages renewable energy mechanisms in the Maldives.[5] • The Government of Maldives has an ambitious goal of raising the share of RE in the national energy mix to 20% by 2023 and ramp it up to 70% by 2030.[6] • Maldives has a net-zero target by 2030, one of the most ambi ous targets for an island na on.[7]
Technological Feasibility	• Maldives receives relatively high levels of solar irradiation of 5.593 kWh/m^2/day and specific yield of 4.442 kWh/kWp, a strong technical feasibility is envisaged for solar projects in Country.[8] • As of 2020, ADB and the environment ministry of Maldives have started to implement solar battery-diesel hybrid systems in 48 islands out of the 160 inhabited islands of the nation.[9] • Electric vehicles are allowed into the Maldives tax-free, while petrol and diesel vehicles have 200% import duty.[10]
Market Maturity	• Access to electricity in Maldives was reported at 100% in 2019.[11] • Share of solar in generation mix for the country is 2.04% as of 2018.[13]
Infrastructure	• Maldives has received strong interest from investors for developing solar power projects proposed by the Government in 2020.[6] • About 150 outer islands are provided with electricity from community owned power generation and distributions systems.[16] • Preparing Outer Islands for Sustainable Energy Development (POISED) project is transforming the diesel-based grids into RE based hybrid systems covering 160 outer islands in Maldives. [17] • Between 1995 and 2019, Maldives' HDI value increased from 0.555 to 0.740, an increase of 33.3%.[18]
Financing	• Under the Preparing Outer Islands for Sustainable Energy Development Project at least 21 MW of solar power, 10 MWh of battery energy storage are envisaged to be commissioned. In 2020, ADB approved additional financing for the project to cover more outer islands.[19] • World Bank approved USD 107.4 Mn project to help Maldives accelerate its transition to renewable energy and support sustainable recovery.[20]
Energy Imperatives	• As of 2019, Electricity Consumption per capita was 1172.94 kWh which was 1218.7 kWh in 2017, almost a third of the global average.[21] • Installed generation capacity for solar minigrids was 0.204 MW as of 2018.[22] • As of 2020, cumulative solar off-Grid Capacity for the country was 15.15 MW and 9.53 MW in 2018.[23] • The price of electricity in the country was US 44.9 Cents/ kWh in 2019 that grew almost by 10% from 2017 levels of US 39.4 Cents/ kWh.[24]

Mali

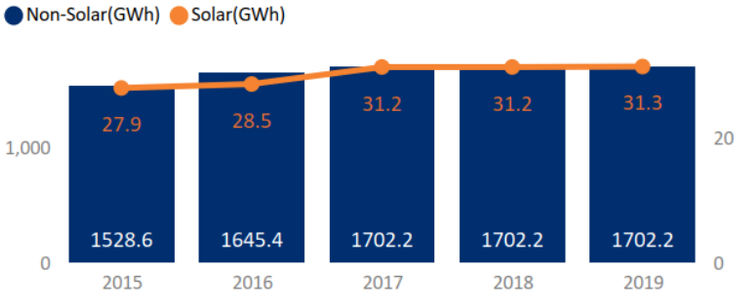
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
2,540.0	69.5	19.5
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.8	0.2	52.9

Cumulative Solar Installed Capacity (MW)



Renewable Energy Generation by Source



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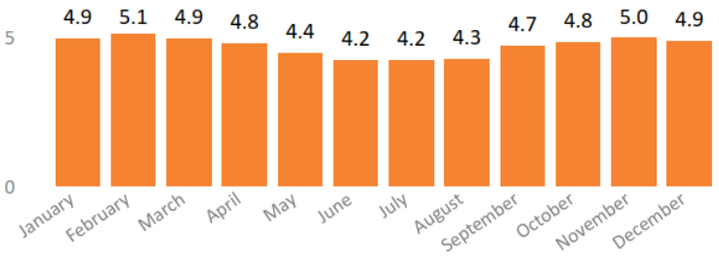
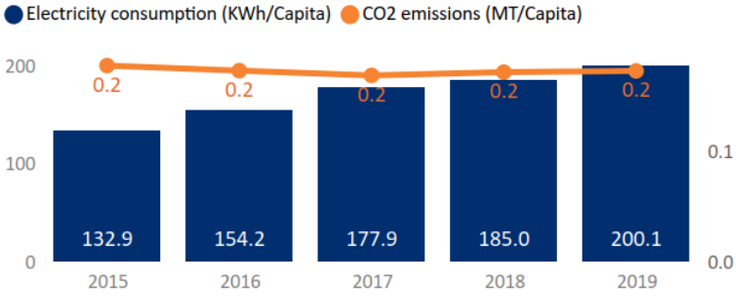
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



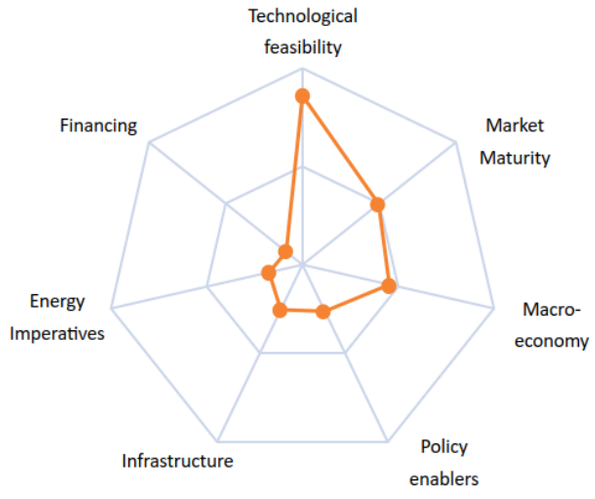
CO2 Emissions & Electricity Consumption



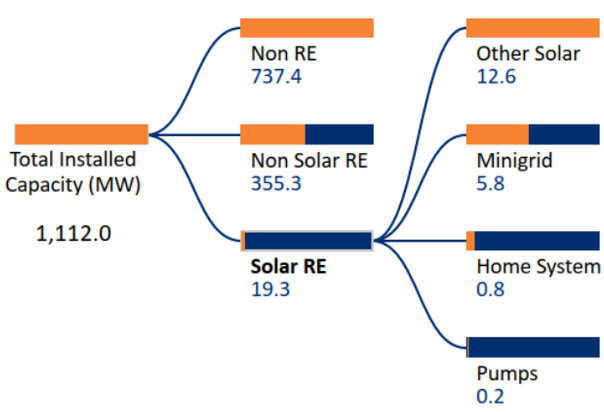
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers



Installed Generation Capacity by Source



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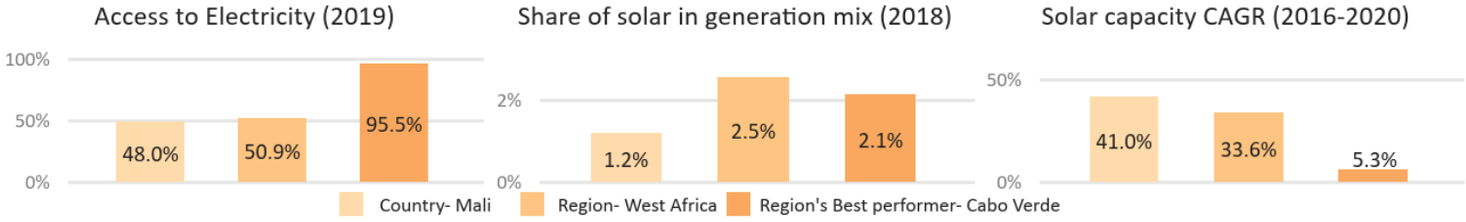
Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Market Maturity

Areas of Improvement → Financing, Energy Imperatives

Key Insights

Drivers	Insights
Macro-economy	• COVID–19 pandemic combined with a military coup d'état in August 2020 drove the economy from strong growth of 5.1% in 2019 to a recession in which real GDP declined by 2% in 2020.[1] • Rising oil prices are expected to increase the inflation rate to 1.5% in 2021 and 2.1% in 2022.[1] • The downturn in economic activity in 2020 is expected to increase extreme poverty incidence in Mali by affecting over 850,000 people according to World Bank estimates.[2]
Policy enablers	• Under the National Action Plan for Renewable Energies (Paner), Mali aims to ramp up its installed renewable cpacity to 1.42 GW by 2030. The nation also aims to install more than 600 MW of off-grid renewables over the next decade.[7] • The country's solar energy roadmap includes plans to build large-scale PV projects. The installations include a 50 MW solar plant in Sikasso by PowerPro, a 50 MW project by Akuo Kita Solar, a 33 MW PV array by Norway's Scatec Solar, and a 25 MW facility to be built in Koutiala.[7] • Mali has waived off value-added taxes and import taxes on equipment such as solar panels.[7]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 6.01 kWh/m²/day and specific yield 4.67 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Mali.[8] • Mali's climate is characterized by a long dry season and a rainy season that lasts on average one to five months per year depending on the region.[5]
Market Maturity	• Access to electricity has doubled in the last decade – but only 25.6% of the country was connected to the grid in 2018 with sharp disparities across urban and rural areas.[3] • For lighting and mobile phone charging, solar equipment has entered Mali in force – with solar representing 40% of the energy sources for these uses, as of 2018.[3]
Infrastructure	• Mali's electricity system encompasses a national grid that is owned and operated by Energie du Mali SA (EDM-SA) supplying in 35 towns. In addition to the national grid, EDM SA manages 30 isolated centres equipped with diesel generators and two centres supplied by Côte d'Ivoire.[6] • Frequent power outages and the high cost of electricity remain a serious bottleneck to the power sector growth.[2]
Financing	• The banking sector was stable when the pandemic hit, but pockets of vulnerability may be intensified by the pandemic.[2] • Fiscal policy in 2021 will focus on the action program of the transition government while maintaining fiscal discipline and public debt sustainability.[2] • In Feb 2019, GCF sanctioned USD 28.2 Mn loan for the development of 4.83 MW of isolated solar PV mini-grid systems in Mali.[9]
Energy Imperatives	• Hydropower accounts for 51% of installed capacity, however, hydrological changes have an impact on power generation and as a result Mali is increasingly resorting to oil-powered stations.[6] •Due to the high generation costs from thermal power stations and excessive network losses, tariffs are high apart from the social tariffs offered when consumption is below 50 kWh per month.[6]

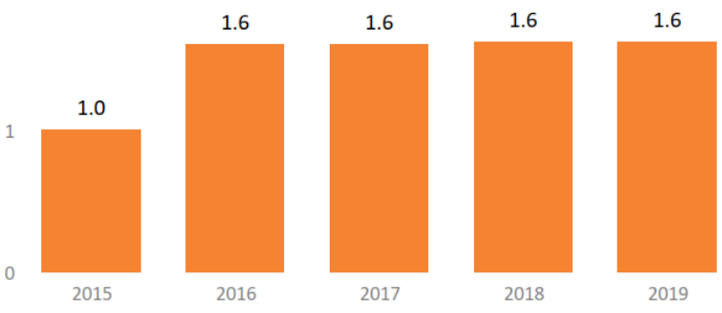
Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
78.0	1.6	0.7

Republic of Marshall Islands

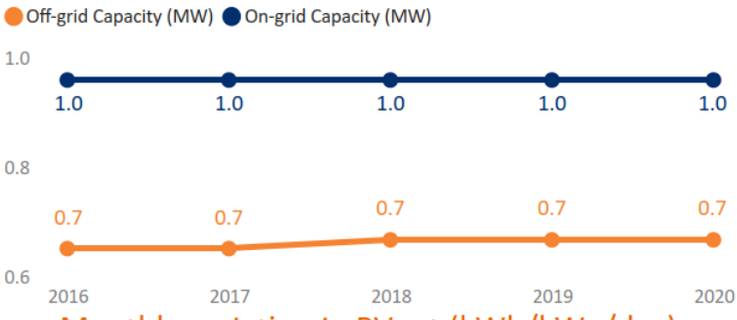
Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
4.3	2.8	50.9

Asia & Pacific

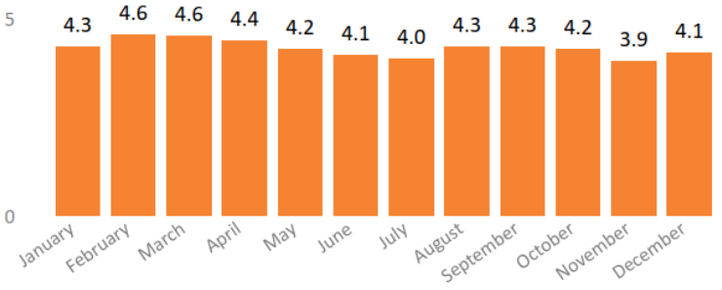
Cumulative Solar Installed Capacity (MW)



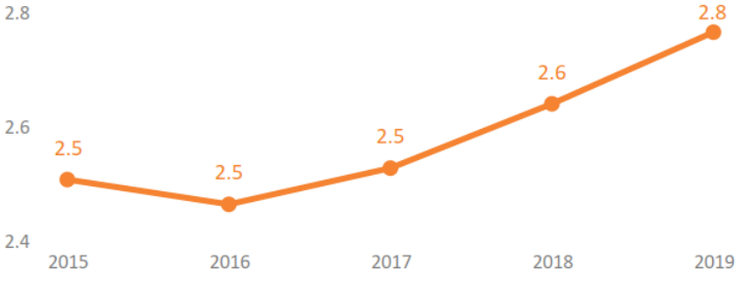
Cumulative Solar Off-grid & On-grid Capacity



Monthly variation in PVout (kWh/kWp/day)



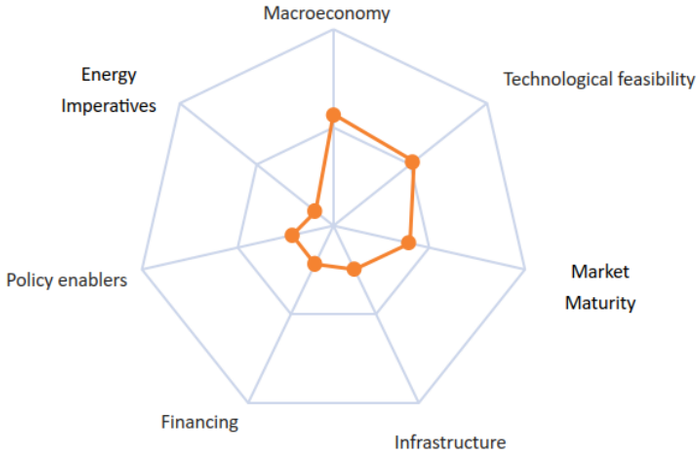
CO2 Emissions (Metric Tonnes/ Capita)



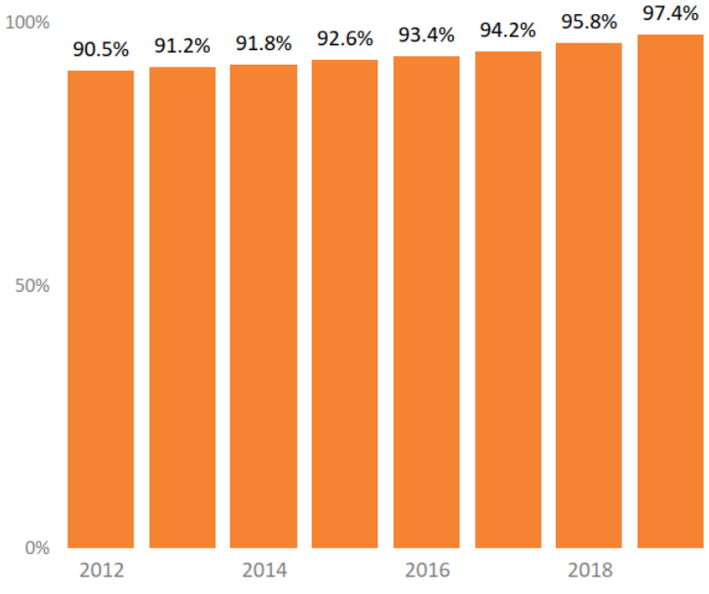
Ease of Doing Solar Classification

Potential

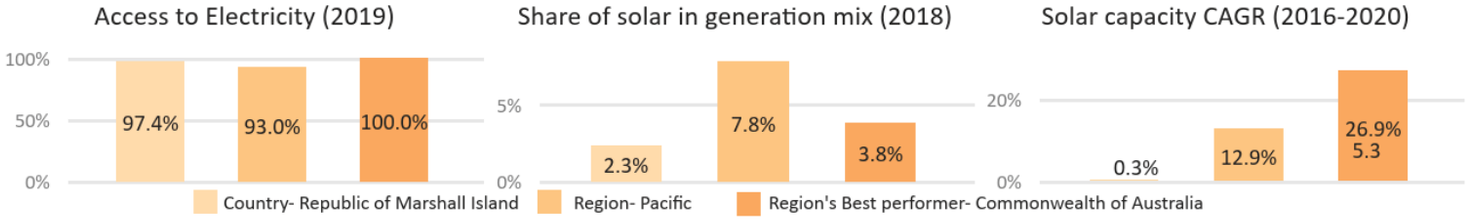
Performance against 7 drivers



Access to Electricity



Country's regional performance and characteristics



Areas of Strength → Macroeconomy; Technological feasibility

Areas of Improvement → Energy Imperatives; Policy enablers

Key Insights

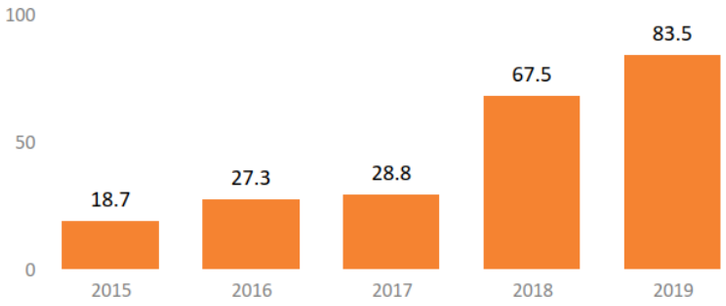
Drivers	Insights
Macro-economy	• GDP (Real) has grown at an annual rate of 6.5% in 2019 and declined by 3.3% in 2020 owing to pandemic.[1] • The Republic of the Marshall Islands' (RMI) economy is driven by strong fishery and construction activities.[2] • Share of Agriculture, forestry, and fishing to the GDP was 20.15% in 2019.[3]
Policy enablers	• The country has committed to reduce GHG emissions by 32% below 2010 levels by 2025, 45% by 2030, and to have net zero emissions by 2050.[5] • Majuro and Ebeye's grid will go from being almost entirely dependent on diesel generation, to over 50% renewables and the additional objective for the system is to be capable of diesel-off mode by 2025.[6]
Technological Feasibility	• RMI receives an average of 2480 hours of sunlight per year. It is sunny 56.6% of daylight hours while 43.4% of daylight hours are likely cloudy or with shade, haze, or low sun intensity.[8] • RMI receives very high levels of solar irradiation of 5.37 kWh/m^2/day and specific yield of 4.23 kWh/ kWp, a strong technical feasibility is envisaged for solar projects in Country.[9]
Market Maturity	• The Ministry of Resources and Development is responsible for the energy, trade, and investment sectors while its Energy Planning Division is responsible for energy planning and coordination.[11] • Marshalls Energy Company (MEC) is a fully state-owned electricity utility which generates, distributes, and retails electricity on Majuro to a population of about 28,000 persons (roughly half of RMI's population).[10] • Kwajalein Atoll Joint Utility Resources (KAJUR), a subsidiary of MEC, is responsible for on-grid electricity generation, transmission, and distribution in Ebeye.[11]
Infrastructure	• Marshall Islands has three types of island electricity systems: main grids of Majuro and Ebeye; outer island mini grids; and small stand-alone systems.[5] • KAJUR's network was upgraded in 2005 to an underground 13.8 kV and low voltage network.[10]
Financing	• Since 1990, ADB has committed loans of USD 93.1 million, grants of USD 72.7 million, technical assistance worth USD 20.9 million, and co-financing of USD 10.7 million for the RMI. Cumulative loan and grant disbursements to the RMI amount to USD 111.1 million.[13] • ADB continues to support efforts by the Government of the Marshall Islands to promote renewable energy sources and shore up energy security.[13]
Energy Imperatives	• As of 2020, cumulative solar PV Capacity for the country was 1.625 MW growing from 1.609 MW in 2017.[14] • Access to electricity (% of population) in RMI was reported at 97.44 % as of 2019.[15] • As of 2020, cumulative solar off-Grid Capacity for the country was 0.67 MW growing from 0.65 MW in 2017.[16]

Mauritius

Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
2,650.1	83.5	NA
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.2	3.7	81.5

Cumulative Solar Installed Capacity (MW)



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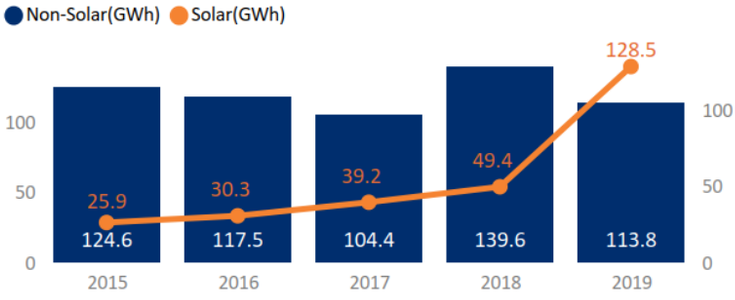

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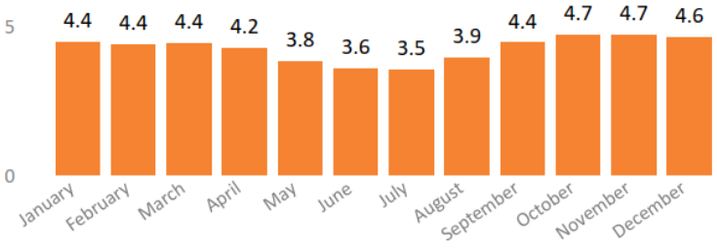
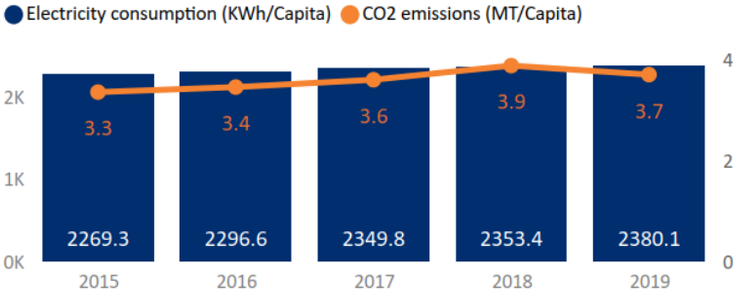


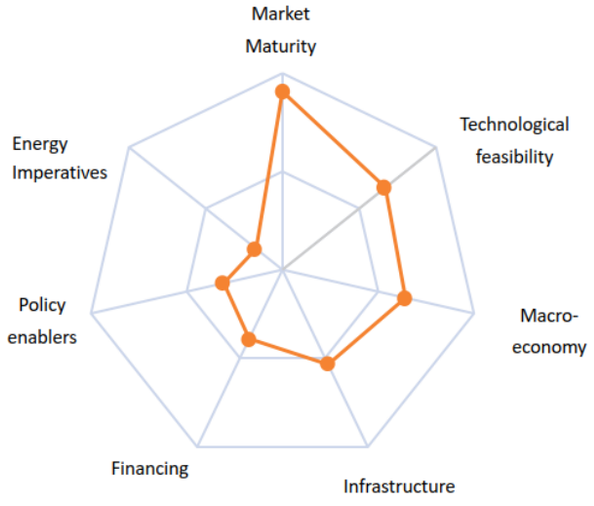
CO2 Emissions & Electricity Consumption



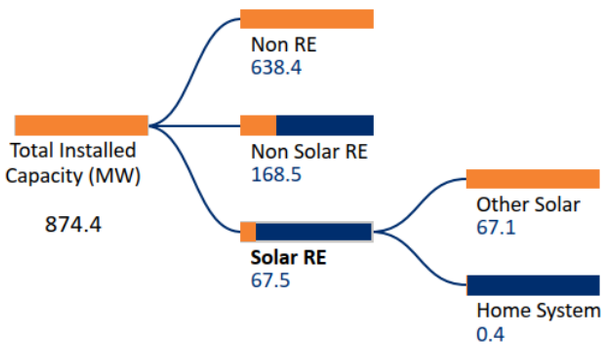
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



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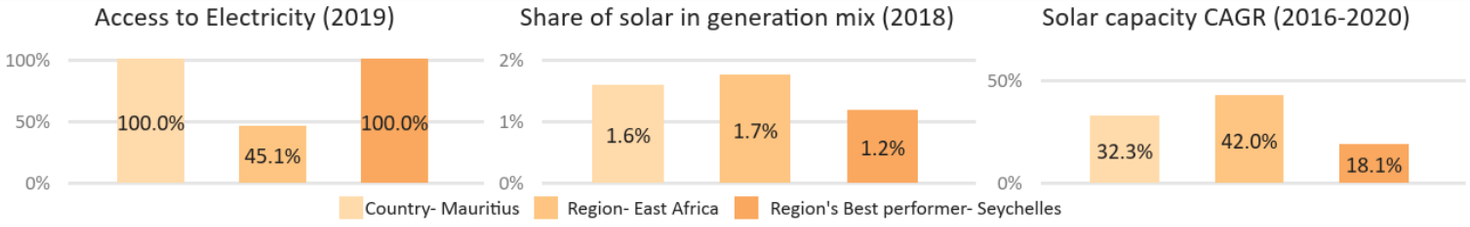
Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

Areas of Improvement → Energy Imperatives, Policy enablers

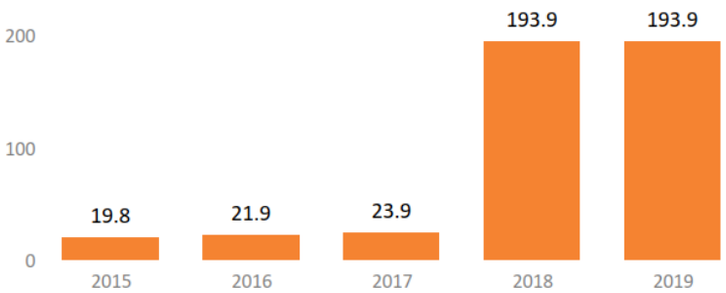
Key Insights

Drivers	Insights
Macro-economy	• Mauritius has undergone a remarkable economic transformation from a low-income, agriculturally based economy to a diversified, 1 High-Income Country by 2020.[2] • GDP (Real) has grown at an annual rate of 3% in 2019 but declined by 15.8% in 2020 owing to pandemic impacts.[3] • In 2020, agriculture contributed 3.41% to the GDP, 16.67% came from the industry and 68.19% from the service sector.[4]
Policy enablers	• The Ministry of Renewable Energy and Public Utilities (MPU) is responsible for energy policy and its portfolio includes energy, water, and wastewater.[6] • Mauritius has set a target for 40% of renewable energy in its electricity mix by 2030.[7] • The Mauritius Energy policy lays emphasis on the development of RE, reduction of dependence on imported fossil fuel and the promotion of energy efficiency.[6] • Mauritius provides incentives for RE projects which includes VAT exempt for Solar PV projects and Accelerated Income Tax Depreciation Provision for Green Investment in green technology equipment (50% straight line).[7]
Technological Feasibility	• Mauritius receives an average of 2889 hours of sunlight per year. It is sunny 65.9% of daylight hours while 34.1% of daylight hours are likely cloudy or with shade, haze, or low sun intensity.[8] • Mauritius receives relatively very high levels of solar irradiation of 5.01 kWh/m2/day and specific yield of 4.2 kWh/kWp, a very high technical feasibility is envisaged for solar projects in Country. [9] • Share of electricity production from Renewables in Mauritius was at 21.05% in 2019.[11]
Market Maturity	• The Mauritius Renewable Energy Agency (MARENA) creates an enabling environment for the development of RE and to increase the share of renewable energy in the national energy mix.[12] • The Utility Regulatory Authority (URA), is an independent body set up by the Government of Mauritius, regulates the utility services, i.e. electricity, water and wastewater.[13] • The Central Electricity Board (CEB) is a parastatal body wholly owned by the Government of Mauritius to prepare and carry out development schemes for improving the generation, transmission, distribution, and sale of electricity in Mauritius.[14]
Infrastructure	• The transmission network consists of 66 kV lines which interconnect power plants and major 66/22 kV substations.[15] • The 22 kV outgoing lines from the substations either supply the rural regions or are used for sub-transmission feeding 22/6.6 kV substations.[15] • The CEB is investing hugely in the replacement of bare conductors by insulated cables to minimise power outages and targets to achieve 50% of underground 22 kV and low voltage network by 2025.[16]
Financing	• African Development Bank provided USD 116.7 Mn loan in 2015 to the CEB. The redevelopment of Saint Louis Power Station has helped to increase the country's existing energy reserve by 42 MW, while improving the environment and reducing GHG emissions.[18]
Energy Imperatives	• As of 2019, Electricity Consumption per capita was 2380.06 kWh growing from 2353.41 kWh in 2018.[11] • As of 2020, cumulative solar PV Capacity for the country stood at 83.49 MW growing from 67.49 MW in 2018.[20] • 100% of the population in Mauritius had access to electricity as of 2019.[21] • The price of electricity is USD 0.142 per kWh for households and USD 0.127 per kWh for businesses which includes all components of the electricity bill such as the cost of power, distribution, and taxes.[22]

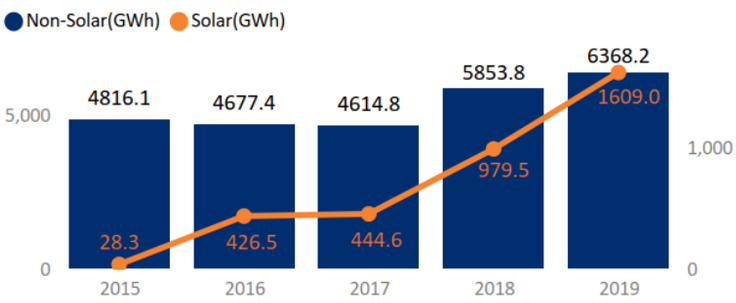
Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
32.6	194.0	22.9

Morocco	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
Africa	5.0	2.0	73.4

Cumulative Solar Installed Capacity (MW)

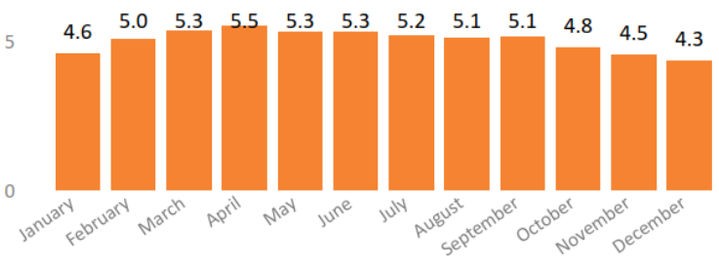


Renewable Energy Generation by Source

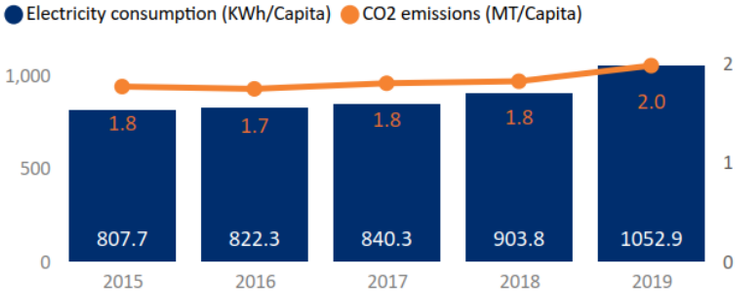


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



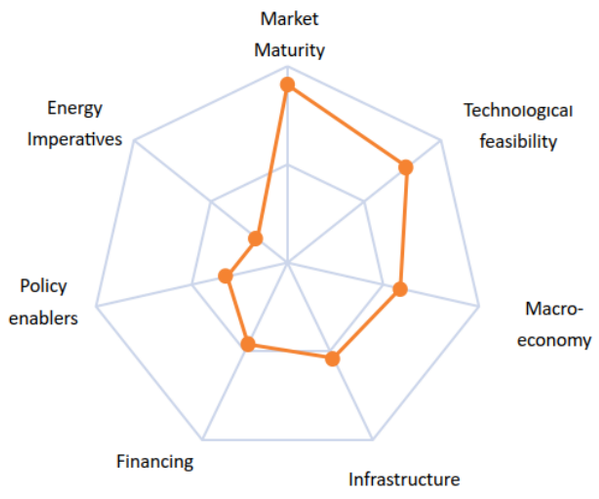
CO2 Emissions & Electricity Consumption



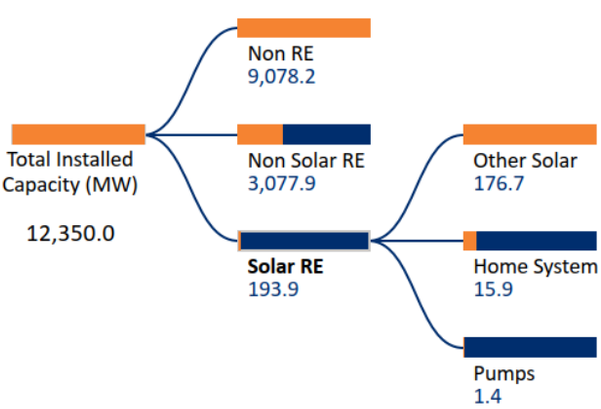
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers



Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
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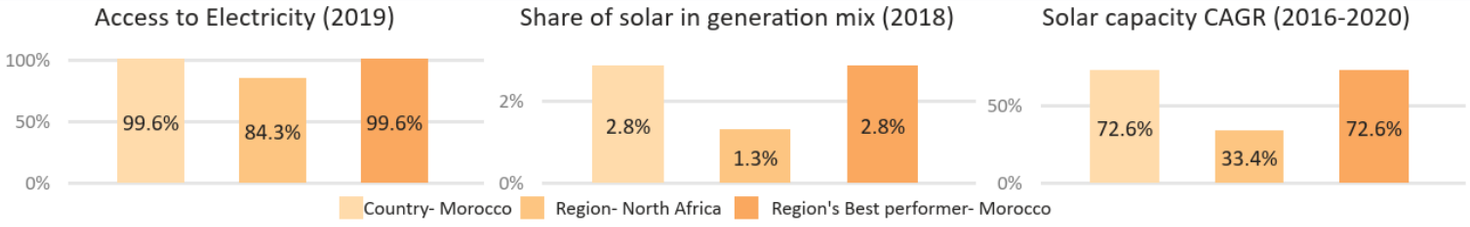
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

Areas of Improvement → Energy Imperatives, Policy enablers

Key Insights

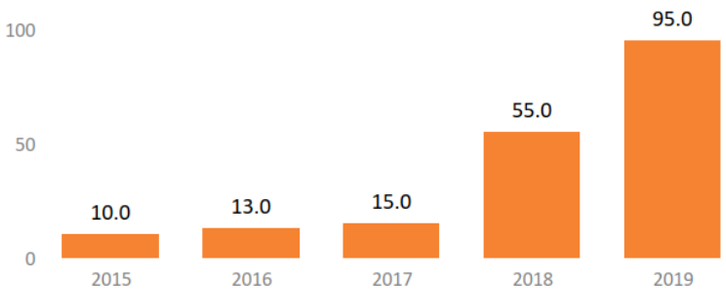
Drivers	Insights
Macro-economy	• On account of COVID-19 Pandemic, the GDP (Real) has declined by 7% in 2020.[1] • The inflation rate (CPI) of Morocco has risen to 0.6% in 2020 from 0.2% in 2019.[1] • In 2019, the services sector was a major GDP contributor having 60.1% share followed by industrial and agricultural sector having 25.2% and 14.7% share respectively.[6] • As of 2019, the exports of manufactured products dominated the total exports having a share of 42.5% followed by travel services and agricultural products having 16.9% and 13.2% share respectively.[6]
Policy enablers	• The government of Morocco aims to have 52% share of renewable energy in the generation mix through 10 GW capacity addition with 4.5 GW solar PV additions by 2030.[10] • To encourage investments in renewable energy net metering, self-generation rights, renewable energy tenders have already been introduced by the government.[7] • The National Agency for Solar Energy aims to promote solar energy across the country through capacity building, channelise foreign investments and develop Public Private Partnerships (PPP) for solar energy projects.[11]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.56 kWh/m^2/day and specific yield 5.02 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• Since 2017, 100% of the population in the country has access to electricity.[3] • The country is blessed with very high solar potential, however in 2019, solar PV has accounted only 4.11% share in generation mix.[4] • The Power sector in Morocco is regulated by National Authority for Electricity Regulation (Autorité Nationale de Régulation de l'Électricité (ANRE). The generation sector has presence of Independent Power Producers (IPPs), while transmission and distribution sectors are wholly controlled by the government entities.[7]
Infrastructure	• The transmission system of Morocco operates between 60 kV to 400 kV AC voltage levels. The total length of transmission lines grew at a CAGR of 3.2% in the last decade reaching 28,693 ckm in 2020.[7] • Distribution of electricity in the country is done by National Office for Electricity and Potable Water (ONEE) with presence of some private distributors with total line length at 364,675 ckm in 2020.[7] • The National grid of Morocco is interconnected with Spain and Algeria. Morocco was an importer of electricity; the country has clocked 3787.7 GWh of imports against 395.2 GWh exports during 2019.[7]
Financing	• In 2015, EBRD launched Morocco Sustainable Energy Financing Facility (MORSEFF), a credit line facility, of EUR 110 mn for financing of renewable energy projects.[12,13] • The Green Value Chain (GVC), developed by EBRD and designed for SME's, has a credit line of EUR 90 mn for providing technical support and financing of green technologies in the country.[14] • In 2018, the World Bank sanctioned funding of USD 125 mn to support Morocco's aim of reducing its dependence on fossil fuels by developing world class solar energy resources.[15]
Energy Imperatives	• Per capita consumption of 1.05 MWh is relatively low in comparison to the global average of 3.35 MWh in 2019.[5] • The total generation from solar PV has risen at a CAGR of 192.8% between 2010-19 reaching 1,581 GWh in 2019 from 0.1 GWh in 2010.[4] • In 2019, Fossil fuel (oil, gas & coal) based thermal power plants dominated the generation mix having 79.0% share in the mix.[4] • In the last decade, the total power demand in the country has risen at a CAGR of 4.0% reaching 37,475 GWh in 2019 from 26,404 GWh in 2010.[4]

Mozambique

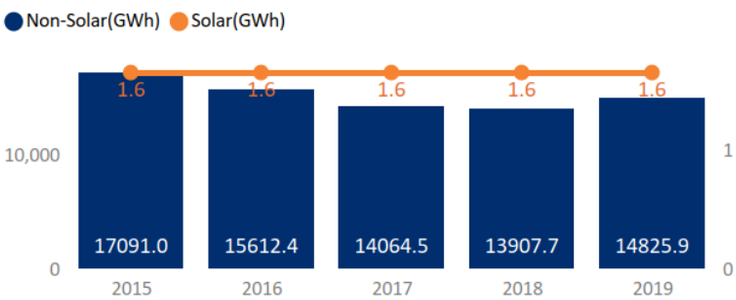
Africa

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
12.7	95.0	15.0
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.4	0.3	55.0

Cumulative Solar Installed Capacity (MW)

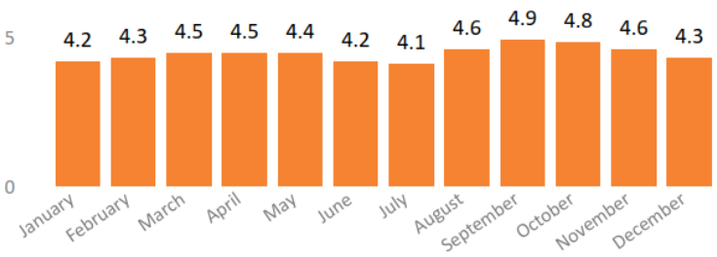


Renewable Energy Generation by Source

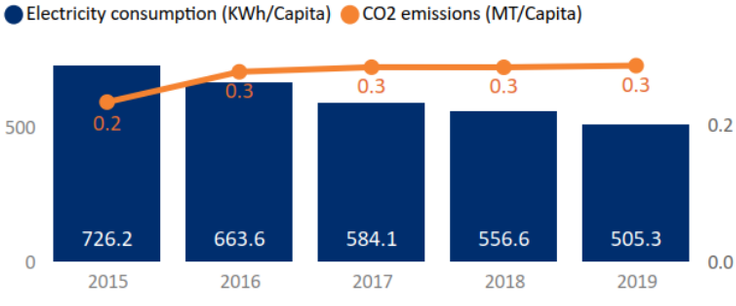


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



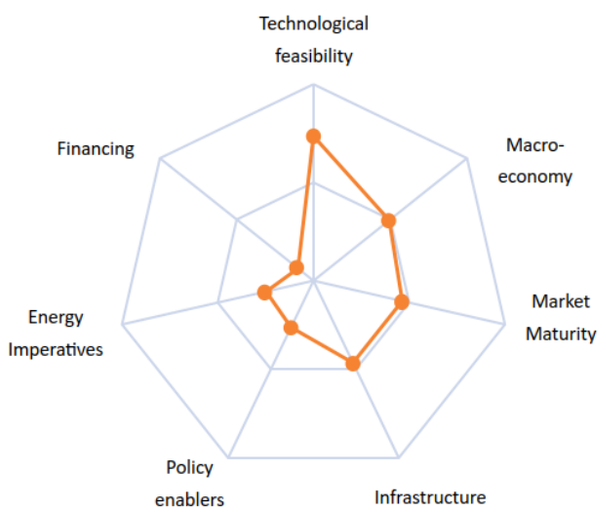
CO2 Emissions & Electricity Consumption



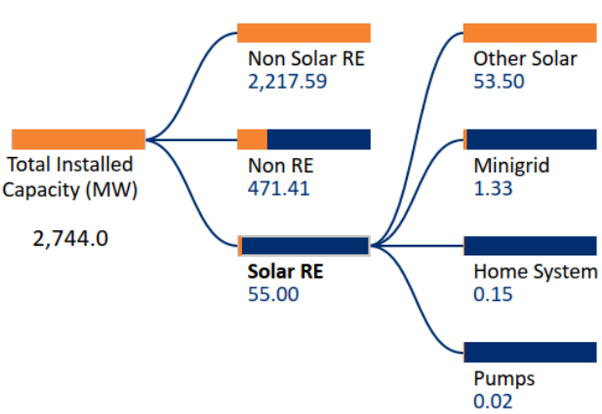
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
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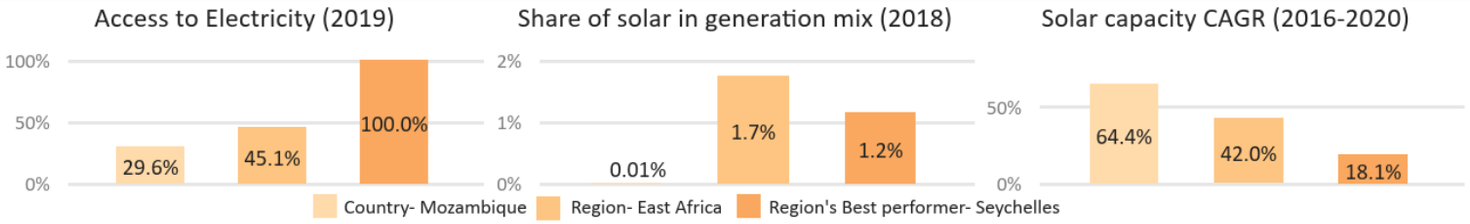
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Energy Imperatives

Key Insights

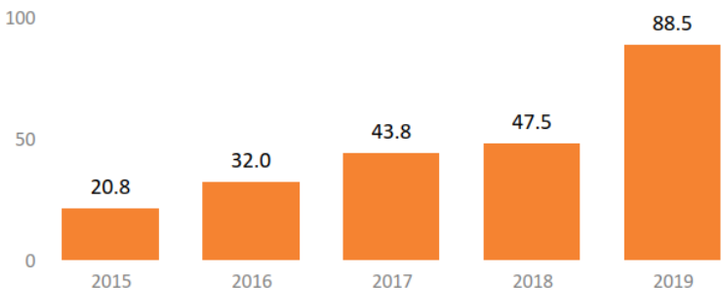
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, Mozambique's GDP (Real) declined by 1.2% in 2020.[1] • The inflaton rate (CPI) of Mozambique has increased in 2020 reaching 3.1% from 2.8% in 2019.[1] • While the economy registered its first contraction in 2020 in nearly three decades, growth is expected to rebound over the medium-term, expected to reach 4% by 2022.[13]
Policy enablers	• In 2018, the Government launched the 'National Energy for All' Programme to focus on grid expansion and highlight the role of off-grid solar and renewable-based solutions.[7] • BRILHO, a five-year programme (2019 – 2024), has been developed to catalyse country's off-grid energy market to provide clean and affordable energy to country's off-grid population.[3] • The Sustainable Energy Fund for Africa (SEFA) initiative for Mozambique targets to develop Feed-In-Tariff regime for small/ medium RE projects, Mini-Grid regulatory framework, and Capacity building and awareness ac vi es.[4]
Technological Feasibility	• Owing to very high levels of average solar irradiation level (GHI) of 5.382 kWh/ m²/ day and specific yield of 4.44 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Mozambique.[8] • The country has significant and largely untapped solar potential of about 23 GW of which 2.7 GW could be easily harnessed.[9]
Market Maturity	• With a current electrification rate of only 29%, the Government of Mozambique aims to electrify all households by 2030.[6] • Mozambique is ranked third among the countries with highest sales in Off-Grid Solar Lighting. Sales in the second half of 2020 were positively impacted by supporting programs such as the BRILHO program and EnDev COVID-PAY.[1] • Private sector off-grid electrification initiatives are scarce but emerging with an identified market potential of approximately 4 mn households.[10]
Infrastructure	• Electricity and Gas exports are generating significant foreign exchange revenues and have established Mozambique as an important regional energy hub.[5] • One of Mozambique's most significant power sector investments, the USD 506 million Temane Transmission Project (TTP), will commence construction later in 2021.[6]
Financing	• The USAID Power Africa program awarded a grant to install off-grid solar powered electrical systems in rural health facilities and is estimated to serve 138,000 Mozambicans.[6] • Since its creation, Fundo de Energia's (FUNAE) has successfully funded and implemented off-grid systems around Mozambique which have reportedly provided some form of energy access to approximately 5 Mn population.[11] • A comprehensive debt strategy aimed at bringing down debt levels to moderate risk of distress over the medium term is being adopted.[12]
Energy Imperatives	• The country has an installed capacity of 2,428MW, yet its vast and abundant renewable energy sources remain untapped.[4] • At 187 GW, Mozambique has the largest power generation potential in Southern Africa from untapped coal, hydro, gas, wind, and solar resources.[6] • The industrial and commercial segments are expected to drive demand growth as residential consumers struggle with the existing highly subsidized tariffs.[6]

Myanmar

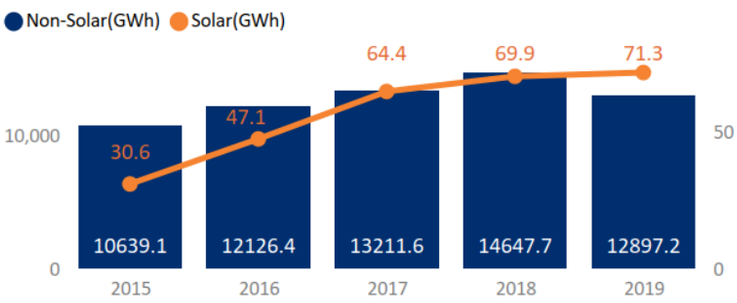
Asia & Pacific

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
18.5	84.5	44.5
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.0	0.5	46.8

Cumulative Solar Installed Capacity (MW)

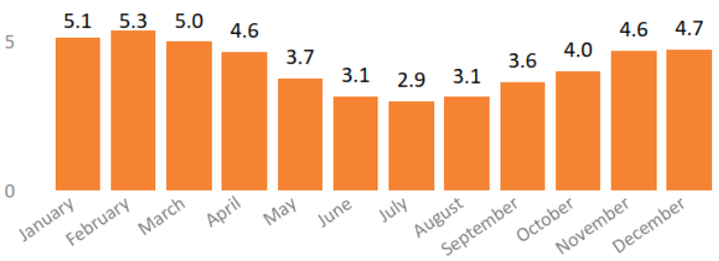


Renewable Energy Generation by Source

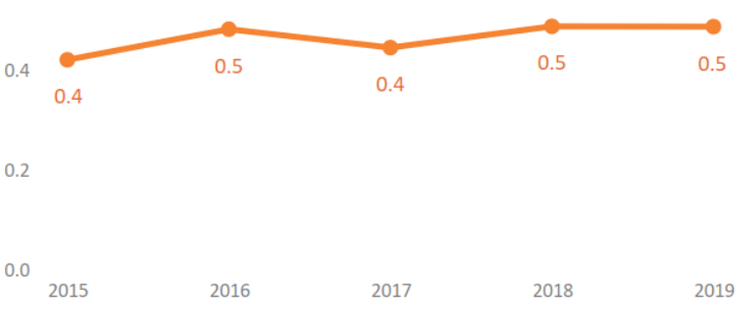


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



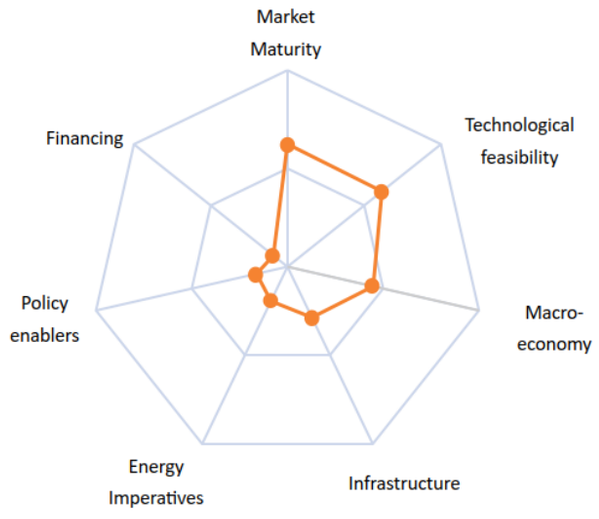
CO2 Emissions (Metric Tonnes/Capita)



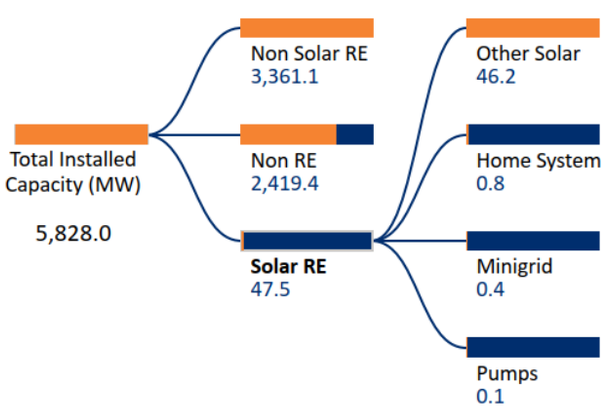
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers



Installed Generation Capacity by Source



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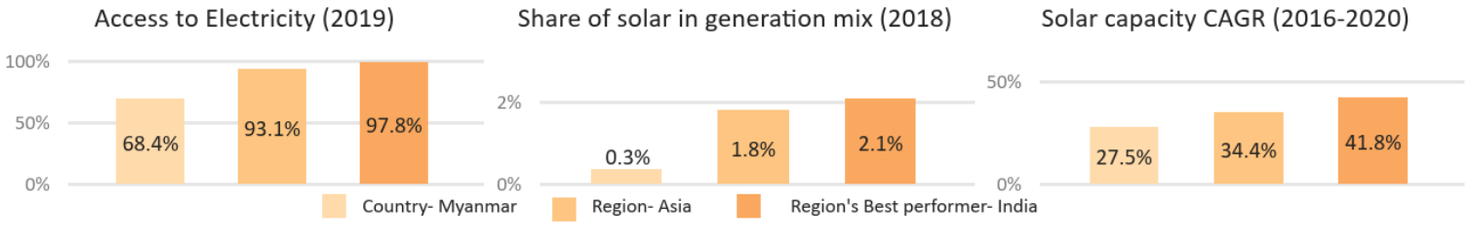
Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

Areas of Improvement → Financing, Policy enablers

Key Insights

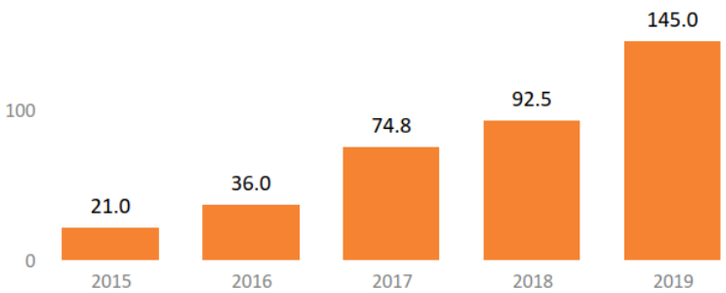
Drivers	Insights
Macro-economy	• GDP (Real) grew at an annual rate of 6.8% in 2019; growth in 2020 was 3.2%, relatively subdued from 2019 levels mainly on account of Covid-19.[1] • The largest service industries in Myanmar - retail and wholesale trade and transport, have been hit by a combination of supply and demand side impacts owing to COVID-19.[2] • As of 2019, the GDP contribution from the processing and manufacturing sector in Myanmar was the highest at about 26,000 tn Myanmar kyat.[3]
Policy enablers	• In Myanmar existing financial incentives for RE are Income tax exemptions for investments in RE projects, Import tax exemption on RE production machinery, equipment and raw materials.[6] • The Government of Myanmar adopted the National Electrification Plan in 2014 with a target to achieve universal access by 2030.[7]
Technological Feasibility	• Myanmar receives very high levels of solar irradiation of 4.69 kWh/m²/day and specific yield of 4.01 kWh/ kW, a very strong technical feasibility is envisaged for solar projects in Country.[8] • Myanmar is mainly dependent on hydropower and gas for power generation; its power development plan relies on large-scale hydropower or coal.[9]
Market Maturity	• In 2016, Myanmar Electric Power Enterprise's functions were split between the Power Transmission and System Control function and Electricity Power Genera on Enterprise (EPGE).[10] • Yangon City Electricity Supply Corporation (YESC) is responsible for the supply of electricity to consumers in Yangon City; whereas Mandalay Electricity Supply Corporation (MESC) and Electric Supply Enterprise (ESE) covers the supply of power to consumers in the rest of the country.[10]
Infrastructure	• The country's transmission system comprises a network of 230 kV, 132 kV, and 66 kV transmission lines and substations.[10] • The distribution system comprises a network of 33 kV, 11 kV, and 6.6 kV lines and substations.[10]
Financing	• In December 2020, ADB approved USD 171.3 Mn for the Accelerated Rural Electrification Project to help Myanmar achieve its goal of universal electricity access by 2030.[12] • In 2020, World Bank approved a USD 350 Mn credit from the International Development Association (IDA) to increase the output and efficiency of power generation and improve the resilience of Myanmar's electricity system to climate change and disasters.[7]
Energy Imperatives	• As of 2020, cumulative solar PV Capacity for the country was 84.5 MW and that in 2018 was 47.5 MW.[13] • As of 2018, installed generation capacity for Solar lights & Solar Home Systems was 0.786 MW, 0.443 MW for solar minigrid and 0.102 MW for solar pumps.[14] • Access to electricity in Myanmar was reported at 68.4% in 2019.[15] • As of 2020, cumulative solar off-Grid Capacity for the country is 44.5 MW which was 43.8 MW in 2017.[16]

Namibia

Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
4,171.0	145.0	23.9
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
5.4	1.7	61.4

Cumulative Solar Installed Capacity (MW)



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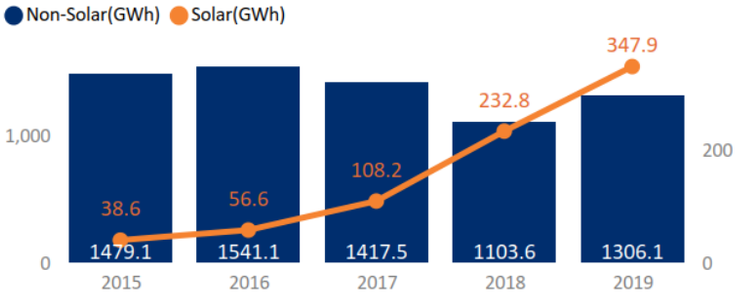

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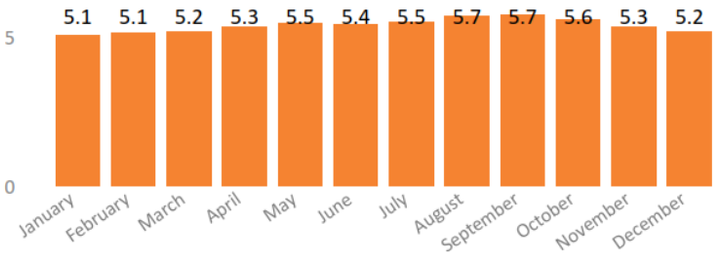
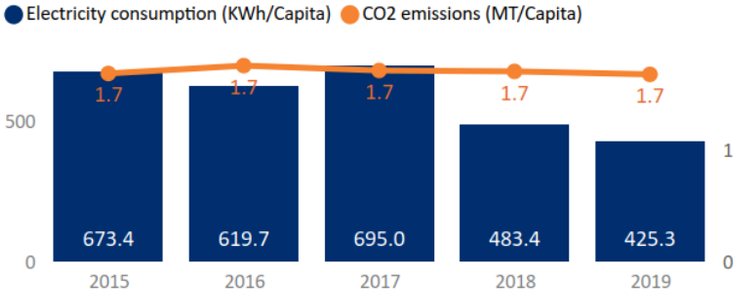


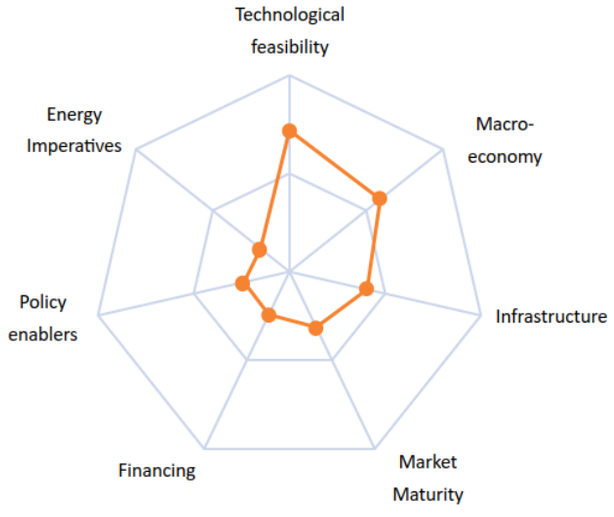
CO2 Emissions & Electricity Consumption



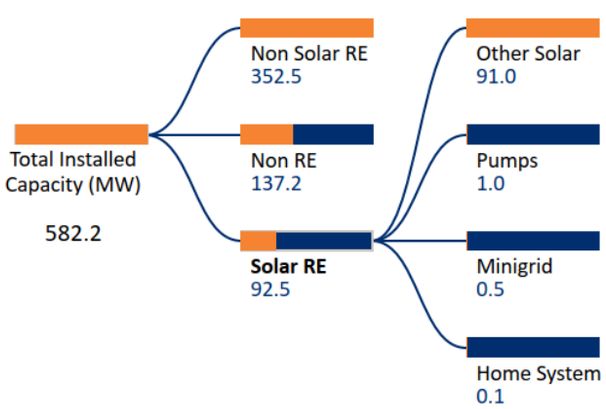
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers



Installed Generation Capacity by Source



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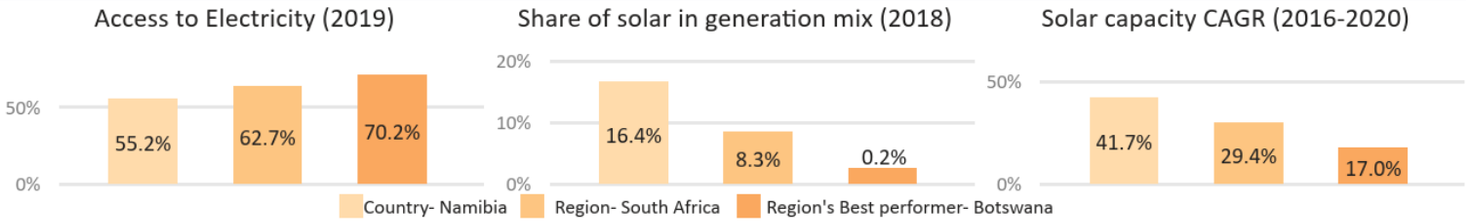
Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Energy Imperatives, Policy enablers

Key Insights

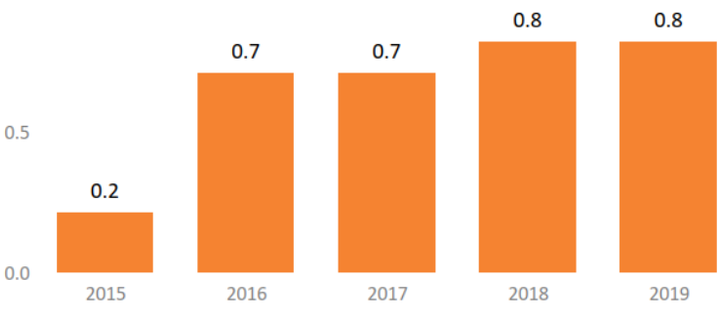
Drivers	Insights
Macro-economy	• Namibia inherited an economy characterised by a narrow industrial base and heavy dependence on the production and export of commodities.[1] • GDP (Real) declined by 7.2% in 2019 but has bounced back growing at an annual rate of 2.6% in 2021.[2] • In 2020, agriculture contributed 9.03% to the GDP, 26.53% came from the industry and 57.95% from the service sector.[3]
Policy enablers	• Ministry of Mines and Energy (MME) is responsible for developing energy policy and approving licences as recommended by the Electricity Control Board (ECB).[5] • NamPower, the country's power utility, has set an ambitious target of generating 70% of the country's electricity from renewable sources by 2030.[6] • Namibia aims at a reduction of about 89% of its GHG emissions compared to the Business as Usual scenario at the 2030- me horizon.[7]
Technological Feasibility	• Namibia receives an average of 3876 hours of sunlight per year. It is sunny 88.4% of daylight hours,11.6% of daylight hours are likely cloudy or with shade, haze, or low sun intensity.[9] • Namibia receives very high levels of solar irradiation of 6.4 kWh/m^2/day and specific yield of 5.41 kWh/ kWp, very high feasibility is envisaged for solar projects in Namibia.[10]
Market Maturity	• NamPower, the national electricity utility is a state-owned company with a mandate to generate, trade, transmit, import, export and distribute electricity.[13] • The Electricity Control Board (ECB) is a statutory regulatory authority to exercise control over the electricity supply industry with the main responsibility of regulating electricity generation, transmission, distribution.[14] • Regional Electricity Distributors (REDs) are autonomous companies tasked with the distribution of power to electricity consumers in a specified region of the country.[5]
Infrastructure	• NamPower owns, operates, and maintains a transmission network comprising 66 kV to 400 kV overhead lines.[16] • During 2017, Namibia's HV transmission network (132 kV to 400 kV) spanned over 7,927 km, of which the majority was opera onal at the 220 kV voltage level.[16] • The country's grid is interlinked with South Africa and Zambia via two links.[16]
Financing	• African Development Bank (AFDB) has approved a USD 129.4 Mn loan to finance the Namibia Economic Governance and Compe veness Support Programme.[18] • The AFDB Group's Country Strategy Paper (CSP) 2020-2024 for Namibia lays out the strategy that will guide Bank support to the country for the achievement of sustainable and inclusive growth. [19]
Energy Imperatives	• As of 2019, Electricity Consumption per capita was 425.28 kWh declining from 483.37 kWh level in 2018.[20] • As of 2020, cumulative solar PV Capacity for the country stood at 144.96 MW growing from 92.52 MW in 2018.[21] • 55.2% of the population in Namibia had access to electricity as of 2019.[22] • As of 2020, cumulative solar off-Grid Capacity for the country stood at 23.87 MW growing from 21.93 MW in 2018.[23]

Nauru

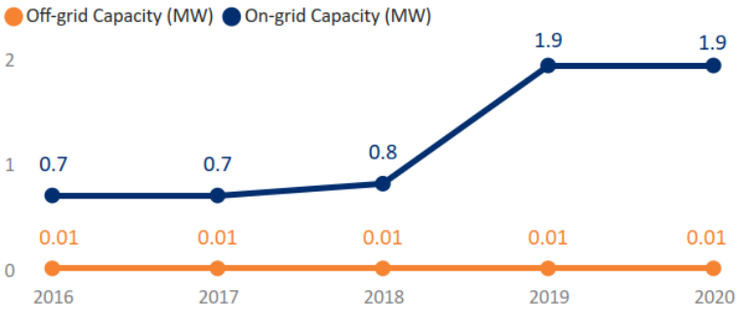
Asia & Pacific

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
28.1	1.9	0.01
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.7	4.8	NA

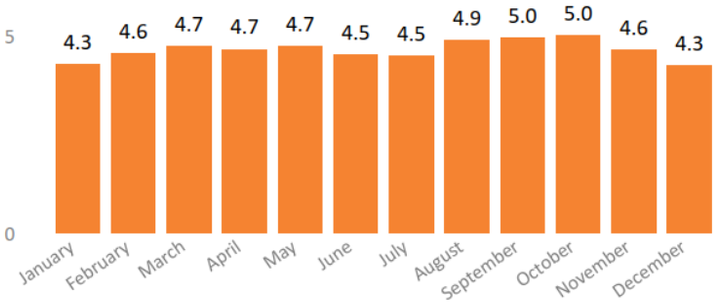
Cumulative Solar Installed Capacity (MW)



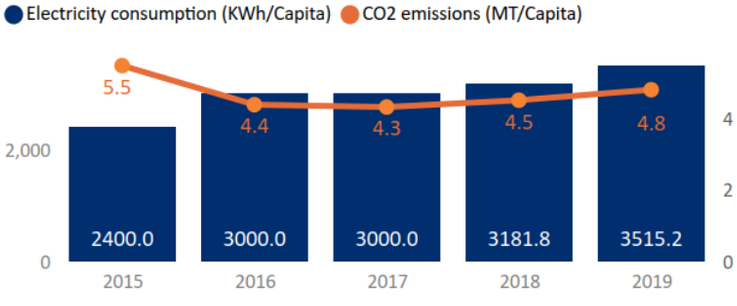
Cumulative Solar Off-grid & On-grid Capacity



Monthly variation in PVout (kWh/kWp/day)



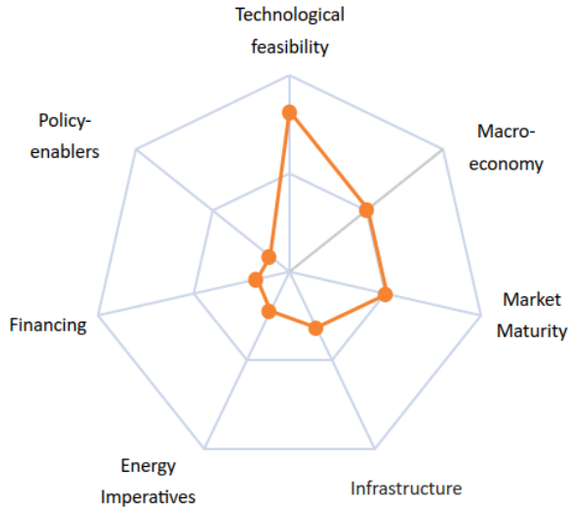
CO2 Emissions & Electricity Consumption



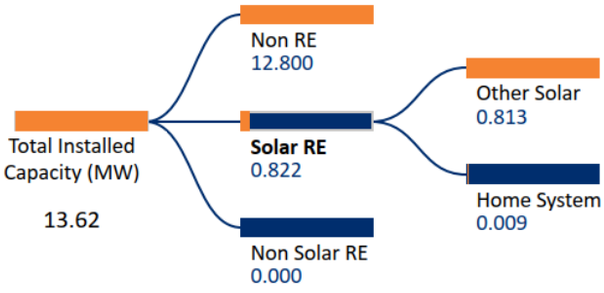
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers

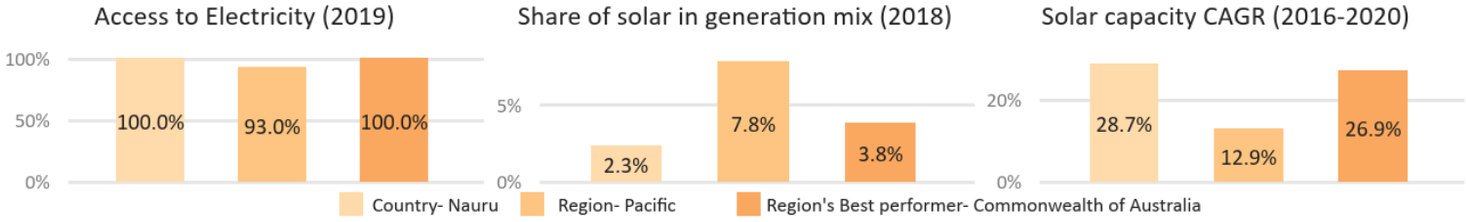


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Policy enablers, Financing

Key Insights

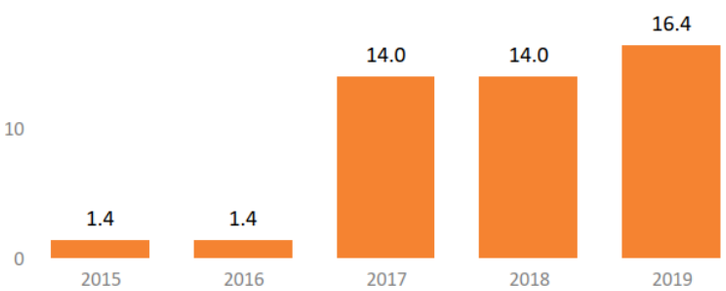
Drivers	Insights
Macro-economy	• GDP (Real) grew at an annual rate of 1% in 2019 and by 0.7% in 2020.[1] • The Nauruan economy is dominated by the public sector. There is relatively minimal private sector activity.[2] • Nauru's economy is driven by Regional Processing Centre (RPC) related activity, fisheries, and phosphate mining.[3]
Policy enablers	• The Government of Nauru has set an objective of 50% renewable energy in the generation mix by 2025.[5] • The Nauru Energy Policy Framework (NEPF) has set broad aims and strategies for the energy sector including power, renewable and energy efficiency.[6]
Technological Feasibility	• Nauru receives very high levels of solar irradiation of 5.88 kWh/m^2/day and specific yield of 4.65 kWh/ kWp, a very high feasibility is envisaged for solar projects in Nauru.[7] • Nauru relies on fuel imports for nearly 97% of its energy supply. In 2018, fuel demand was 25.8 ML comprising of Diesel for electricity generation (9.4 ML).[5]
Market Maturity	• Access to electricity in Nauru was reported at 100% as of 2019.[8] • The Ministry of Finance provides the national budget for energy, and sets prices for fuel and oversees the implementation of the National Sustainable Development Strategy.[5] • The state-owned Nauru Utilities Corporation (NUC) owns and operates power generation and distribution as well as water desalination and supply.[2]
Infrastructure	• Installed generation capacity for Solar lights & Solar Home Systems was 0.009 MW as of 2018.[9] • Nauru has a ring main distribution system with 11 kV, 3.3 kV and 415 V levels.[5] • NUC has formulated plans for replacing and upgrading various transmission/ distribution equipment with funding from the EU to cater for future load growth and future grid connected renewable sources.[5]
Financing	• In 2019, ADB and the Government of Nauru signed a USD 22 Mn grant for a project for the delivery of reliable, affordable, secure, and sustainable solar energy to help meet the socioeconomic development needs of the Pacific island nation.[11]
Energy Imperatives	• As of 2019, Electricity Consumption per capita was 3.5 MWh which was 3.0 MWh in 2017, comparable to global average.[12] • As of 2020, cumulative solar PV Capacity for the country was 1.95 MW which grew from 0.82 MW level in 2018.[13] • As of 2020, cumulative solar off-Grid Capacity for the country stood at 0.008 MW.[14]

Nicaragua

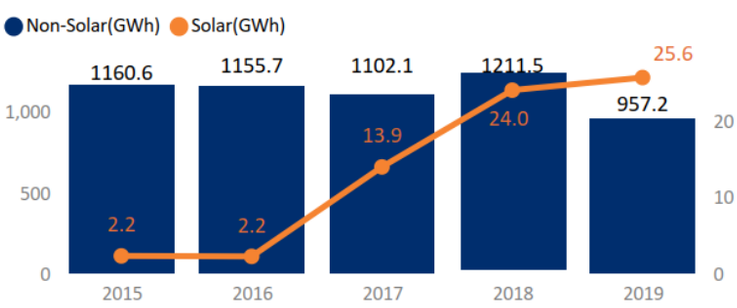
Latin America & Caribbean

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
3,594.0	16.4	2.4
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.1	0.8	54.4

Cumulative Solar Installed Capacity (MW)

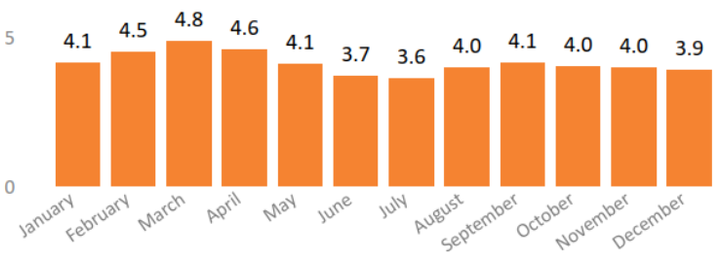


Renewable Energy Generation by Source

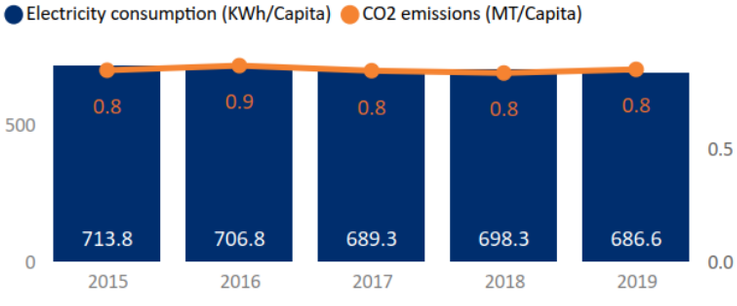


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



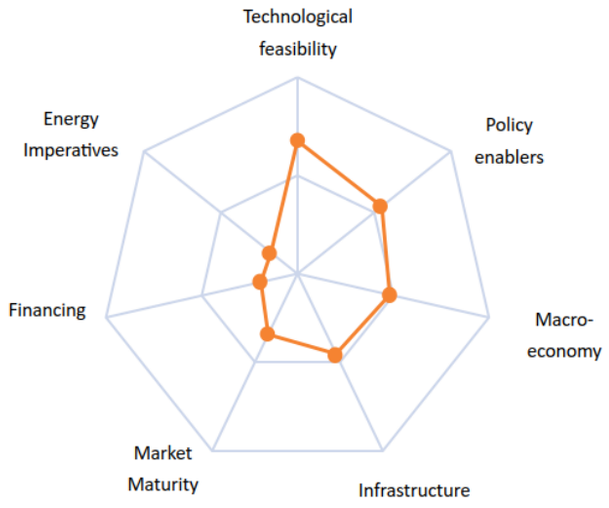
CO2 Emissions & Electricity Consumption



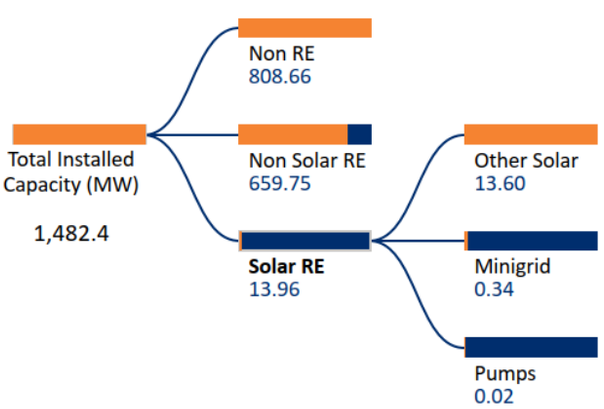
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



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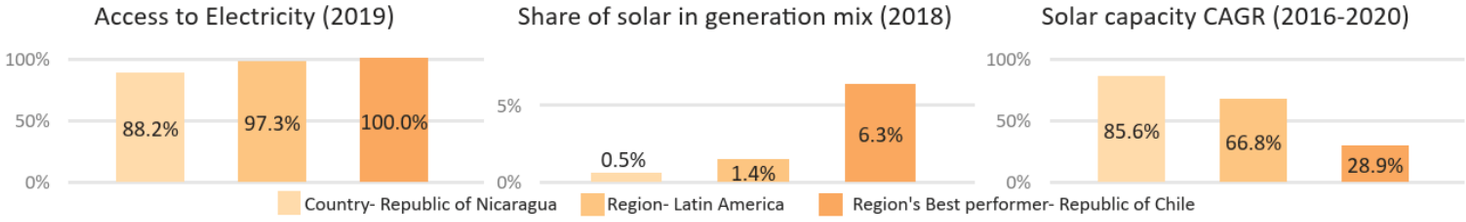
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility; Policy enablers

Areas of Improvement → Energy Imperatives; Financing

Key Insights

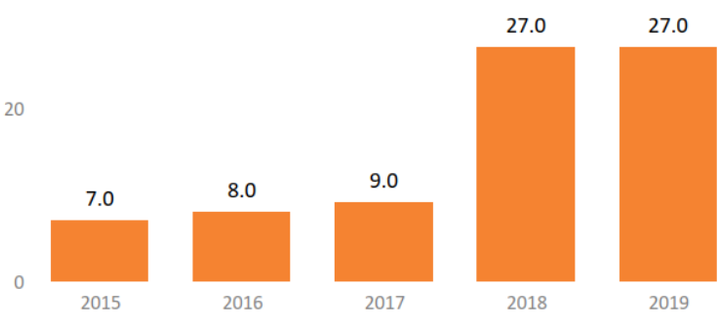
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, the GDP (Real) declined at a rate of 10.2% in 2020. In 2021, it is expected to bounce back and grow at 1.5% from 2020 level.[1] • Nicaragua is a lower middle-income country with a GDP per capita (PPP) USD 5,574 in 2020.[4,1] • The inflation rate (CPI) of Nicaragua has improved to 3.7% in 2020 from 5.4% in 2019.[1]
Policy enablers	• The National Energy Policy has set a target to increase the share of RE in the generation mix by creating a favourable environment for development of clean energy in the country.[3] • The reference prices for RE were introduced by the Government in 2015 with an aim to increase the competitiveness of RE sources.[3] • To encourage Solar PV installations net metering scheme has been implemented in the country.[3]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.04 kWh/m^2/day and specific yield 4.07 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Country.[5] • In 2019, 56% of the country's power demand met through RE sources indicating a substantial share of RE.[9] • Nicaragua's dependence on fossil fuels for its electricity generation to a substantial extent makes it vulnerable to fluctuating prices of crude oil.[9]
Market Maturity	• 88% of the popular on in Nicaragua had access to electricity as of 2019.[4] • Between 2010-19, Nicaragua attracted investments worth USD 994.3 million for clean energy projects with USD 2.1 million recorded in 2019.[9] • The Power sector in Nicaragua is regulated by Regional electricity market regulator (CRIE). The power sector was unbundled in 1998 with different power companies handling the generation, transmission and distribution in the country.[3,10]
Infrastructure	• The power sector is facing a key challenge in the form of high transmission and distribution losses of the tune of 22.2%.[3] • The national grid operates at a frequency of 60 Hz with voltage levels of 10.5 kV to 230 kV.[3] • In 2021, The Central American Bank for Economic Integration (CABEI) has provided USD 40.1 million funding to the Electric Transmission System Expansion Program for laying of 68.15 kms of transmission line.
Financing	• In 2017, the Inter-American Development Bank (IDB) has sanctioned USD 65 mn loan to the electricity sector for its financial and operational sustainably.[13] • In 2018, the IDB also disbursed USD 20 million loan to MSME's in the country for the development of RE projects in the country.[14] • The climate investment fund has sanctioned the scaling up RE program in 2015 to achieve a 90% share by RE in the generation mix by 2027.[15]
Energy Imperatives	• Per capita consumption of 0.72 MWh is substantially low in comparison to the global average of 3.35 MWh in 2019.[6] • The total solar installed capacity was 16 MW in 2020 and is expected to reach 284 MW by 2030.[7,3] • A total of 4.5 TWh electricity was generated in 2019 of which 43% came from fossil fuel based power plants.[9] • As of 2018, the residential, manufacturing and service sector had equal share in the total power demand in the country.[3]

Niger

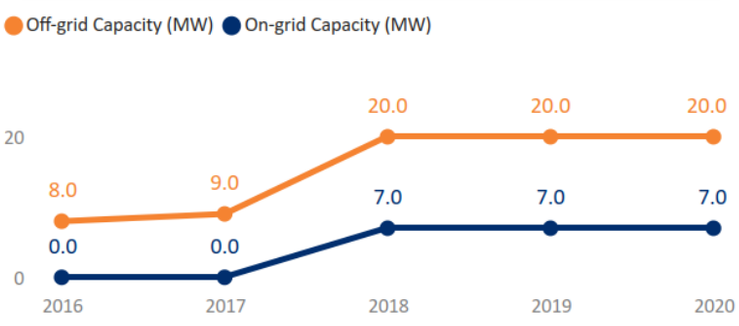
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
1,379.0	27.0	20.0
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
5.0	0.1	56.8

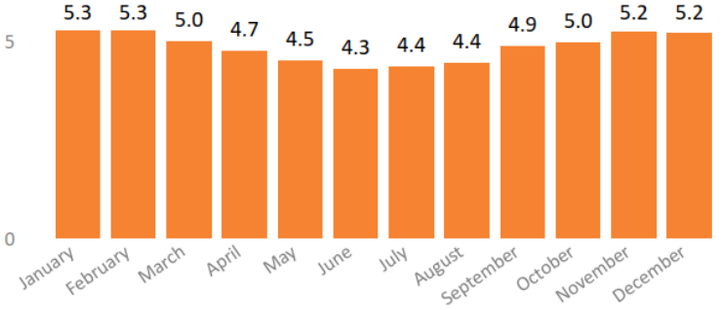
Cumulative Solar Installed Capacity (MW)



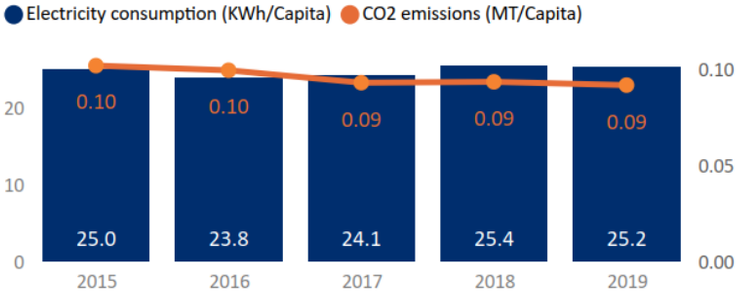
Cumulative Solar Off-grid & On-grid Capacity



Monthly variation in PVout (kWh/kWp/day)



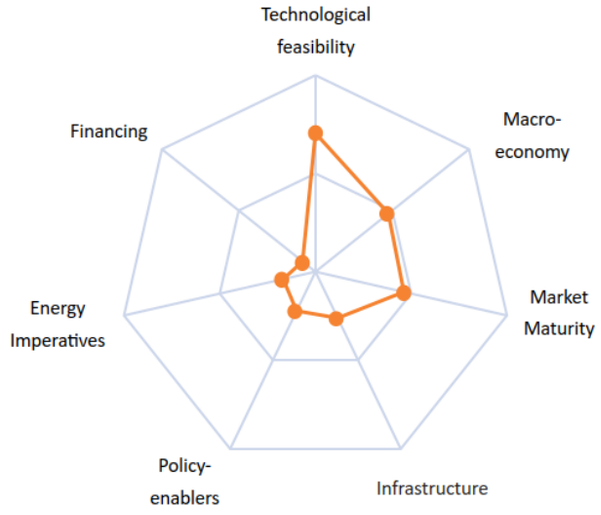
CO2 Emissions & Electricity Consumption



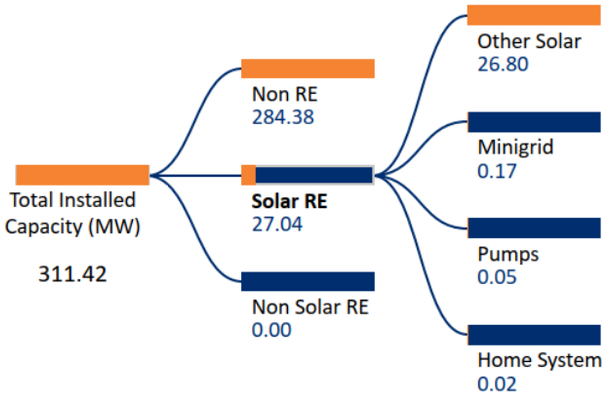
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers

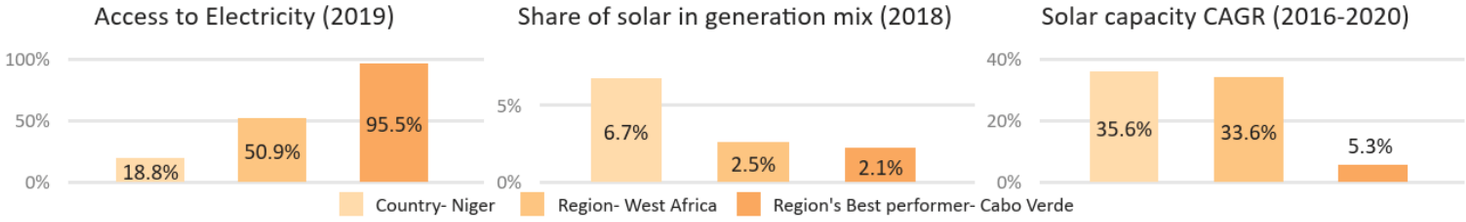


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Energy Imperatives

Key Insights

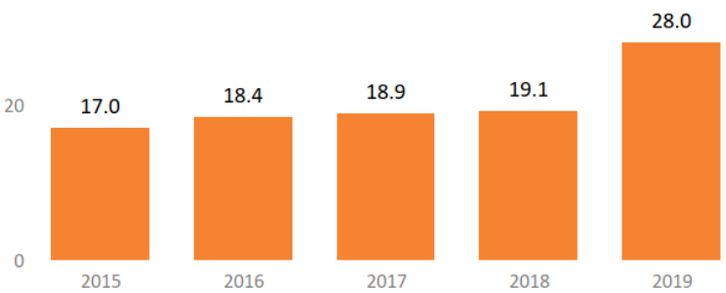
Drivers	Insights
Macro-economy	• GDP (at current prices) is USD 13.67 Bn as of 2020.[2] • Real GDP contracted by 1.2% in 2020 and expected to grow at 6.9% in 2021 showing an emergence from Covid-19 pandemic.[3,8] • Agriculture and extractive sectors are main contributors to the country's economy.[8,9]
Policy enablers	• Niger is a member of the Economic Community of West African States (ECOWAS) which is developing the SEforALL initiative as well as the national RE and energy efficiency action plans.[13] • Lighting Africa worked with Niger ministry of energy and ministry of finances to exempt Taxes on imports of solar and other RE products which came into effect in 2017.[14] • Regional Off-grid electrification project (ROGEP) supported by World Bank was launched in Niger with an objective to increase electricity access.[14] • The Government of Niger created a Nigerien Agency for the Promotion of Rural Electrification (ANPER) to design, implement, and monitor rural electrification programs.[10]
Technological Feasibility	• Owing to very high average solar irradiation level (GHI) of 6.26 kWh/m²/day and specific yield of 5.03 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Niger.[1] • Niger is a member of the West African Economic Monetary Union (WAEMU) whose objective is to increase share of RE to 57% in electricity mix by 2030.[15] • Niger has set up the National Solar Energy Centre (CNES) to undertake applied research in various aspects of renewable energies.[17] • ANPER launched nationwide feasibility study on mini-grid development with the support of USAID and Power Africa in 2019.[10]
Market Maturity	• 19% of total population had access to electricity as of 2019. Country is set to achieve a target of universal electricity access by 2035.[6,10] • RE share in total electricity consumption was 78% as of 2018.[6] • The Niger Solar Electricity Access Project (NESAP) supported by the World Bank, aims to increase access to electricity through solar energy in rural and semi-urban areas.[11]
Infrastructure	• The Nigeria-Niger-Benin-Burkina Faso power interconnection project of a 330 kV double-circuit line over 842 km allows the power exchange among the countries.[4] • The Government of Niger announced partnership under the World Bank Group's Scaling Solar program to develop up to 50 MW of grid-connected solar power in Jun 2021.[12] • Niger is a member of Sahel Alliance, an initiative launched in 2017 which aims to develop effective response for challenges such as climate change, poverty, domestic security.[16]
Financing	• International fund flow in 2018 was USD 29.2 Mn (in PPP terms) to support clean energy and RE deployment.[6] • Sovereign rating of B3 with stable financial outlook reflects country's credit view.[7] • The World Bank currently finances 22 national and 10 regional projects valued at USD 2.98 billion.[9] • Niger adopted a new Economic and Social Development plan (PDES) which is used to prepare World Bank country partnership framework 2018-2022.[9]
Energy Imperatives	• Per capita electricity consumption in 2020 was 25 kWh which is significantly lower in comparison to the global average.[5] • 13% of rural population had access to electricity as of 2019 indicating a major opportunity for new energy solutions.[6] • Total installed capacity was 421.93 MW as of 2018 consisting of 358.33 MW thermal power plants, 7 MW of solar and 4 MW of standalone systems.[18]

Nigeria

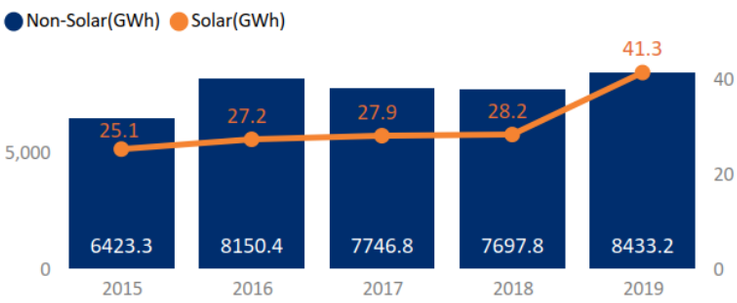
Africa

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
26.3	28.4	26.9
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.3	0.7	56.9

Cumulative Solar Installed Capacity (MW)

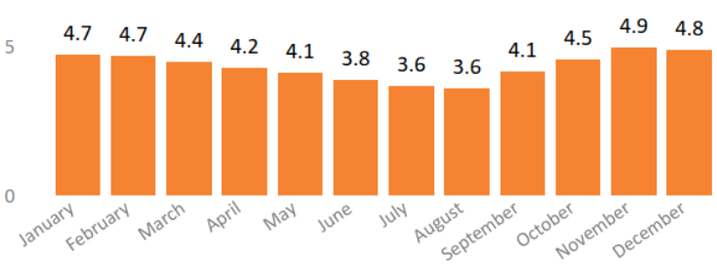


Renewable Energy Generation by Source

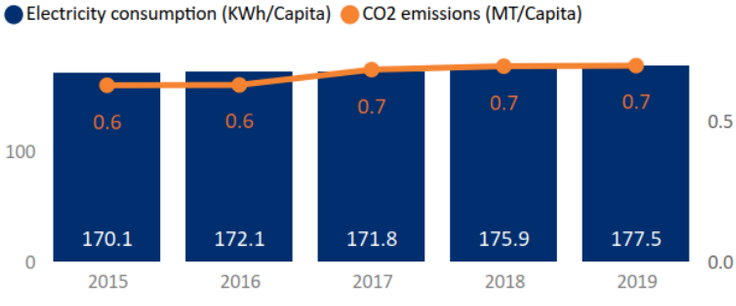


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



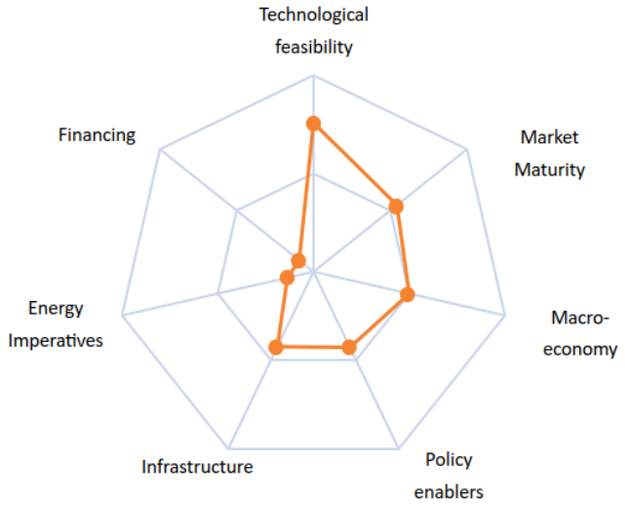
CO2 Emissions & Electricity Consumption



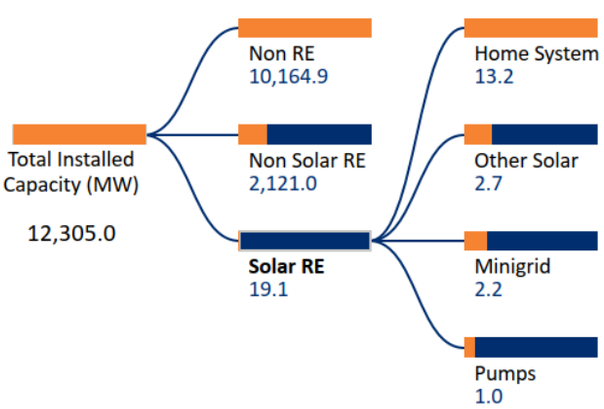
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



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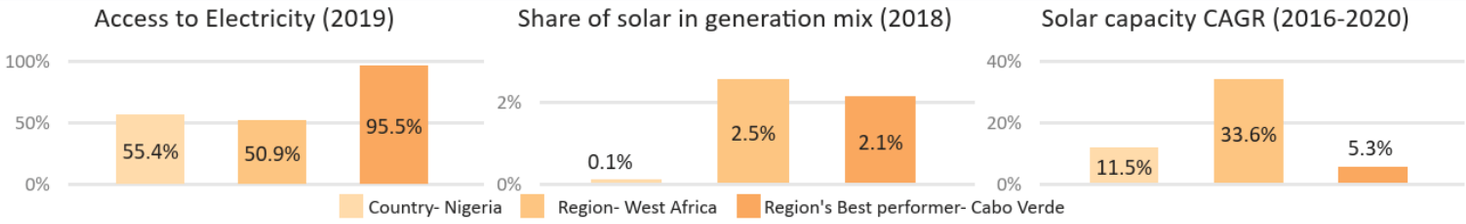
Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Market Maturity

Areas of Improvement → Financing, Energy Imperatives

Key Insights

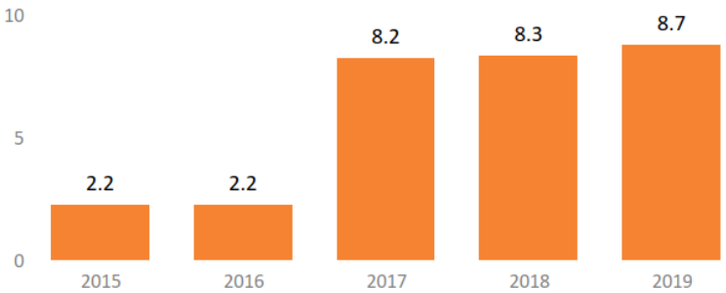
Drivers	Insights
Macro-economy	• GDP (at current prices) is USD 432.3 bn in 2020.2 Real GDP contracted by 2% in 2020 due to Covid 19 impact.[3] • Nigeria is a large chemical exporter and has richest oil resource across the African continent which are also the main contributors to its economy.[12] • The economy is expected to grow by 1.5% in 2021 and 2.9% in 2022 due to measures taken up in the Economic Sustainability Programme (ESP) and Finance act of 2020.[11]
Policy enablers	• The Government of Nigeria approved feed-in tariff regulations in 2015 that mandates electricity distribution companies to source at least 50% of their electricity requirements from renewables.[16] • In 2016, Nigeria adopted the Mini-Grid Policy to regulate the mini-grids and speed up electrification process.[17] • Approved in 2018, Nigeria Electrification project, with a commitment of USD 350 mn, aims to implement solar hybrid mini grids for rural economic development, stand-alone solar systems for homes and sustainable power to public educational institutions.[18]
Technological Feasibility	• Owing to very high average solar irradiation level (GHI) of 5.44 kWh/m^2/day and specific yield of 4.29 kWh/kWp, high technical feasibility is envisaged for solar projects in Nigeria.[1] • Stand-alone solar photovoltaic (PV) systems offer pay-as-you-go (PAYGo) business models for mini-grids that are not sustainable.[7] • The RE Master Plan (REMP) intends to increase the supply of renewable electricity and targets 500 MW solar PV installed capacity by 2025.[9]
Market Maturity	• 55% of total population had access to electricity as of 2019.[6] • Renewable constituted 23% of total electricity generation in 2015 and is targeted to reach 36% by 2030.[9] • RE share in total electricity consumption is 79.7% as of 2018.[6]
Infrastructure	• Nigeria's transmission network consists of high voltage substations with a total capacity of 7,500MW and over 20,000 km of length.[22] • The Electricity community of Benin (CEB) – Nigerian Electric Power Authority (NEPA) power interconnection project is a first step in power generation and pooling efforts by ECOWAS.[23]
Financing	• Nigeria has been one of International Finance Corporation's (IFC) fastest growing portfolio and represents IFC's fifth largest global country exposure with a committed volume of USD 1.8 bn in 2020.[10] • The world bank approved $500 mn to support Nigerian government in improving performance of electricity distribution companies (DISCOMs) through Nigerian Distribution Sector Recovery Program (DISREP).[21] • International fund flow in 2017 was USD 97 mn (in PPP terms) to support clean and renewable energy.[6]
Energy Imperatives	• Per capita electricity consumption in 2020 was 184 kWh which is significantly lower in comparison to the global average.[5] • 26% of rural population had access to electricity as of 2019.[6] • Nigeria's total installed capacity was 13,089 MW in 2019 of which 16% comes from renewable sources.[8] • Hydro dominates the renewable with 2,111 MW capacity whereas solar constitute 28 MW as of 2019.[8]

Sultanate of Oman

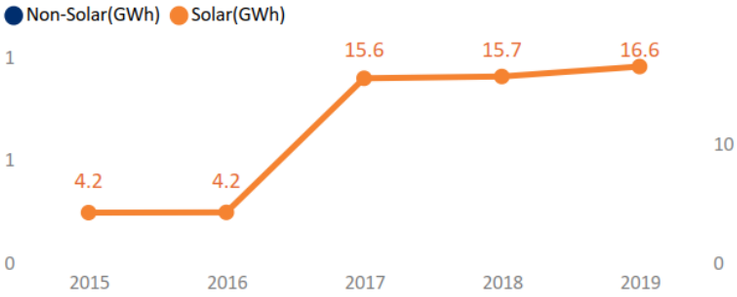
Middle East

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
33.5	108.7	0.01
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
5.2	14.4	70.0

Cumulative Solar Installed Capacity (MW)

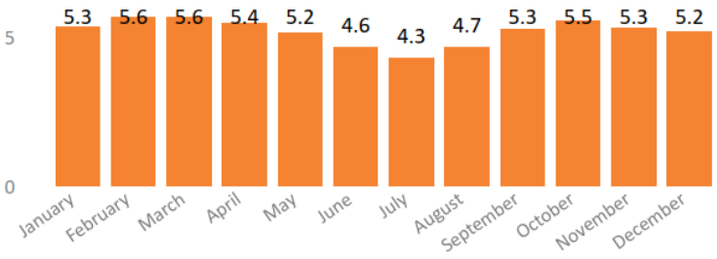


Renewable Energy Generation by Source

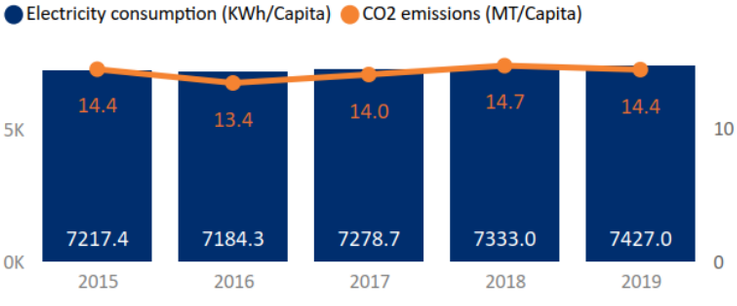


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



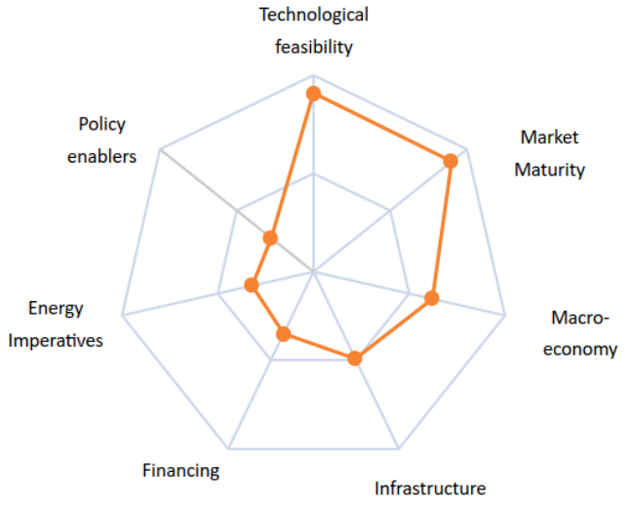
CO2 Emissions & Electricity Consumption



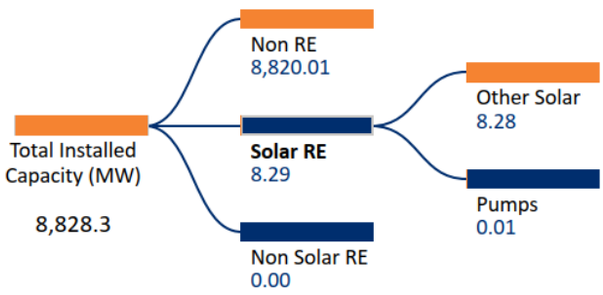
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers

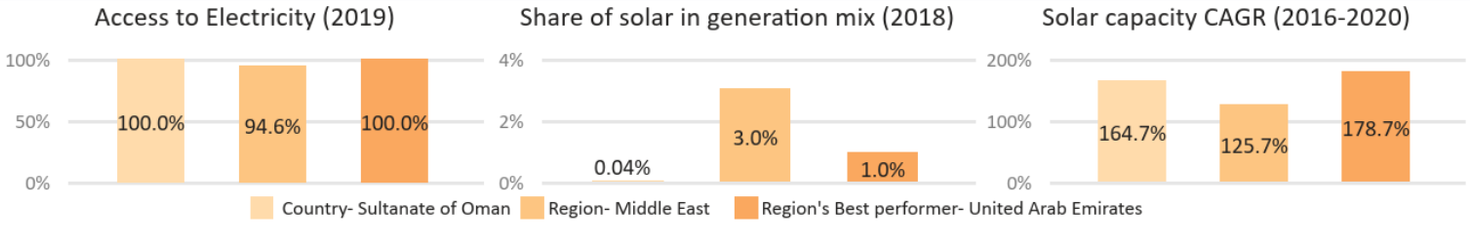


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics

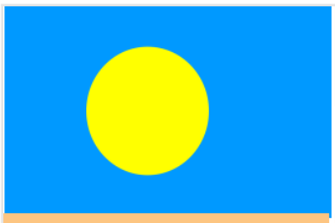


Areas of Strength → Technological feasibility, Market Maturity

Areas of Improvement → Policy enablers, Energy Imperatives

Key Insights

Drivers	Insights
Macro-economy	• Oman is a high-income status country[1]. Its economy was hit by a dual shock of the pandemic and a collapse in oil prices in 2020.[2] • GDP (Real) has declined by 6.4% in 2020 and grown at an annual rate of 1.8% in 2021.[3] • In 2019, agriculture contributed 2.35% to the GDP while 53.72% share came from the industry and 48.14% from the service sector.[4]
Policy enablers	• The Sultanate of Oman has engaged through its Intended Nationally Determined Contributions (INDCs) to reduce their absolute GHG emission by 2% by 2030.[6] • In 2017, the oil share of GDP was 39% while non-oil sources accounted for 61%. The Sultanate aims to reduce the oil share of GDP to 16% in 2030 and 8.4% by 2040.[6] • The Sultanate of Oman has set a target to raise the energy intensity (GDP per unit of energy) from 6.92 in 2014 to 14.57 in 2030 and 17.3 in 2040.[6] • Oman has an ambitious target to raise the share of remewables in the energy mix to 20% in 2030 and up to 35-39% in 2040, defined in the Oman Vision document 2040.[6]
Technological Feasibility	• Oman receives relatively very high levels of solar irradiation of 6.28 kWh/m^2/day and specific yield of 5.18 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Country.[8] • Oman's energy supply is entirely generated by nationally produced natural gas and oil products and the country is a large exporter of oil and gas.[9] • Oman's state-owned Rural Electricity Company (Tanweer) tendered 11 solar-diesel-storage hybrid projects (in 2019) with a combined capacity of 146 MW for non-interconnected areas.[10]
Market Maturity	• The Authority for Electricity Regulation, Oman is responsible for regulating the electricity and related water sector in the Sultanate of Oman.[11] • The Oman Power and Water Procurement Company (OPWP) is the sole buyer of power and water for all IPP/IWPP projects within the Sultanate of Oman.[12] • The Oman Electricity Transmission Company SAOC (OETC) is the sole provider of transmission services in the MIS and Dhofar Systems.[13] • Muscat Electricity Distribution Company SAOC, Majan Electricity Company SAOC, Mazoon Electricity Company SAOC and Dhofar Energy Company are the electricity distribution companies in Oman.[14]
Infrastructure	• The Oman Electricity Transmission Company SAOC (OETC) owns and operates the 220 kV, 132 kV and 400 kV interconnected transmission systems.[15] • The transmission grid network of Dhofar operates at 132 kV level with 8 grid stations and 520 km length of power circuit lines.[14] • The transmission system is interconnected with the transmission system of UAE (Abu Dhabi Transco) at Mahdah (Al Wasit) grid station through 220kV line.[15]
Financing	• The Asian Infrastructure Investment Bank (AIIB) approved a USD 60 Mn loan to increase Oman's renewable power generation capacity and reduce the country's dependence on gas and other fossil fuels for electricity generation.[17] • AIIB approved financing of up to USD 60 Mn for the Ibrill 500 MW Solar PV Independent Power Plant Project which is approximately 15% of the total project cost.[18]
Energy Imperatives	• As of 2019, Electricity Consumption per capita stood at 7426 kWh growing from 7332.98 kWh in 2018.[19] • As of 2019, cumulative solar PV Capacity for the country was 8.74 MW growing from 8.29 MW in 2018.[20] • Since 1990, 100% of the population in Oman had access to electricity.[21] • As of 2020, cumulative solar off-Grid Capacity for the country was 0.011 MW.[22]



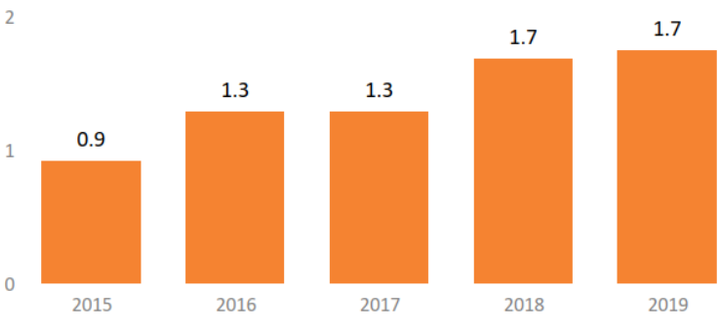
Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
73.0	1.7	0.2

Palau

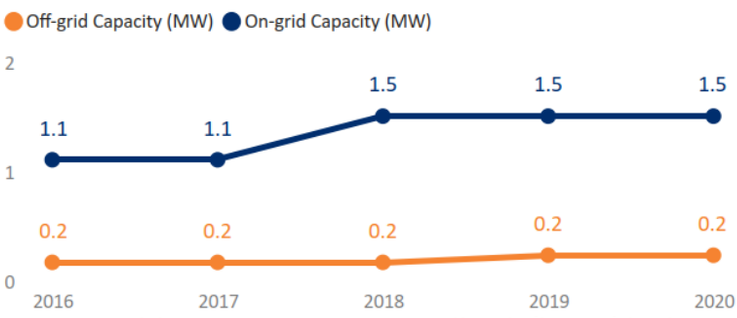
Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
4.0	NA	53.7

Asia & Pacific

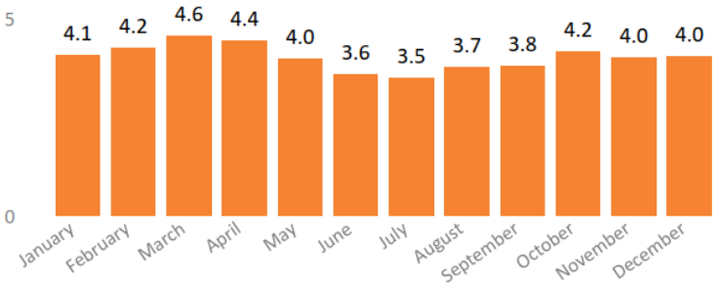
Cumulative Solar Installed Capacity (MW)



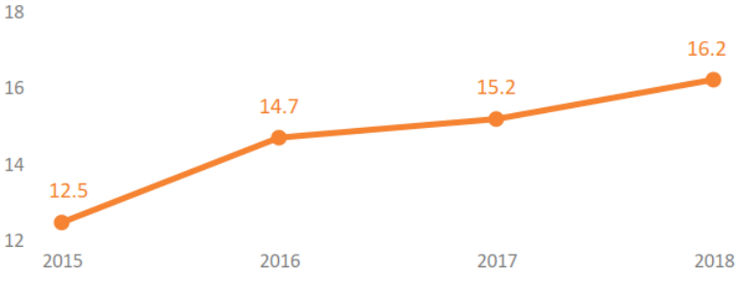
Cumulative Solar Off-grid & On-grid Capacity



Monthly variation in PVout (kWh/kWp/day)



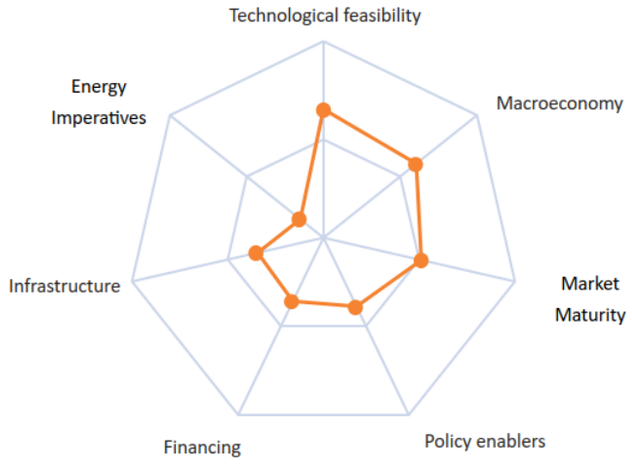
CO2 Emissions (Metric Tonnes/Capita)



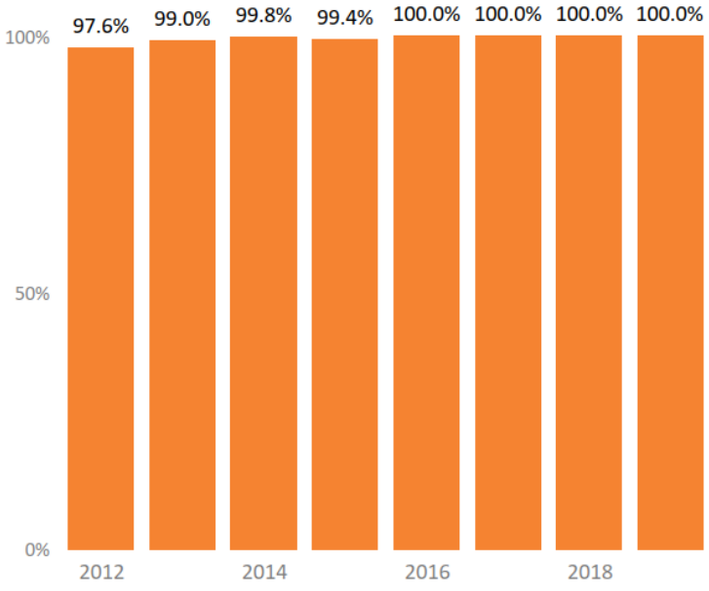
Ease of Doing Solar Classification

Influencer

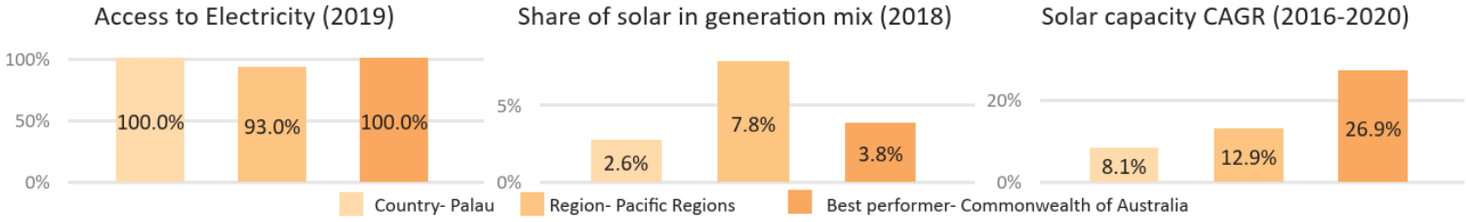
Performance against 7 drivers



Access to Electricity



Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Market Maturity, Infrastructure

Key Insights

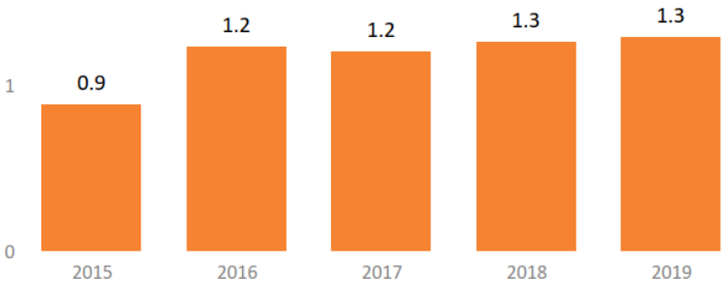
Drivers	Insights
Macro-economy	• Palau is the most energy intensive economy amongst the Pacific countries with a per capita electricity consumption of 4.00 MWh per year.[1] • GDP (Real) grew at an annual rate of 5.8% in 2018 and declined by 10.3% in 2020 due to Covid19 pandemic.[2] • Palau's economy is driven by tourism, trade, fishing, and subsistence agriculture. The tourism industry dominant contributor and accounts for about 40% of GDP.[3,4,5]
Policy enablers	• The Government of Palau has set a target for 45% share of renewable generation in the overall mix by 2025.[1] • The Palau National Energy Policy delineates the Government's policy vision for a reliable and resilient energy sector delivering sustainable, low emissions energy services.[6] • Palau Net Metering Act facilitates a system of customer based renewable energy generation to produce energy for the customer's own use with excess electricity running to the provider and for other related purposes.[7]
Technological Feasibility	• Palau receives very high levels of solar irradiation of 4.98 kWh/m^2/day and specific yield of 4.01 kWh/ kWp, a very strong feasibility is envisaged for solar projects in Country.[8] • The government of Palau has initiated a 20 MW solar power development project including solar generation and battery storage system by 2021.[1]
Market Maturity	• Since 2016, 100% of the popular on in Palau had access to electricity.[9] • Palau Energy Administration (PEA) is the primary focal point for developing the National Energy Policy (NEP) and setting energy efficiency benchmarks for public utilities.[1] • The Palau Public Utilities Corporation (PPUC) is a public corporation established to manage and operate the electrical power and the water and wastewater systems of the Republic of Palau.[10]
Infrastructure	• The country's power grid cover approximately 114 linear miles of 13.8 kV distribution lines, which is interconnected by 47 linear miles of 34.5 kV transmission lines of an undersea cable and maintained by PPUC.[1] • The network losses (transmission and distribution) are about 20% and remains one of highest among Pacific states.[1] • Palau's HDI value for 2019 is 0.826, which puts the country in the very high human development category.[11]
Financing	• In 2020, ADB committed USD 5 Mn to support Palau's Public Utilities Corporation Reform Program.[12] • ADB will continue to encourage Palau's involvement in regional cooperation programs particularly in expanding access to renewable resources, improving energy efficiency, and responding to the impacts of climate change.[12]
Energy Imperatives	• In 2015, the peak demand on the national grid was 15 MW and 88.75 GWh of electricity was delivered to the transmission network.[1] • As of 2020, cumulative solar PV Capacity for the country is 1.75 MW which was 1.68 MW in 2018.[13] • As of 2020, cumulative solar off-Grid Capacity for the country is 0.235 MW which was 0.170 MW in 2018.[14]

Papua New Guinea

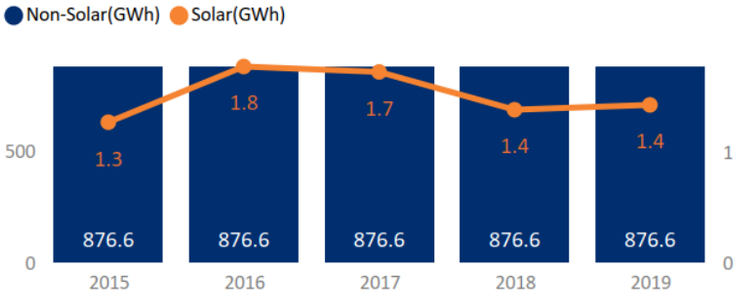
Asia & Pacific

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
3,951.4	1.3	1.0
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
3.6	0.8	59.8

Cumulative Solar Installed Capacity (MW)

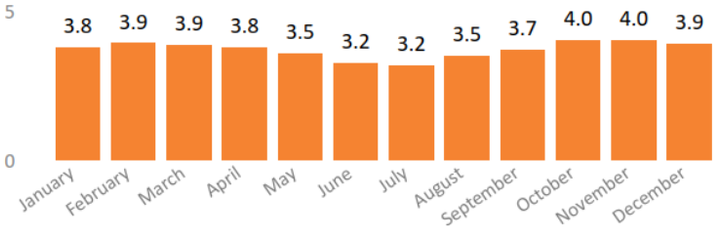


Renewable Energy Generation by Source

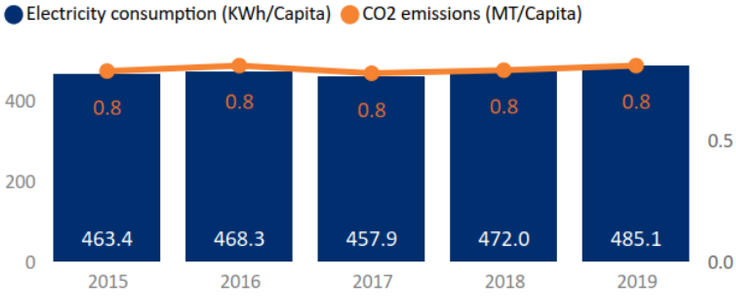


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



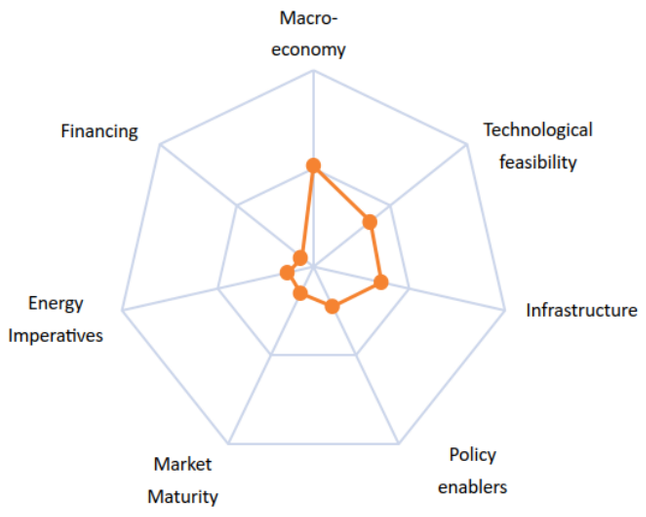
CO2 Emissions & Electricity Consumption



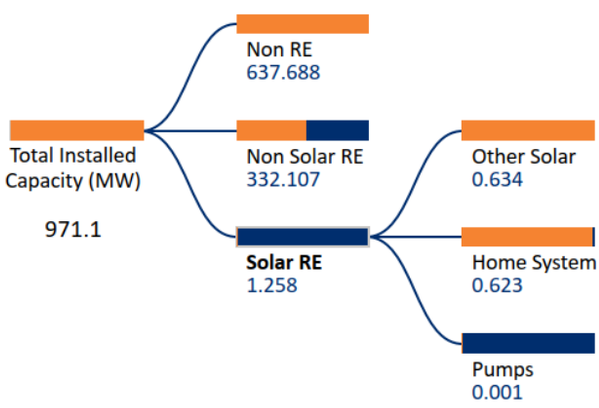
Ease of Doing Solar Classification

Potential

Performance against 7 drivers



Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
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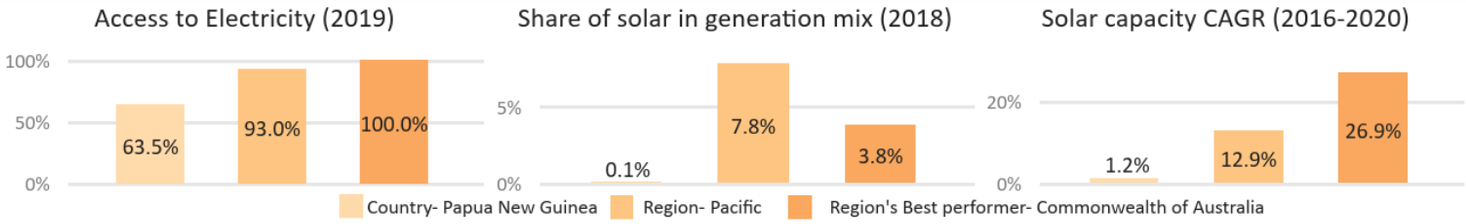
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Macroeconomy; Technological feasibility

Areas of Improvement → Financing; Energy Imperatives

Key Insights

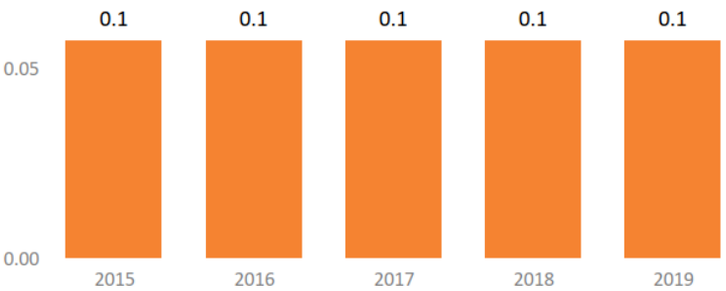
Drivers	Insights
Macro-economy	• On account of COVID-19 Pandemic, country's GDP (Real) declined by 3.9% in 2020.[1] • Papua New Guinea is an island nation with a GDP per capita (PPP) US dollar 3,833 in 2020. [1,3] • The inflation rate (CPI) of Papua New Guinea has risen to 5.0% in 2020 from 3.7% in 2019.[1] • As of 2019, the fuels export dominated the total exports with a share of 28.4% followed by agricultural products and food items having 18.6% and 17.6% share respectively.[14]
Policy enablers	• The government has set an ambitious goal to reach 70% grid electrification rate in the country by 2030 through the National Electrification Rollout Plan.[9] • Long term support to Papua New Guinea was outlined in May 2019 when the World Bank and Papua New Guinea Government agreed on the 2019-22 Country Partnership Framework for the country.[13] • The National Energy Policy 2016-20 aim to have 100% share of renewable energy in the genera on mix by 2050.[10]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 4.48 kWh/m2/day and specific yield 3.59 kWh/kWp, a strong technical feasibility is envisaged for solar projects in the country.[2] • Papua New Guinea is vulnerable to fluctuating prices of fossil fuels because of its dependence on them for electricity generation.[4]
Market Maturity	• 63% of the population in Papua New Guinea had access to electricity as of 2019.[3] • Solar PV has accounted for 0.03% share in generation mix in 2019.[4] • As of 2021, access to grid is a challenge as, only 13% of the total population are having access to grid-connected electricity.[6]
Infrastructure	• Unreliable power supply, blackouts, electricity theft and poor access to grid are some of the major challenges that the country has been facing.[6,7] • PNG power is implementing a pilot rooftop solar power project with the International Finance Corporation (IFC) in Port Moresby with an aim to use rootop solar to generate 2% of the peak demand for electricity in the capital.[8] • In 2017, the IFC launched a pilot (with Origin Energy PNG) to support RE use in off-grid communities through Pay-as-you-Go (PayGo) model helping make a clean distributed energy affordable and accessible.[8]
Financing	• In April 2021, the World bank launched the Energy Utility Performance and Reliability Improvement Project (EUPRIP) 2021-26 with a funding of USD 30 mn.[6] • Papua New Guinea has been a member of the Global Green Growth Institute (GGGI) since 2012. GGGI has recently started providing Readiness and Preparatory Support to facilitate fund access from the Green Climate Fund.[11] • In 2018, ADB has sanctioned USD 66.7 mn loan to PNG Power Ltd with an aim to construct new transmission lines, substation, increase the hydropower capacity and upgradation of grid by 2022.[12]
Energy Imperatives	• Per capita consumption of 0.48 MWh which is relatively very low in comparison to the global average of 3.35 MWh (2019).[5] • The total generation from solar PV has risen at a CAGR of 12.0% between 2010-19, reaching 1.38 GWh in 2019, from 0.5 GWh in 2010.[4] • In 2019, Oil & Gas based thermal power plants dominated the generation mix having 80.2% share in the generation mix.[4] • In the last decade, the total power demand in the country grew at a CAGR of 2.6% reaching 4,257 GWh in 2019 from 3,387 GWh in 2010.[4]

Paraguay

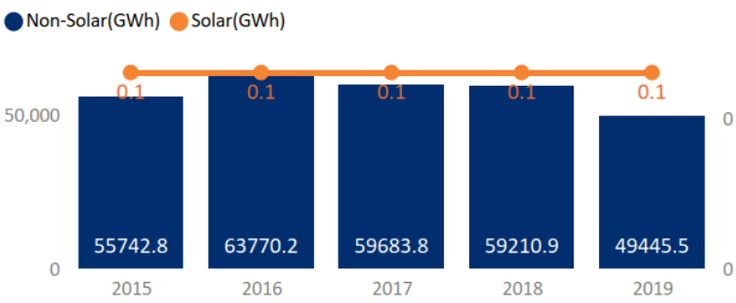
Latin America & Caribbean

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
12.5	0.1	0.1
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.2	1.2	59.1

Cumulative Solar Installed Capacity (MW)

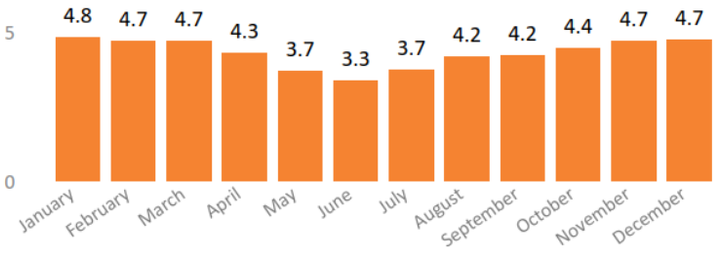


Renewable Energy Generation by Source

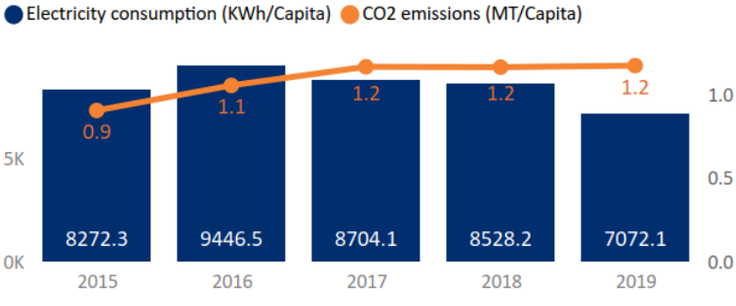


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



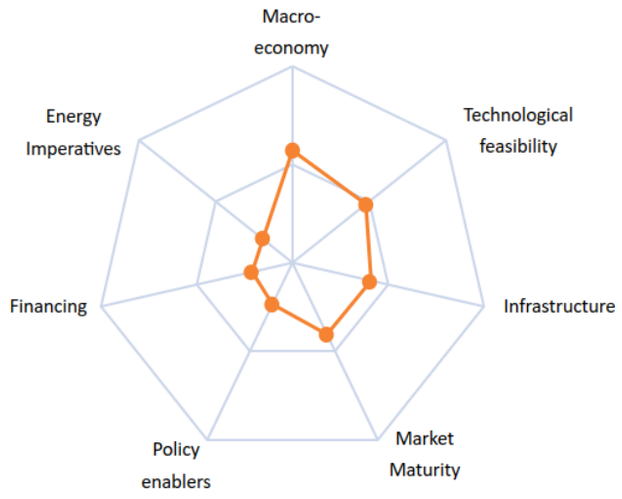
CO2 Emissions & Electricity Consumption



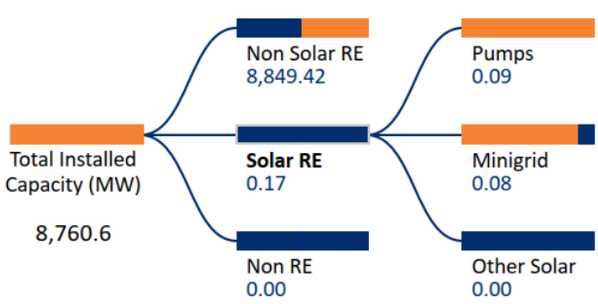
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers



Installed Generation Capacity by Source



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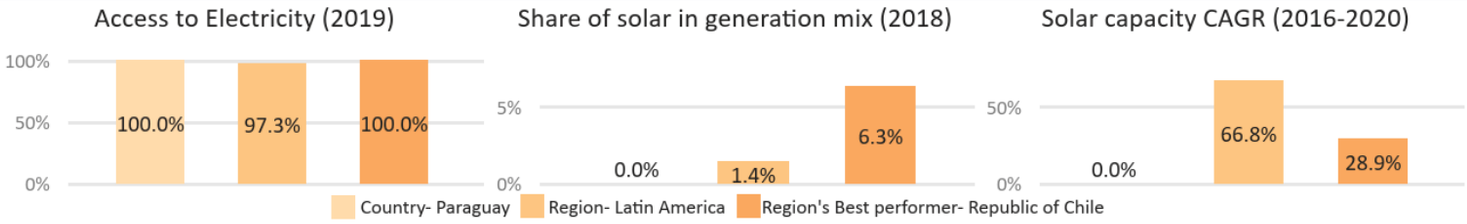
Country's regional performance and characteristics



Areas of Strength → Macroeconomy; Technological feasibility

Areas of Improvement → Energy Imperatives; Financing

Key Insights

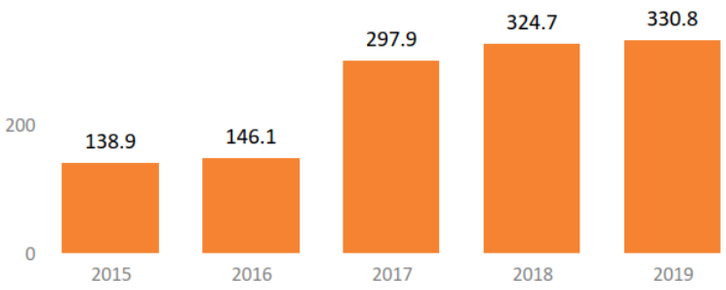
Drivers	Insights
Macro-economy	• The GDP (Real) declined at a rate of 0.9% in 2020. In 2021, it is expected to bounce back and grow at 4% from 2020 level.[1] • Paraguay is an upper-middle-income economy[2] with a GDP per capita (PPP) at USD 13,454 in 2021.[1] • Paraguay's economy is based mainly on agriculture and the services sectors which have shown strong growth in recent years.[9]
Policy enablers	• The Ministry of Public Works and Communications (MOPC) manages Paraguay's electricity sector through the Vice-Ministry of Mines and Energy (VMME).[9] • Paraguay established RE targets in its National Development Plan 2014–2030.[4] • The country's goal is to reach 60% of RE share in the total energy consumption on by 2030.[4] • The country recently updated Nationally Determined Contributions (NDC) with a commitment to 20% emission reductions by 2030.[9]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.08 kWh/m^2/day and specific yield 4.24 kWh/kWp, a strong technical feasibility is envisaged for solar projects in the country.[6] • The country majorly depends on hydropower as approximately 98% of its electricity generation in 2021 came from hydro.[7] • The existing installed capacity of variable RE serves primarily as isolated systems and pilot projects in remote locations.[9]
Market Maturity	• 100% of the population in Paraguay had access to electricity as of 2019.[5] • The power sector is vertically integrated and has a monopoly on energy sales.[9] • The electricity sector lacks an independent regulator.[9] • Investment opportunities in solar PV projects are being assessed by private firms, including an investment of USD 18 Mn for a 20 MW Solar PV plant.[9]
Infrastructure	• National Interconnected System (SIN) which handles transmission in the country has transmission network asset of ~6,682 kms as of 2019.[9] • The electricity distribution networks comprised 68,331 kms of medium-voltage lines and 85,913 transformers with an installed power of 6,561 MW.[9] • The Itaipú and Yacyretá hydropower plants are the largest installed generation plants and are also integrated with the electricity systems of Brazil and Argentina.[9]
Financing	• The main external financiers of RE and energy efficiency projects in Paraguay are the IDB, CAF and KfW.[9] • Paraguay's Development Finance Agency (AFD) has access to concessional and non-reimbursable resources from the GCF to finance RE projects.[9]
Energy Imperatives	• Total Installed Capacity of electric power plants in the country was 8.7 MW in 2019.[8] • Per capita consumption of 1.03 MWh is low compared to the global average of 3.31 MWh in 2020.[7] • During the period 2001-2019, electricity consumption grew at 15.8% annually on average, from 4,502 GWh to 12,840 GWh.[9]

Peru

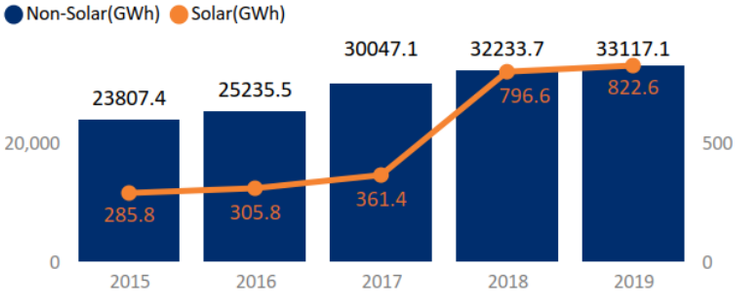
Latin America & Caribbean

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
48.3	330.8	45.8
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.2	1.7	68.7

Cumulative Solar Installed Capacity (MW)

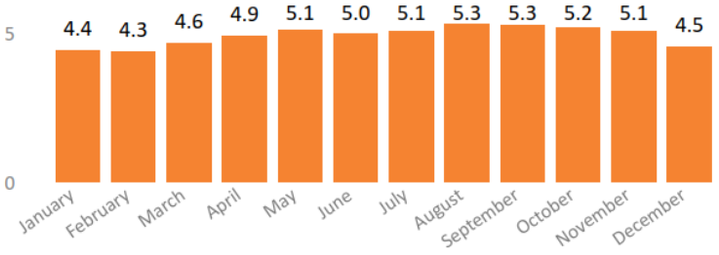


Renewable Energy Generation by Source

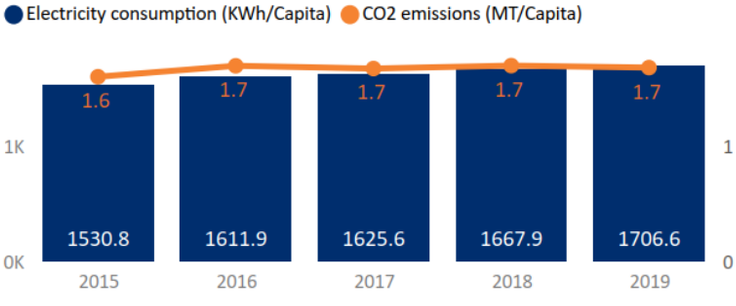


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



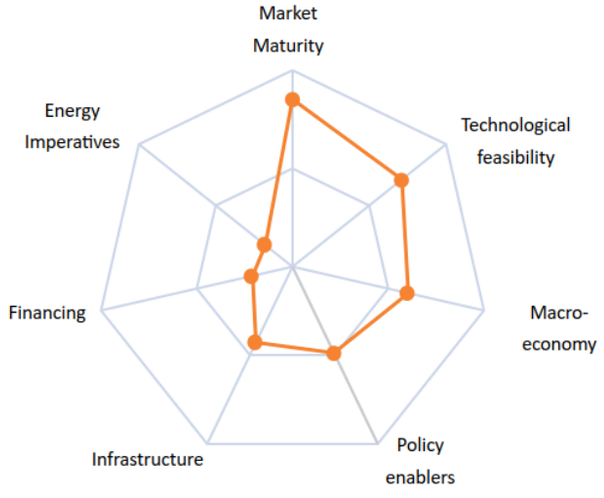
CO2 Emissions & Electricity Consumption



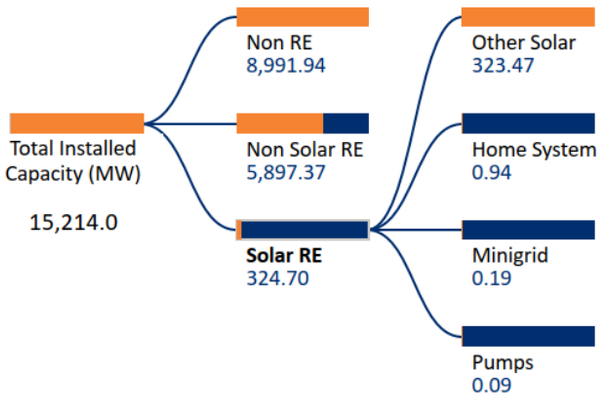
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

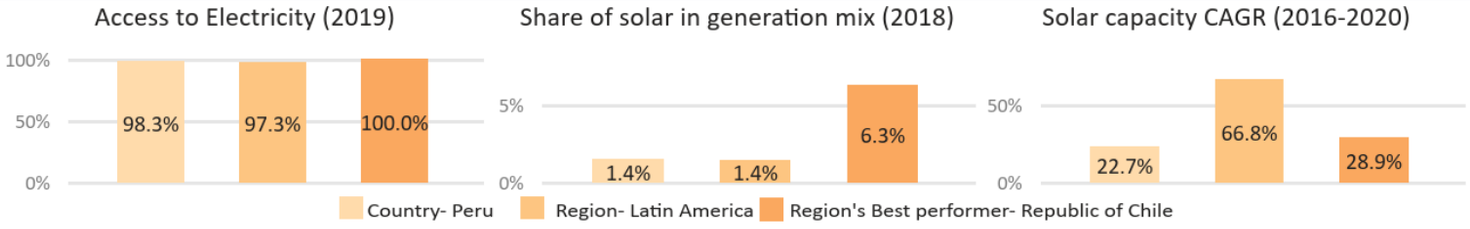


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength

- Market Maturity
- Technological feasibility

Areas of Improvement

- Energy Imperatives
- Financing

Key Insights

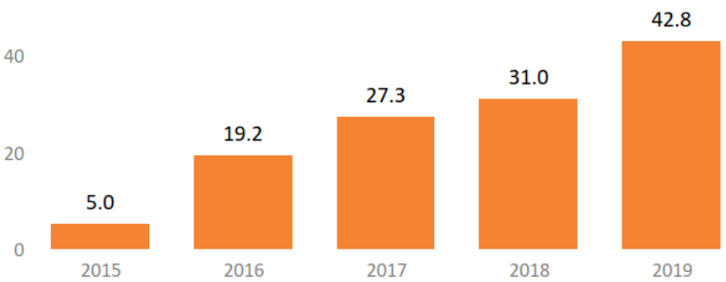
Drivers	Insights
Macro-economy	• On account of COVID-19 Pandemic, the GDP (Real) declined by 11.1% in 2020. In 2021, it is expected to bounce back to an annual growth rate of 8.5%.[1] • The inflation rate (CPI) of Peru has improved to 1.8% in 2020 from 2.1% in 2019.[1] • In 2019, Peru secured 79th rank out 189 countries in the Human Development Index.[2] • In 2020, Fuels & mining products dominated the total exports with a share of 48.2% followed by Agriculture and Manufactured products having 21.6% and 8.8% share respectively.[16]
Policy enablers	• To promote RE investments in the county, mechanisms like standardised PPA and purchase obligations have been implemented.[8] • Favourable RE policies such as net metering and remuneration schemes are already operating in the country.[3] • The National Rural Electrification Plan 2016-25 aims to invest USD 1,280 mn in rural electrification systems with USD 294 million in solar PV to provide electricity to 3.3 million people in rural areas.[3]
Technological Feasibility	• As of 2020, renewable energy accounted 6.2% share in the total power generation.[3] • Peru has abundant potential (of 559,000 GWh/year) for solar energy, however, only 767 GWh power is generated from solar as of 2019.[9,10] • Steep slopes in Southern region of Peru might be a challenge for development of large-scale solar PV plants.[9]
Market Maturity	• The Power sector in Peru is regulated by OSINERGMIN (Organismo Supervisor de la Inversión en Energia y Minería). The generation, transmission, and distribution utilities are unbundled with multiple private companies operating in these areas.[3] • Peru has an active power market comprising of bilateral contracts and a power market. Open access regulations offer a high level of transparency in procedures, market prices, quantities, and settlements.[11]
Infrastructure	• Peru's transmission system operates at voltage levels of 30 kV to 500 AC kV. The total length of transmission lines had grown at a CAGR of 5.3% in the last decade reaching 28,628 cKM in 2020.[3] • Electricity Distribution sector is majorly privatised with some government entities operating as well. The total length of distribution network reached 263,445 ckm in 2020.[3] • The national grid of Peru is connected with Ecuador through 220 kV interconnector. To increase the volume of power trade between the two countries, a 500 kV transmission line is expected to be operational by the year 2025.[3,7]
Financing	• In 2018, Peru has passed the Climate Change Framework Law to mitigate climate change through various measures including funding of low-carbon technologies.[12] • The Electric Social Compensation Fund (FOSE) was established in 2004 to promote private investments for off grid RE power in rural areas through subsidies.[3] • PPP law, reformed in 2015, allows access to domestic financial instruments to raise funds from the private sector for infrastructure projects.[14] • The European Investment Bank announced in 2018 to provide USD 150 million to fund development of solar PV projects in Peru.[15]
Energy Imperatives	• Per capita consumption at 1.57 MWh is relatively low to the global average of 3.35 MWh in 2020.[6] • The total solar installed capacity has reached 342 MW in 2020 and is expected to reach 1,638 MW by 2030.[3] • The industrial sector accounts for 59.0% share in the electricity consumption followed by residential and commercial having 21.7% and 17.2%.[3] • As of 2020, Hydropower dominates the total installed capacity mix with a share of 55.2% followed by Natural Gas having 38.2% respectively.[10] • Peru is a net importer of electricity; power imports have risen to 22 GWh in 2020 from 17 GWh in 2017.[3]

Rwanda

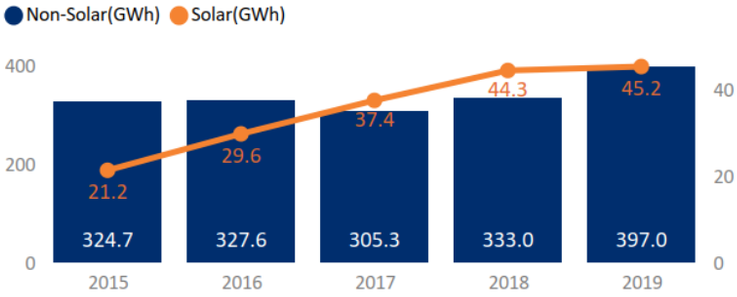
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
668.1	NA	18.9
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.1	0.1	76.5

Cumulative Solar Installed Capacity (MW)

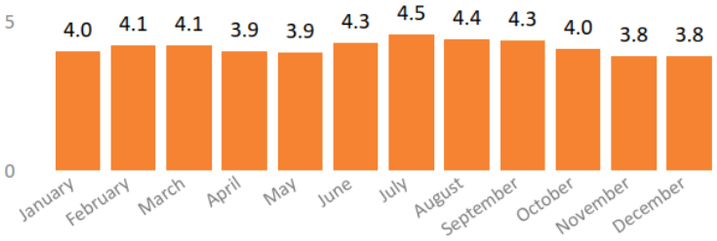


Renewable Energy Generation by Source

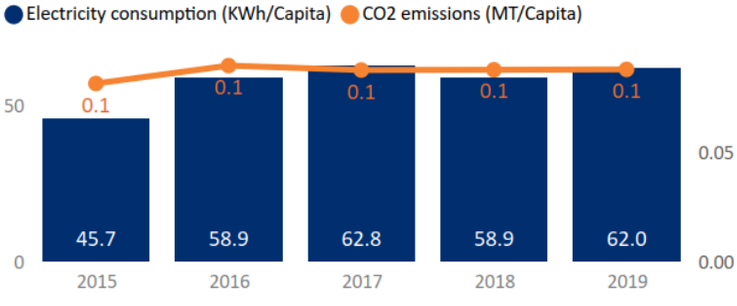


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



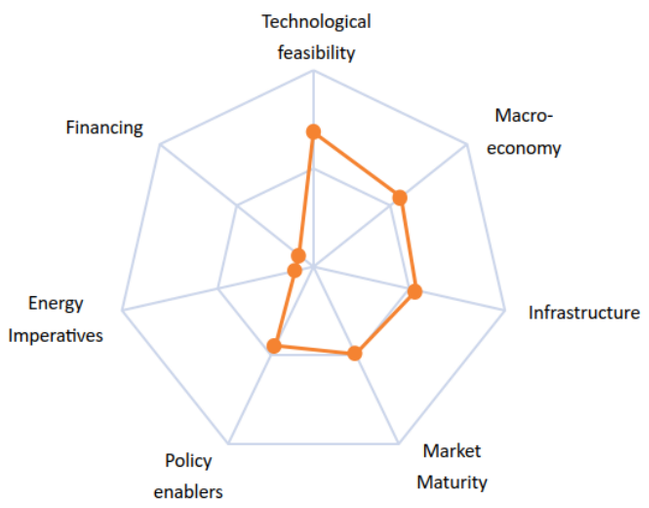
CO2 Emissions & Electricity Consumption



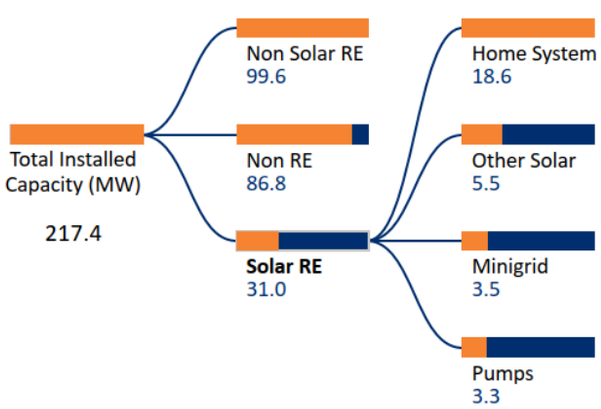
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
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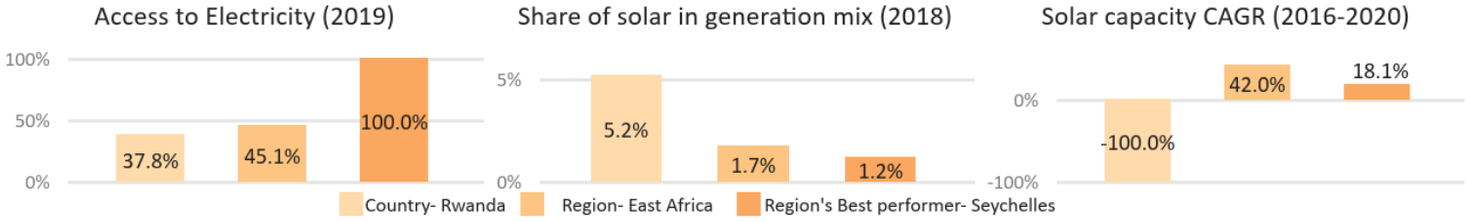
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Energy Imperatives

Key Insights

Drivers	Insights
Macro-economy	• GDP (at current prices) was USD 10.33 Bn in 2020 which had contracted by 0.2% in 2020 from 2019 levels. [2, 3] • Growth is projected to rebound in 2021 and 2022, supported by infrastructure projects and a pickup in the tourism sector as the effects of the pandemic are fading out.[10] • Rwanda aspires to reach Middle Income Country (MIC) status by 2035 and High-Income Country (HIC) status by 2050.[11]
Policy enablers	• Government of Rwanda aims to ramp up its generation capacity to 512 MW by 2023-24 with a lot of focus on increasing the share of solar in the energy mix.[12] • Rwanda Energy Group's strategic plan for 2019-24 aims to implement energy projects to sustainably deliver reliable and affordable energy for household and commercial usage.[14] • The Rwanda Utilities Regulatory Agency (RURA) sets the tariff and has recently published the National RE Feed in Tariff.[16]
Technological Feasibility	• Owing to relatively high average solar irradiation level (GHI) of 5.08 kWh/m²/day and specific yield of 4.08 kWh/kWp a strong technical feasibility is envisaged for solar projects in Rwanda.[1] • Renewable generation is 445 GWh which constitutes 54% of the total electricity generated as of 2019.[9] • Power Africa advises the Rwandan government on the design and implementation of its rural electrification strategy, which supports the role-out of solar home systems and mini-grids.[15]
Market Maturity	• 38% of total population had access to electricity as of 2019. Country is set to achieve a target of universal electricity access by 2024.[6,15] • RE share in total Final electricity consumption is 85.7% as of 2018.[6] • Rwanda is a member of the Eastern African Power Pool which aims to optimize the available energy resources and reduce electricity cost in the region.[4] • Rwanda has an electricity tariff of USD 0.22/kWh, which is highest in the Eastern African region.[12]
Infrastructure	• Currently, more than 500 kms of transmission lines are under construction / procurement stage to strengthen the regional electricity trade.[12] • USD 7 bn investments are estimated to be required in generation, transmission, and distribution infrastructure between 2013 and 2025 to increase the capacity and meet the growing future demand.[12] • Electric grids of 769 km of 220 kV and 110 kV power lines are interconnected to Burundi, Kenya, Uganda, DR Congo, and Rwanda.[13] • The Government of Rwanda, Mara Corporation Ltd, and SB Energy Corp have signed an MoU in 2018 to develop a 30 MW solar power plant with a storage facility.[17]
Financing	• International financial flow in 2018 was USD 16 Mn (in PPP terms) to support clean technologies and RE.[6] • The World Bank Group's portfolio in Rwanda currently includes 21 national projects with a net commitment of more than $2,109.97 Mn and 4 regional projects worth a national commitment of $240.30 Mn.[11] • Currently, IFC investment portfolio stands at USD 152 Mn and over USD 14 Mn in advisory services.[11] • The Government of Rwanda has signed a USD 48.9 Mn funding agreement with the World Bank in 2017 to provide affordable loans to purchase solar energy-based systems.[19]
Energy Imperatives	• Per capita electricity consumption in 2019 was 62 kWh which is significantly lower in comparison to the global average.[5] • 26% of rural population had access to electricity in 2019.[6] • Rwanda's total installed capacity was 259 MW in 2020 with 55% (141 MW) share of renewables.[9] • As of 2020, Hydro constitutes approximately 78% (110 MW) of renewable capacity with remaining 22% coming from solar.[9]

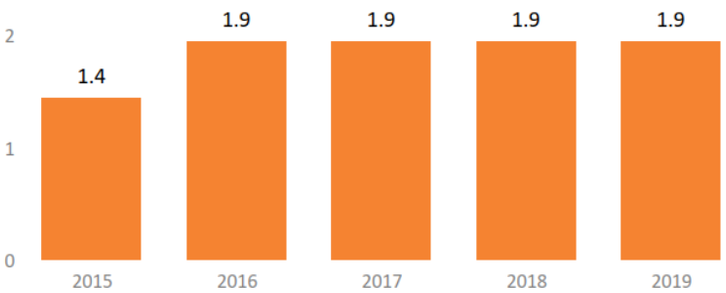
Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
187.0	1.9	NA

Saint Kitts and Nevis

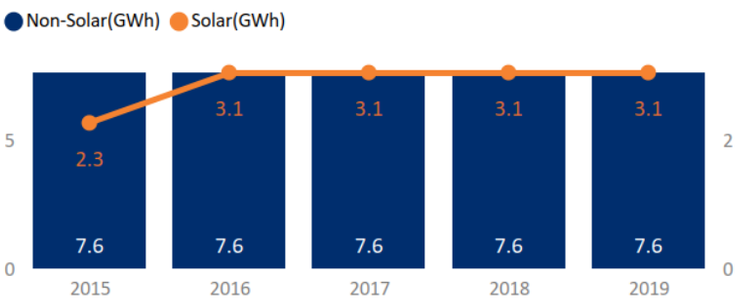
Latin America & Caribbean

Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
4.6	4.6	54.6

Cumulative Solar Installed Capacity (MW)

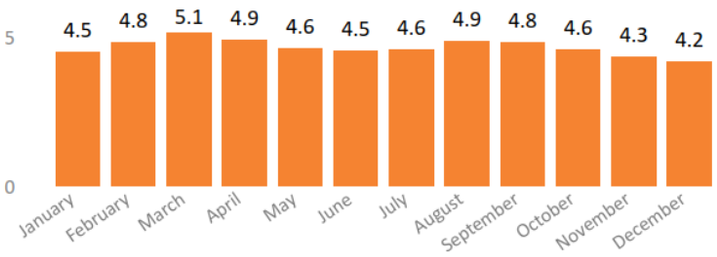


Renewable Energy Generation by Source

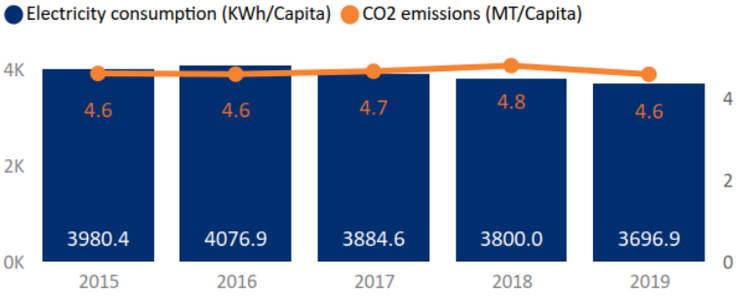


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



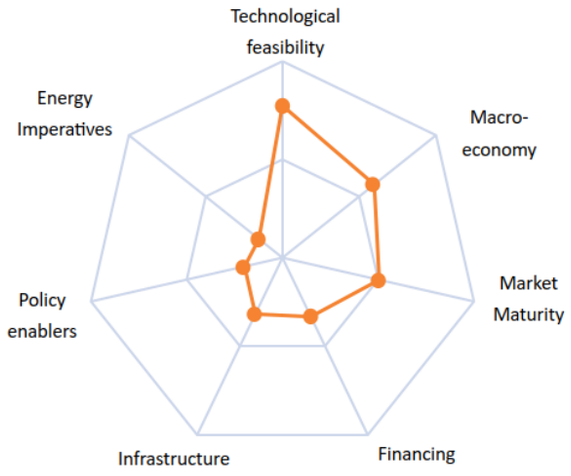
CO2 Emissions & Electricity Consumption



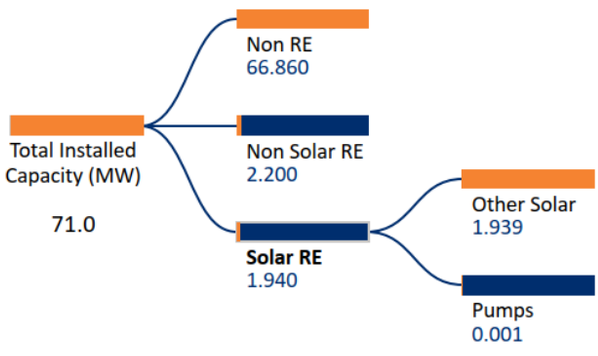
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers



Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
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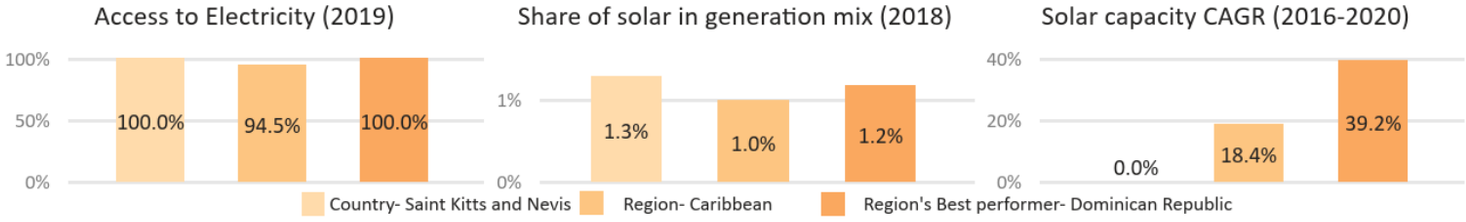
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Energy Imperatives, Policy enablers

Key Insights

Drivers	Insights
Macro-economy	• 100% of the population in Saint Kitts & Nevis had access to electricity as of 2019.[9] • Per capita consumption of 3.7 MWh is slightly higher than the global average of 3.35 MWh in 2019.[8] • The installed Solar PV capacity stood at 2 MW in 2020.[11]
Policy enablers	• Owing to very high levels of solar irradiation (GHI) of 5.58 kWh/m^2/ day and specific yield 4.64 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Saint Kitts & Nevis.[7] • Potential for Solar PV in the country is 16 MW.[5] • Share of renewables in the generation mix was 5.6% in 2019.[13]
Technological Feasibility	• Saint Kitts & Nevis is a Small Island Developing States (SIDS) having a high-income economy[2] with GDP per capita (PPP) of USD 20,730 in 2021.[1] • Due to COVID-2019 pandemic, economy of the country which is majorly based on tourism has been deeply impacted.[3] • The GDP (Real) growth is expected to recover from -18.7% in 2020 to -2% in 2021.[1]
Market Maturity	• SKELEC owns a power station which comprises of 10 diesel generators operating with a total capacity of 43 MW.17 • The transmission system comprises of twelve (12) 11 kV radial feeders originating at the generator bus bar at the power station.[17] • The Basseterre Valley Solar PV Park having with a 14.8 MW / 45.7 MWh lithium-ion system is under construction in Saint Kitts and Nevis.[16]
Infrastructure	• St. Kitts Electricity Company Ltd. (SKELEC) and St. Kitts Nevis Electricity Company Ltd. (NEVLEC) are both vertically integrated utilities, manage generation, transmission, and distribution in the country.[5] • The Ministry of Public Works, Utilities, Transport and Post also regulates energy sector in the country.[10] • Contribution of solar power in the electricity generation stood at 1.28% in 2018.[11]
Financing	• The Ministry of Public Infrastructure, Posts, Urban Development & Transport oversees the energy sector in the country.[4] • The National Energy Policy (NEP) of Saint Kitts & Nevis prioritises renewables to achieve sustainable development.[14] • In its Intended National Determined Contributions commitments, the country has set a target to generate 50% of its total electricity using renewables by 2030.[12] • The government offers VAT reductions and import duty waivers on a range of renewable goods/equipment.[15] • A low-interest solar loan program for residential consumers and businesses to increase solar water heating use is being provided by the Government.[5]
Energy Imperatives	• Under the European Investment Bank's USD 1 Mn line of credit, the Development Bank of Saint Kitts and Nevis provides small and medium-sized enterprises with low-interest financing for renewable projects.[15] • In 2020, the EU disbursed EUR 3.44 Mn to Saint Kitts and Nevis to promote the integration of renewables and energy efficient technology in public facilities.[4]

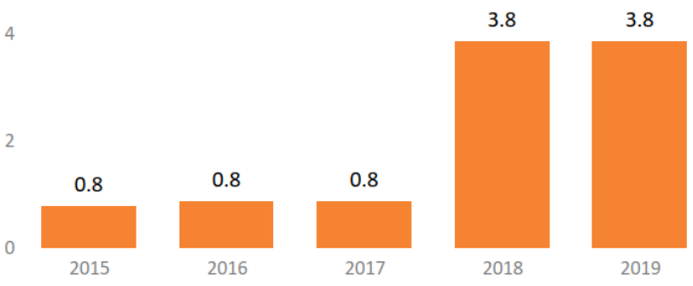
Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
361.6	3.8	NA

Saint Lucia

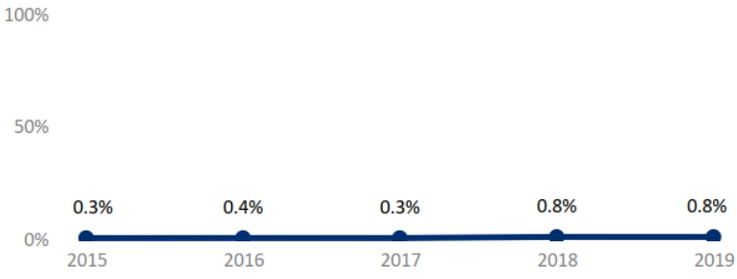
Latin America & Caribbean

Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
4.4	1.9	63.7

Cumulative Solar Installed Capacity (MW)

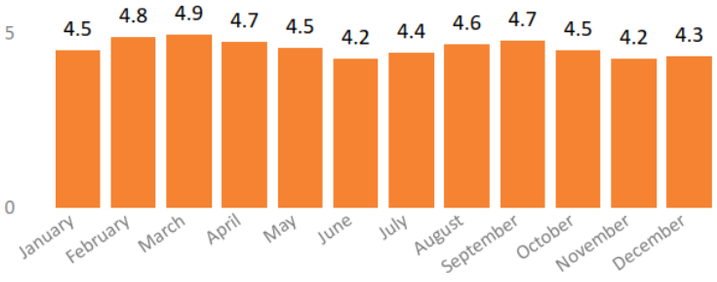


Share of electricity production from RE

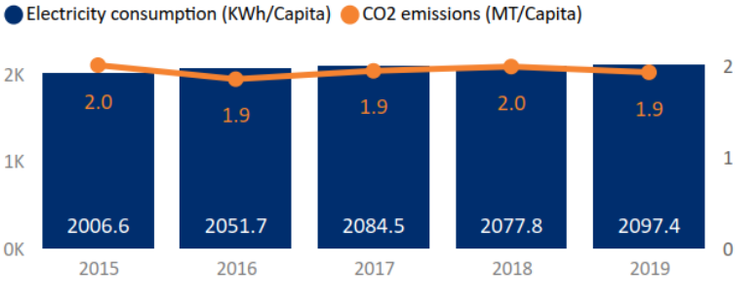


Renewables include electricity production from hydropower, solar, wind, biomass. and waste, geothermal, wave and tidal sources.

Monthly variation in PVout (kWh/kWp/day)



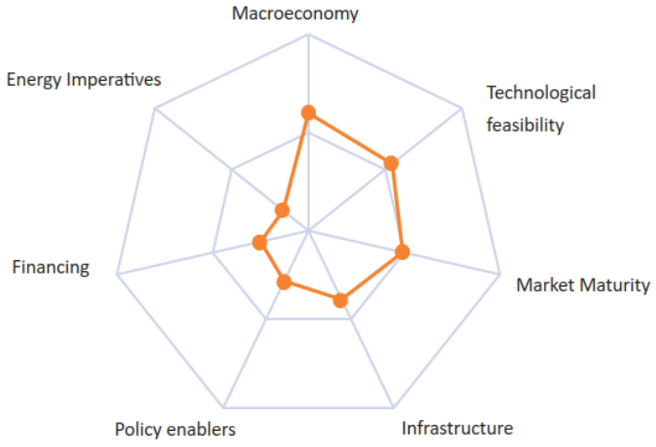
CO2 Emissions & Electricity Consumption



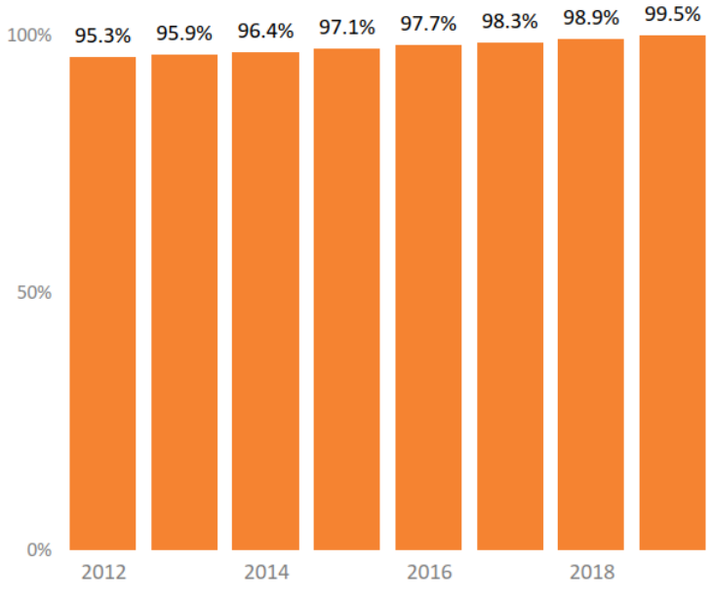
Ease of Doing Solar Classification

Progressive

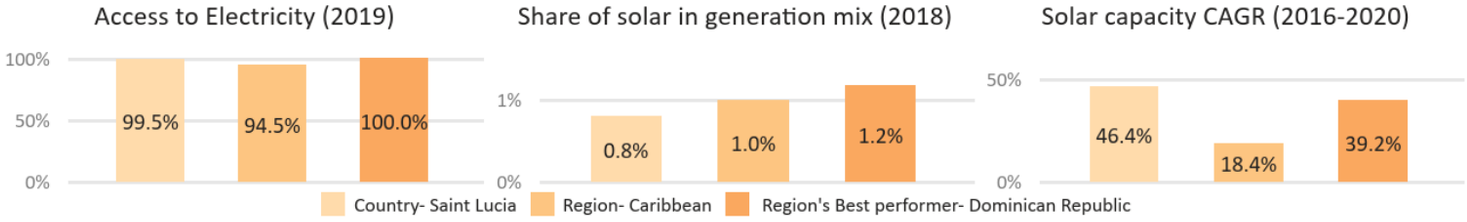
Performance against 7 drivers



Access to Electricity



Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Infrastructure

Areas of Improvement → Financing, Policy enablers

Key Insights

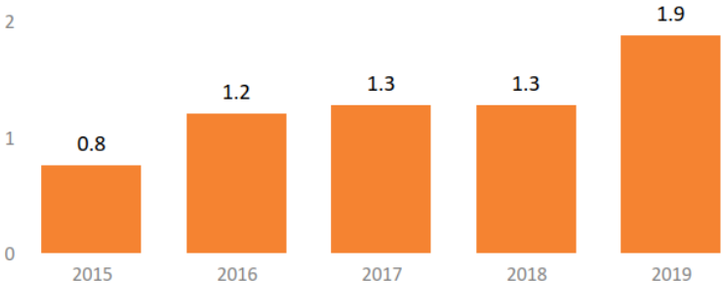
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, Saint Lucia's GDP (Real) has declined by 18.9% in 2020.[1] • The inflation rate (CPI) of Saint Lucia has reversed in 2020 reaching -1.8% from 0.5% in 2019.[1] • Tourism is the major contributor to the economy contributing 65% to GDP and the major source of foreign exchange for the country.[6]
Policy enablers	• To catalyse the growth of renewable energy in the country various incentives such as net metering, import duty exemptions and income tax deductions for RE projects have already been provided by the government.[8] • Based on the country's Nationally Determined Contributions the country has set a target to achieve 50% share of renewable energy in the generation mix by 2030.[10] • Several policies such as National Energy Policy, National Energy Transition Strategy and Integrated Resource Plan and Sustainable Energy Plan have been launched by the government in the past with an aim to reduce dependence on fossil fuels and support development of renewables in the country.[8]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.40 kWh/m²/day and specific yield 4.39 kWh/kWp, a very high technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• As of 2019, 100% of the population in the country had access to electricity.[3] • Saint Lucia is blessed with high solar irradiation index, however in 2019, solar PV accounted for a mere of 0.82% share in generation mix.[4] • The Power sector in the country is regulated by National Utilities Regulatory Commission (NURC). The generation, transmission and distribution sectors are wholly controlled by privately owned St. Lucia Electricity Services Ltd. (LUCELEC).[7]
Infrastructure	• The power infrastructure of Saint Lucia operates between 240/415 V & 11 kV to 66 kV AC voltage levels. • The total length of transmission and distribution lines stands at 78 miles and 2,676 miles respectively as of 2020.[8] • The system losses have improved in the last 5 years reaching 5.94% in 2020 from 7.52% in 2016.[8] • To develop smart grid and real time monitoring of distributed generation several steps such as establishment of optical fiber network, utility scale battery storage system and upgradation of equipment in substation have been taken up by the utility.[9]
Financing	• In July 2021, the World Bank sanctioned USD 21.9 Mn to Saint Lucia with an aim to develop favourable business environment for clean energy, improve the reliability of power infrastructure and explore geothermal potential in the country.[11] • Under the Credit Risk Abatement Facility (CRAF), the CARICOM Development Fund (CDF) in collaboration with Saint Lucia Development Bank will provide partial credit guarantee for the development of renewables and energy efficiency projects across the country and the region.[12]
Energy Imperatives	• Per capita consumption of 2.1 MWh is relatively low compared to the global average of 3.35 MWh in 2019.[5] • The total generation from solar PV has risen at a CAGR of 63.8% between 2012-19 reaching 3.1 GWh in 2019 from 0.1 GWh in 2010.[4] • In 2019, gas & oil based thermal power plants dominated the generation mix having 99.1% share in the generation mix followed by solar PV power plants having 0.8% share.[4] • In the last decade, the total power demand in the country has risen at a CAGR of 0.8% reaching 383 GWh in 2019 from 358.0 GWh in 2010.[4]

Saint Vincent and the Grenadines

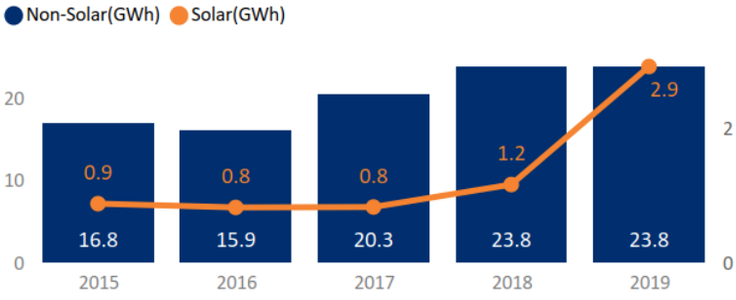
Latin America & Caribbean

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
135.1	1.9	NA
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.3	2.3	57.1

Cumulative Solar Installed Capacity (MW)

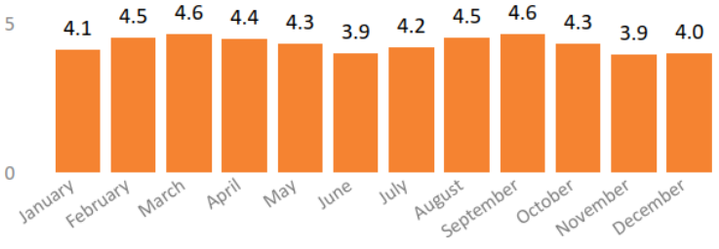


Renewable Energy Generation by Source

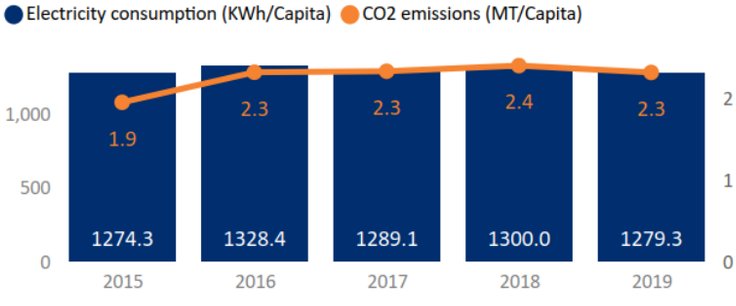


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



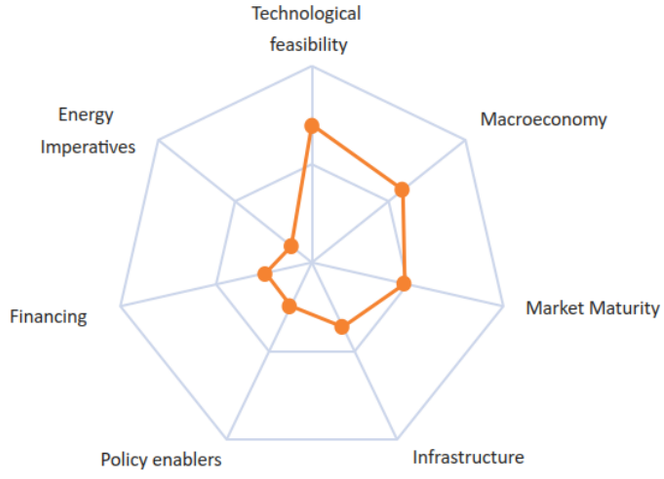
CO2 Emissions & Electricity Consumption



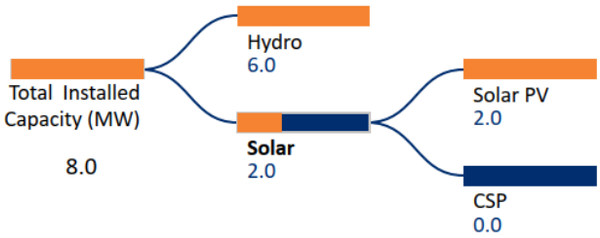
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers

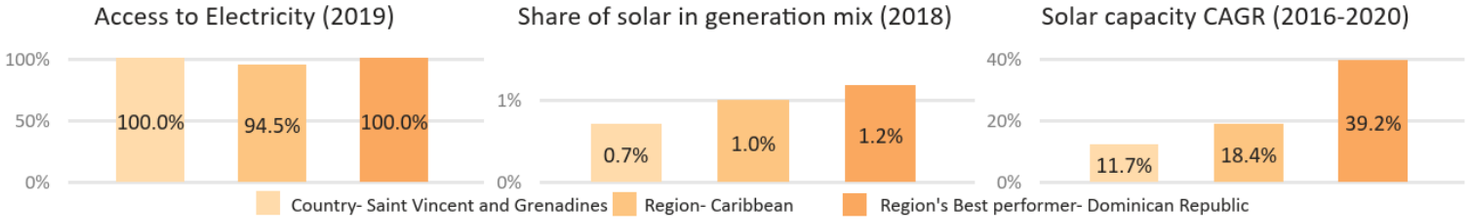


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Energy Imperatives, Financing

Key Insights

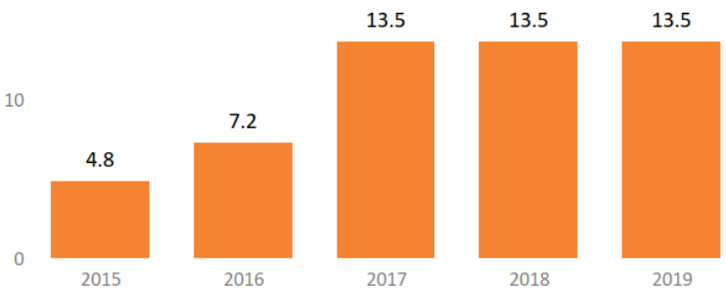
Drivers	Insights
Macro-economy	• Saint Vincent & Grenadines is an upper middle-income country with GDP per capita (PPP) of USD 12,606.[1,3] • Due to COVID-19 Pandemic, the GDP (Real) has declined by 4.2% in 2020.[1] • The inflation rate (CPI) of Saint Vincent & Grenadines has decreased in 2020 reaching -0.6% in 2020 from 0.9% in 2019.[1] • Agriculture, tourism, and construction activities are the major contributors to the economy.[6]
Policy enablers	• To catalyse the growth of renewable in the country, various incentives & schemes such as feed-in tariff and tax exemptions for renewable energy have already been deployed by the government.[8] • To increase participation of global private players in the renewable energy sector, the interconnection standards have already been implemented in the country.[8] • Several policies such as National Energy Policy, Energy Action Plan and National Economic and Social Development Plan (2013–2025) has been launched by the Government with aim to develop an enabling environment for private sector participation and support the growth of renewable in the country.[9]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.19 kWh/m^2/day and specific yield 4.26 kWh/kWp, a strong technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• Since 2019, 100% of the population in the country had access to electricity.[3] • Saint Vincent & Grenadines is blessed with high solar irradiation index, however in 2019, solar PV accounted for a mere 0.70% share in generation mix.[4] • There is no independent energy regulator in the country. St Vincent Electricity Services Ltd. (VINLEC) is a sole entity which is responsible for generation, transmission, and distribution of electricity in the country.[7]
Infrastructure	• Absence of any national grid in the country is a key factor that hinders the growth of power sector by restricting free flow of electrons across the nation.[9] • The transmission & distribution losses stood at 6.3% of output, indicating a considerably better quality of network.[9] • The country is planning to increase the solar PV capacity from 1.9 MW in 2019 to 4.8 MW in 2030. To achieve this, VINCLEC has signed a contract with solar energy firms for construction of solar battery storage in the country.[9]
Financing	• The Caribbean Development Bank in 2020 has sanctioned USD 8.6 Mn to the St. Vincent Electricity Services Ltd (VINLEC) for the developing solar PV power plant and battery energy storage system in the country.[10] • The Green Climate fund along with several co-financers have sanctioned USD 192.4 Mn to Dominica, Grenada, Saint Kitts & Nevis, Saint Lucia and Saint Vincent & Grenadines to reduce dependence on fossil fuels by exploration and development of geothermal energy across the countries.[11] • In 2019, the Caribbean Development Bank along with the Inter-American Development Bank, EU Caribbean Investment facility and UK Department for International Development have sanctioned USD 27 Mn for the development of geothermal power project in the county.[12]
Energy Imperatives	• Per capita consumption of 1.27 MWh is relatively low compared to the global average of 3.35 MWh in 2019.[5] • The total generation from solar PV has risen at a CAGR of 56.9% between 2013-19 reaching 1.0 GWh in 2019 from 0.06 GWh in 2010.[4] • In 2019, gas & oil based thermal plants dominated with 82.4% share in the generation mix followed by hydro power plants having 16.9% share.[4] • In the last decade, the total power demand in the country has risen at a CAGR of 0.5% reaching 142.0 GWh in 2019 from 136.0 GWh in 2010.[4]

Samoa

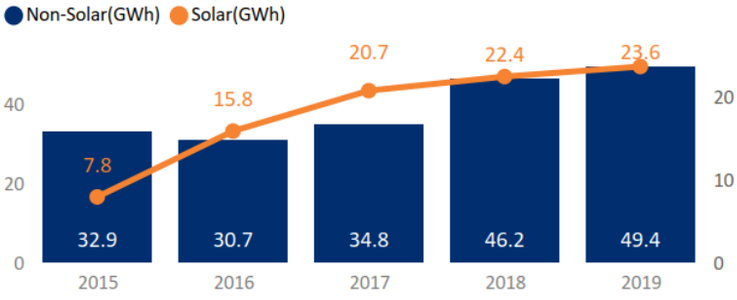
Asia & Pacific

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
134.4	13.5	0.01
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
3.9	1.4	62.1

Cumulative Solar Installed Capacity (MW)

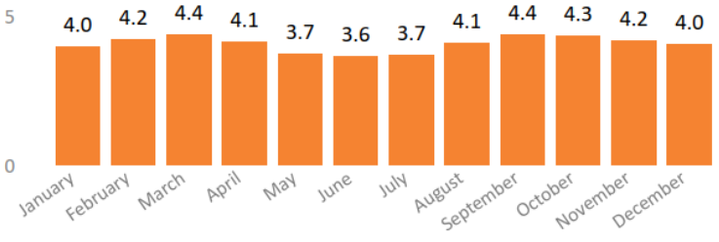


Renewable Energy Generation by Source

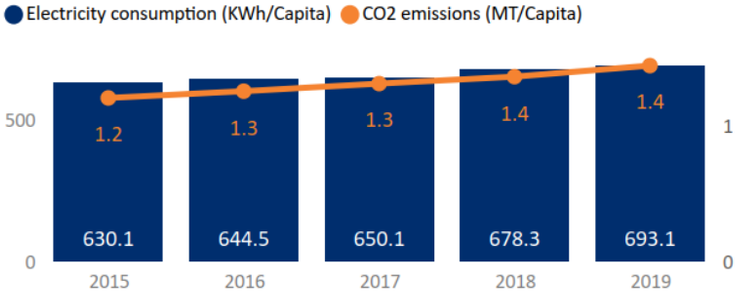


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



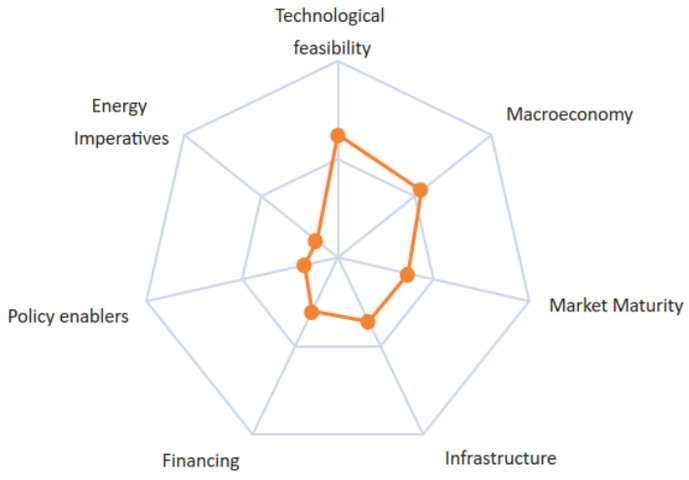
CO2 Emissions & Electricity Consumption



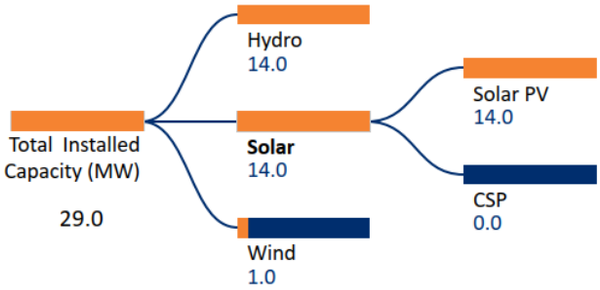
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers

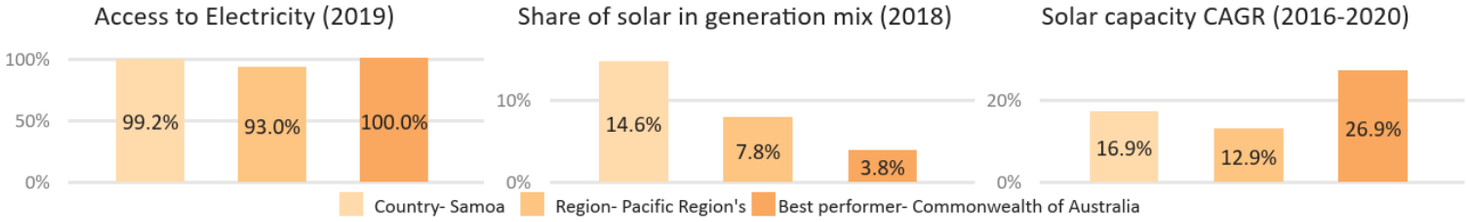


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Energy Imperatives, Policy enablers

Key Insights

Drivers	Insights
Macro-economy	• On account of COVID-19 pandemic, the GDP (Real) declined by 3.2% in 2020.[1] • The inflation rate (CPI) of Samoa has stabilised to 1.5% in 2020 from 2.2% in 2019.[1] • The economy majorly depends upon tourism, agriculture, manufacturing and remittances from Samoans living overseas.[4]
Policy enablers	• The country has set a target to achieve 100% share of renewable energy by 2025.[8] • The Electricity Act 2010 has allowed the Independent Power Producers to set up RE power plants in the country.[9] • Ministry of Natural Resources and Environment (MNRE) undertakes feasibility studies and research into RE sources for Samoa.[6]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 4.78 kWh/m²/day and specific yield 3.93 kWh/kWp, a strong technical feasibility is envisaged for solar projects in the country.[3] • In 2019, 34.3% of the country's power demand is met through renewable energy sources.[2]
Market Maturity	• 99% of the population in Samoa had access to electricity as of 2019.[7] • In 2020, the total installed solar PV capacity had reached 13.5 MW with a CAGR of 16.93% between 2015-20.[5] • The Electric Power Corporation (EPC) is responsible for the generation, transmission, distribution and sale of electricity in Samoa.[10]
Infrastructure	• Under the Power Sector Expansion Project, USD 100 mn (funded by JICA, ADB, Government of Samoa) was invested for upgrading power infrastructure and construction of renewable energy projects to improve the quality and reliability of power supply in the country.[13] • As of 2019, EPC declared its plan to install over 32,000 smart meter in country in the coming years.[14]
Financing	• The country's four commercial banks provide almost 60% of credit to the economy, while the Samoa National Provident Fund and the Development Bank of Samoa account for approximately 30% of the credit.[15] • Project "IMPRESS" (Improving the Performance and Reliability of Renewable Energy Power System in Samoa) funded through the GEF with USD 6.07 mn and USD 46 mn co-financing by the Government of Samoa aims to enhance sustainable and cost-effective energy production in Samoa.[12] • ADB has provided funding under the RE Development and Power Sector Rehabilitation Project for the development of hydropower projects in the country to reduce its dependence on imported fossil fuels.[11]
Energy Imperatives	• Per capita consumption of 0.69 MWh is substantially lower in comparison to the global average of 3.35 MWh (2019).[2] • In 2019, Oil based thermal power plants dominated the generation mix having 65.66% share followed by hydro-power having 34.23% share respectively.[2] • In the last decade, the total power demand in the country has risen at a CAGR of 1.81% reaching 136.54 GWh in 2019 from 116.20 GWh in 2010.[2]

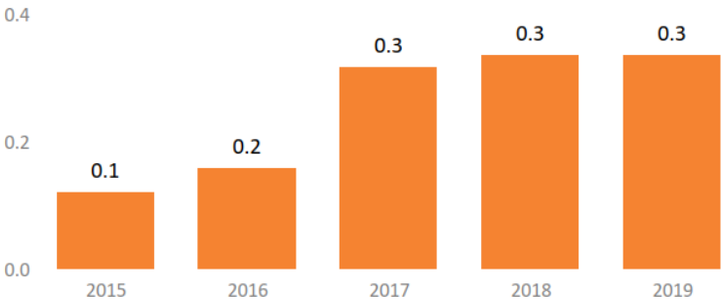
Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
73.0	0.3	0.3

Sao Tome and Principe

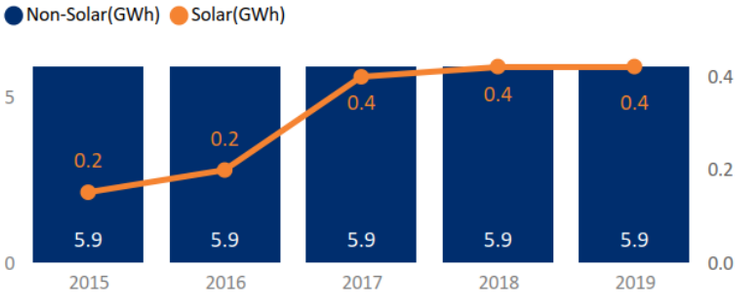
Africa

Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
3.5	0.6	45.0

Cumulative Solar Installed Capacity (MW)

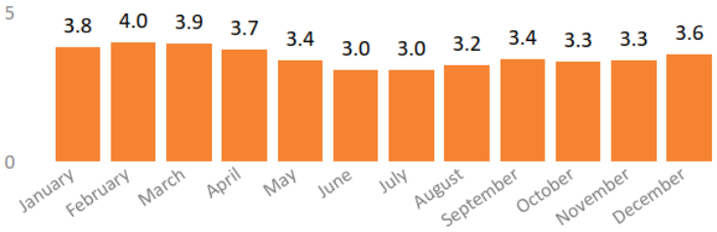


Renewable Energy Generation by Source

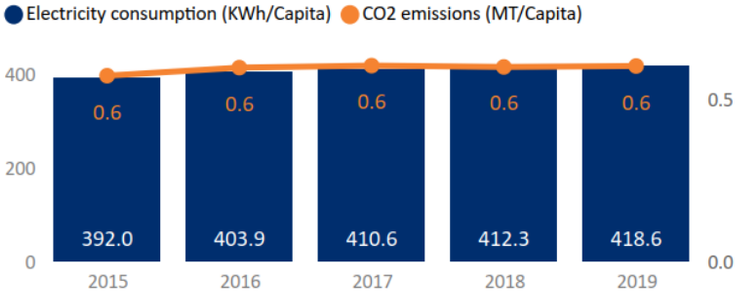


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



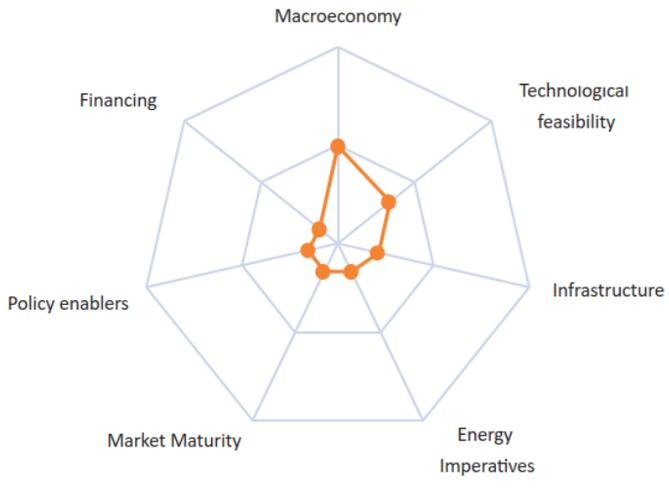
CO2 Emissions & Electricity Consumption



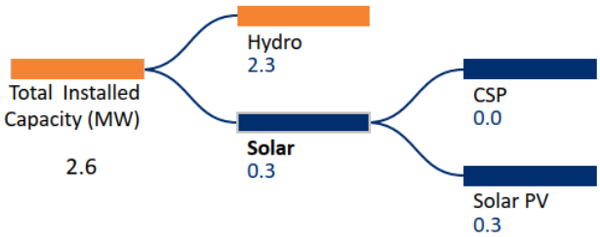
Ease of Doing Solar Classification

Potential

Performance against 7 drivers

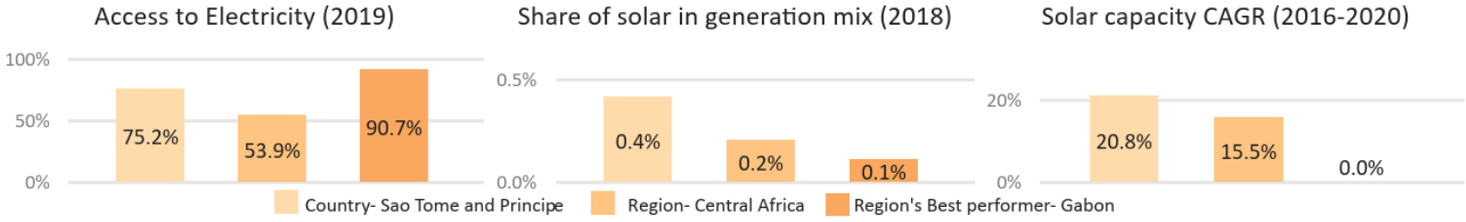


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Macroeconomy; Technological feasibility

Areas of Improvement → Financing; Policy enablers

Key Insights

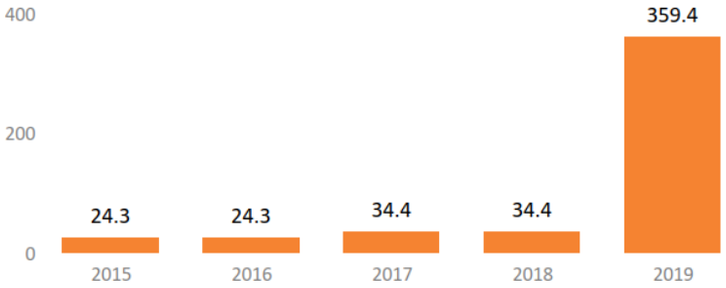
Drivers	Insights
Macro-economy	• GDP (at current prices) for the country was USD 0.418 Bn as of 2020.[2] • Real GDP contracted by 6.5% in 2020 mainly attributed to a sharp decline in tourism and service sectors.[3,7] • Country's growth is driven by agriculture, tourism, and oil-fuelled foreign direct investment.[4]
Policy enablers	• "Sao Tome and Principe 2030: the country we need to build" is its vision of integrating renewable energy and transform the country into a climate-resilient and vibrant island hub for blue economy businesses, financial services and tourism.[14] • A Least Cost Power Development Plan (LCPDP) has been prepared that targets to increase the share of renewable energy in the energy mix to 50%.[11]
Technological Feasibility	• Owing to relatively average solar irradiation level (GHI) of 4.3 kWh/m²/day and specific yield of 3.46 kWh/kWp, moderate technical feasibility is envisaged for solar projects in Sao Tome and Principe.[1] • Renewable generation is 6 GWh which constitutes 6% of total electricity generated as of 2018.[10]
Market Maturity	• 75% of total population had access to electricity as of 2019. Country has set a target of universal electricity access by 2030.[6,11] • RE share, in total final electricity consumption, is 38% as of 2018.[6]
Infrastructure	• Transmission and distribution networks are old and not well maintained leading to high technical losses.[12] • The interconnected power generation infrastructure in the Island nation is limited and diesel consumption (by oil fired power plants) constitutes a large portion of the operating expenses.[12]
Financing	• Country's Power Sector Recovery Project was approved in 2016 with a commitment amount of USD 16 mn. The project aims to increase renewable energy generation and improve the reliability of the electricity supply.[9] • The World Bank had approved a USD 16 mn project financing from International Development Association (IDA) in 2016. This funding aims at increasing renewable energy generation and improve the reliability of the electricity supply in the country.[4] • The current portfolio, funded by International Development Association (IDA), of power sector related projects had commitments of USD 80 mn of which nearly 28% are disbursed.[4]
Energy Imperatives	• Per capita electricity consumption in 2020 was 419 kWh which is significantly lower in comparison to the global average.[5] • 69% of rural population had access to electricity as of 2019.[6] • STP's total installed capacity was 48 MW in 2019 with 6% (3 MW) share coming from renewables.[10] • As of 2019, Hydro constitutes approximately 88% of renewable capacity with remaining 12% coming from solar.[10]

Saudi Arabia

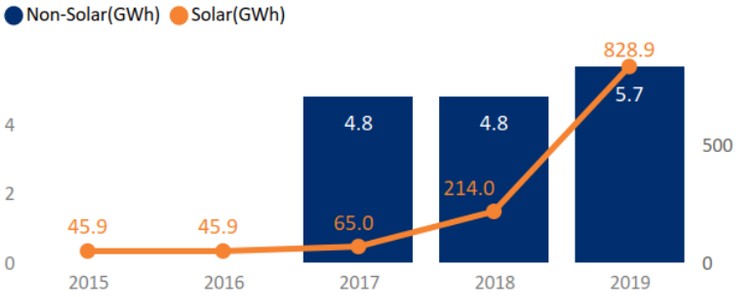
Middle East

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in GW (2020)	Off-Grid Solar Capacity in MW (2019)
265.7	359.4	0.01
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
5.2	17.0	71.6

Cumulative Solar Installed Capacity (MW)

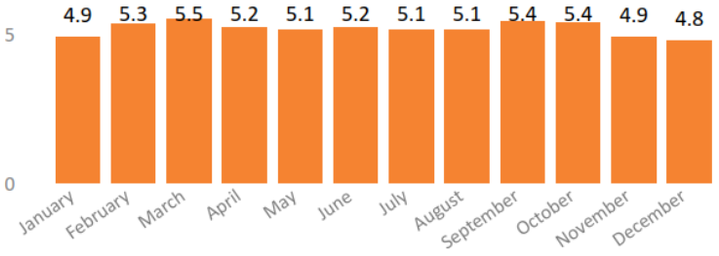


Renewable Energy Generation by Source

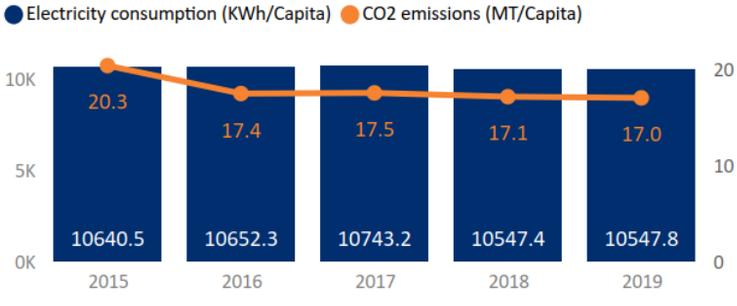


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



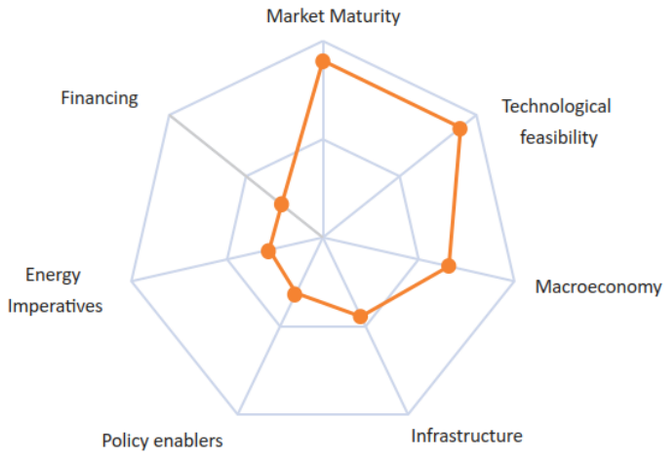
CO2 Emissions & Electricity Consumption



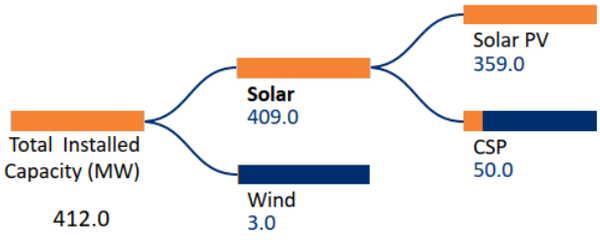
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers

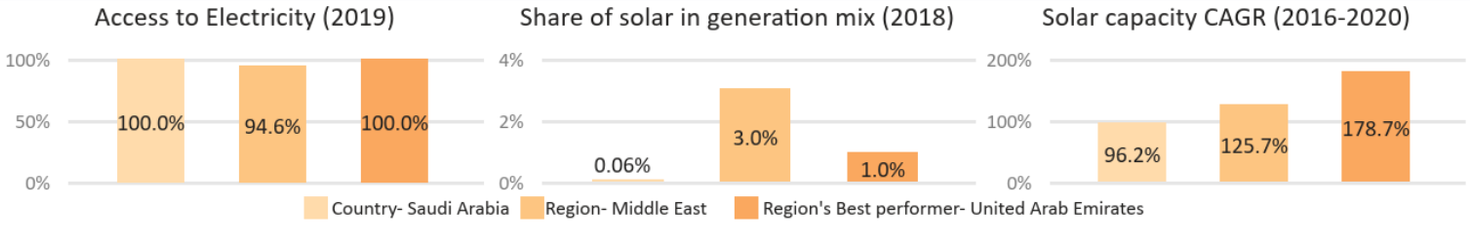


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

Areas of Improvement → Financing, Energy Imperatives

Key Insights

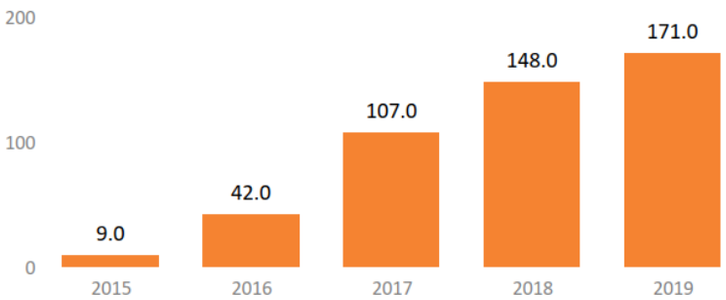
Drivers	Insights
Macro-economy	• On account of COVID-19 Pandemic, the GDP (Real) has declined by 4.1% in 2020.[1] • The inflation rate (CPI) of Saudi Arabia has risen to 3.4% in 2020 from -2.1% levels in 2019.[1] • In 2019, the services sector was a major contributor to the GDP having 50.4% share followed by industrial and agricultural sector having 47.4% and 2.2% share respectively.[6]
Policy enablers	• The Saudi Green Initiatives launched in 2021, aims to have 50% share of renewable energy in the generation mix by 2030.[10] • Launched in 2017, the National Renewable Energy Program (NREP) has target to achieve cumulative renewable energy capacity of 27.3 GW by 2024 and 58.7 GW by 2030.[8] • To stimulate private sector investments incentives such as custom duty exemptions, net-metering, land incentives and repatriation of capital already exists in the country.[11,12]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 6.21 kWh/m^2/day and specific yield 5.17 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• Since 2001, 100% of the population in the country has access to electricity.[3] • Saudi Arabia is blessed with very high solar potential, however, as of 2019, solar PV has accounted only 0.04% share in generation mix.[4] • The Power sector in Saudi Arabia is regulated by Electricity & Co-Generation Regulatory Authority (ECRA). The generati on sector has presence of Independent Power Producers (IPPs), while transmission and distribution sectors are wholly controlled by the government entities.[8,9]
Infrastructure	• The transmission system of Saudi Arabia operates between 110 kV to 380 kV AC voltage levels. The total length of transmission lines rose at a CAGR of 6.4% in the last decade reaching 85,645 ckm in 2020.[8] • Distribution of electricity in the country is done by the Saudi Electricity Company (SEC) with total line length reaching 679,644 cKM in 2020.[8] • Saudi Arabia is a part of Gulf Cooperation Council (GCC), which has Bahrain, Kuwait, Oman, Qatar, and the UAE among its members. Since 2011, the country has been a net exporter of electricity with 47 GWh exports against 4 GWh imports in 2020.[8]
Financing	• Launched under Vision 2030, the National Renewable Energy Program aims to attract investment worth US dollar 30 bn to US dollar 50 bn for the deployment of clean energy projects in the country.[13] • The International Finance Corporation (IFC) has sanctioned USD 20 mn loan to Saudi Orix Leasing Company (SOLC) to magnify its capacity for financing of renewable energy projects.[14]
Energy Imperatives	• Per capita consumption of 10.548 MWh is more than three times as compared to the global average of 3.35 MWh in 2019.[5] • The total generation from solar PV has risen at a CAGR of 30.5% between 2012-19 reaching 155 GWh in 2019 from 24 GWh in 2012.[4] • In 2019, Fossil fuel (oil, gas & coal) based thermal power plants dominated the generation mix having 99.9% share in the generation mix.[4] • In the last decade, the total power demand in the country has risen at a CAGR of 5.4% reaching 361,462 GWh in 2019 from 225,662 GWh in 2010.[4]

Senegal

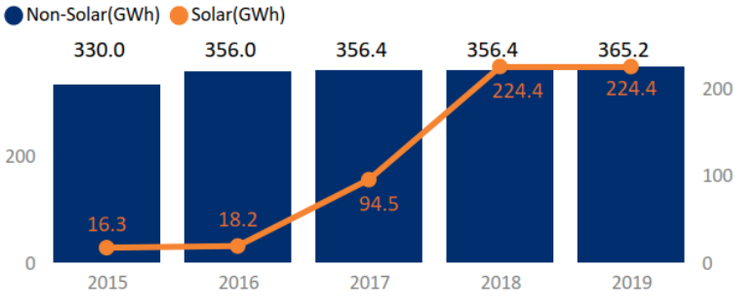
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
3,998.0	171.0	12.0
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.6	0.6	59.3

Cumulative Solar Installed Capacity (MW)

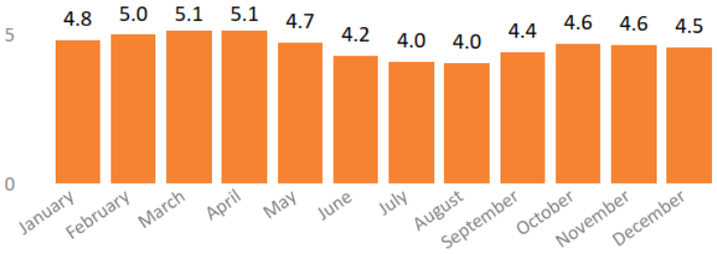


Renewable Energy Generation by Source

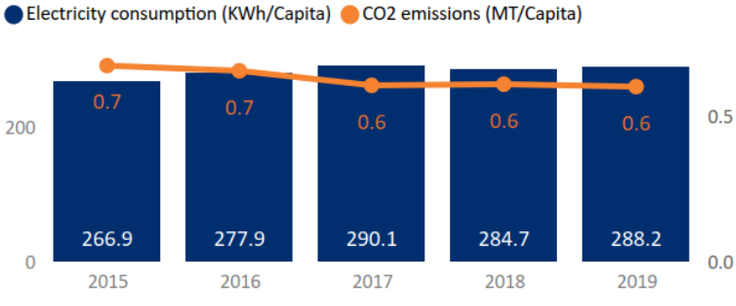


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



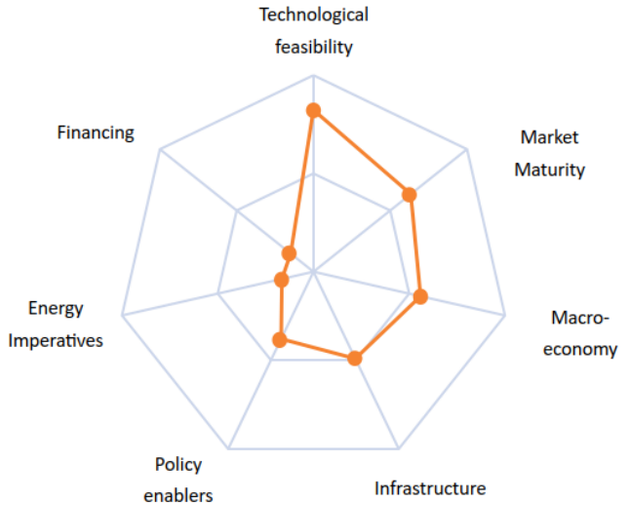
CO2 Emissions & Electricity Consumption



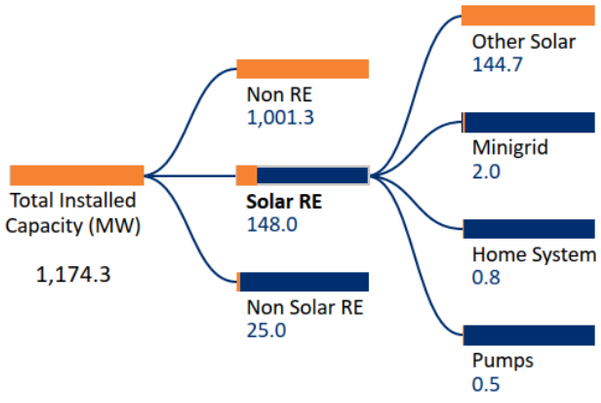
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

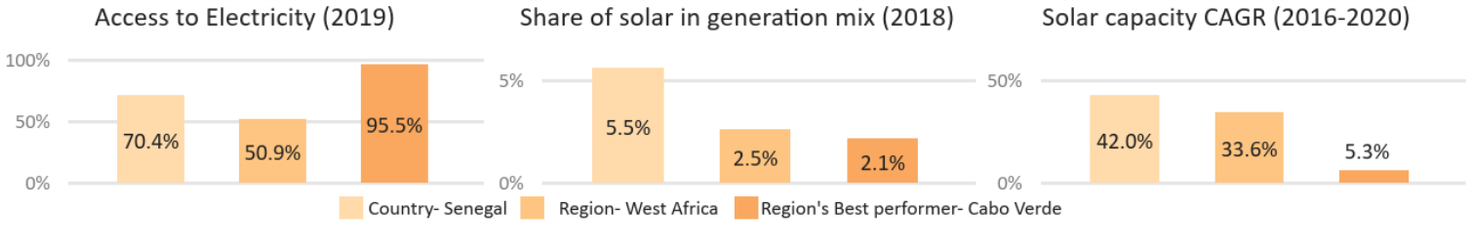


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Market Maturity

Areas of Improvement → Financing, Energy Imperatives

Key Insights

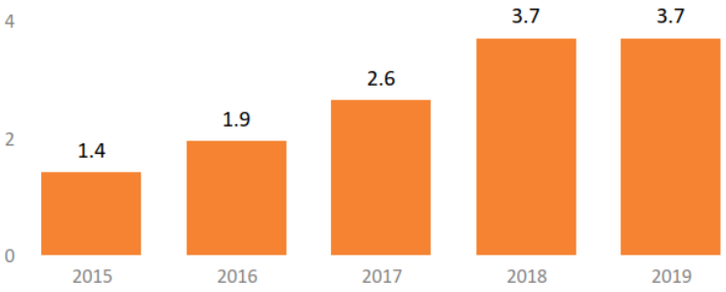
Drivers	Insights
Macro-economy	• GDP (at current prices) was USD 24.91 Bn as of 2020.[2] • Real GDP contracted by 0.8% in 2020 and is expected to rebound to 5.1% in 2021 by resumption of public investments and reminances pick up.[3,11] • Services sector, investments and exports are the major contributors in Senegal's economy.[10]
Policy enablers	• Senegal is a member of the Economic Community of West African States (ECOWAS) which is developing SEforALL initiative as well as the national renewable energy and energy efficiency action plans.[4] • Electricity Sector Regulating Committee (CRSE) regulates the Energy sector and Société Nationale d'électricité du Sénégal (SENELEC) transmits and distributes electricity in Senegal.[13] • Regulation like feed-in tariff scheme and tax incentives for development are in place to promote RE in the country.[13] • The Energy Sector Development Policy Letter (LPDSE 2019-2023) supports RE development and establishment of quality control system of RE equipment.[12]
Technological Feasibility	• Owing to very high solar irradiation level (GHI) of 5.8 kWh/m^2/day and specific yield of 4.59 kWh/kWp, very strong technical feasibility is envisaged for solar projects in Senegal.[1] • Renewable generation is 343 GWh which constitutes 8% of total electricity generated as of 2018.[7] • Senegalese Agency for Rural Electrification (ASER) aims to promote the development of off-grid RE mini-grids to reduce CO2 emissions.[12]
Market Maturity	• 70% of the Senegalese population had access to electricity as of 2019. Country has set a target of universal electricity access by 2025.[4,6] • RE share in total final electricity consumption was 36.6% as of 2018.[6] • National Agency for Renewable Energy (ANER) was established to promote RE including the bio energy in all the sectors of activity.[14]
Infrastructure	• The Government of Senegal announced partnership under the World Bank Group's Scaling Solar program to develop up to 60 MW of solar power.[9] • Senegal is a member of the West African Economic Monetary Union (WAEMU) whose objective is to promote RE sources.[8] • Taiba N'Diaye is Senegal's first utility-scale wind farm commissioned in 2019 which will pump in 158 MW of RE into the national grid lighting up homes and businesses across the country.[15]
Financing	• International fund flow in 2018 was USD 53 Mn (in PPP terms) to support clean and RE sources.[6] • The World Bank portfolio in Senegal comprises 20 national investment projects totalling USD 2.13 Bn and 9 regional projects totalling USD 336 Mn.[10] • A Country Partnership Framework (CPF) for 2020-24 lays out the World Bank Group program guided by second priority action plan (2019-23) of the Government's emerging Senegal plan and WB's systematic country diagnostic.[10] • International Finance Corporation's (IFC) portfolio in Senegal stands at approximately USD 160 Mn, while Multilateral Investment Guarantee Agency (MIGA) commitments are at USD 305 Mn.[10]
Energy Imperatives	• Per capita electricity consumption in 2020 was 288 kWh which is significantly lower in comparison to the global average of 3.31 MWh.[5] • 48% of rural population had access to electricity as of 2019.[6] • Senegal's total installed capacity was 1,075 MW in 2019 of which 19% (209 MW) came from renewables.[7] • As of 2019, Solar constitutes approximately 64% (134 MW) of the renewable capacity and remaining coming from wind and bioenergy.[7]

Seychelles

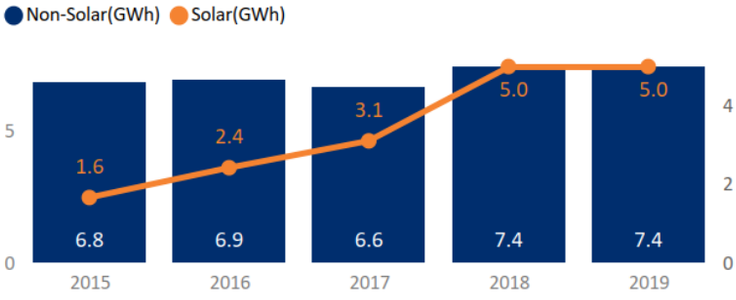
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
475.7	3.8	1.0
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.5	6.4	61.7

Cumulative Solar Installed Capacity (MW)

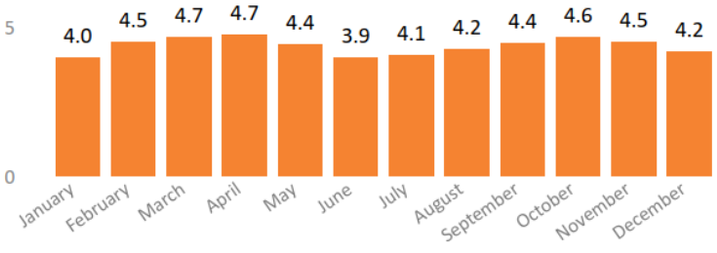


Renewable Energy Generation by Source

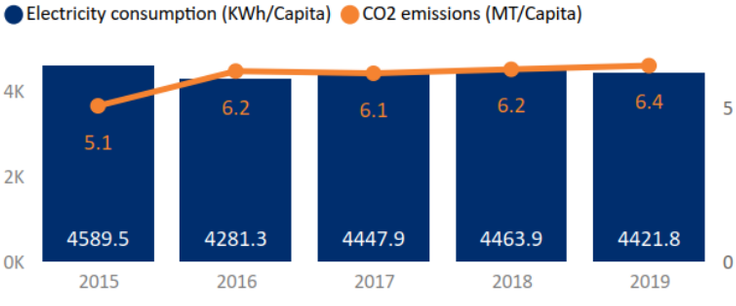


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



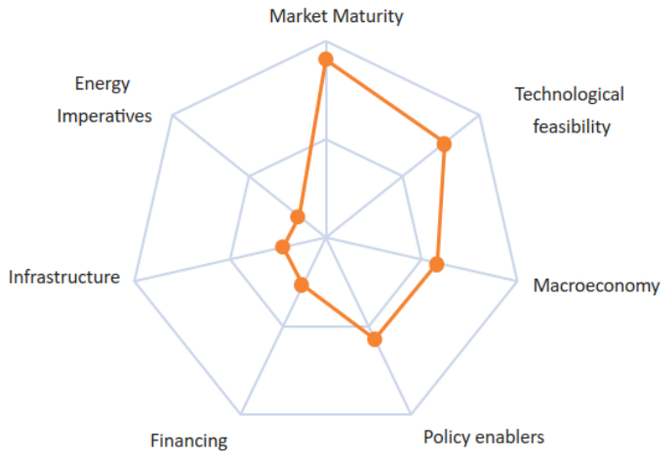
CO2 Emissions & Electricity Consumption



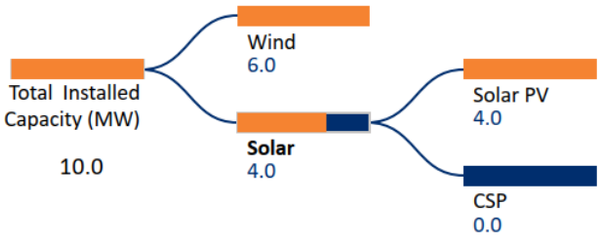
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

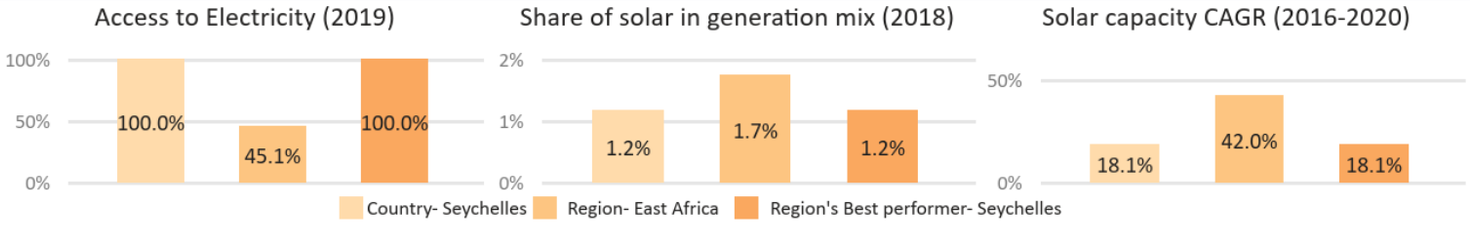


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Market Maturity; Technological feasibility

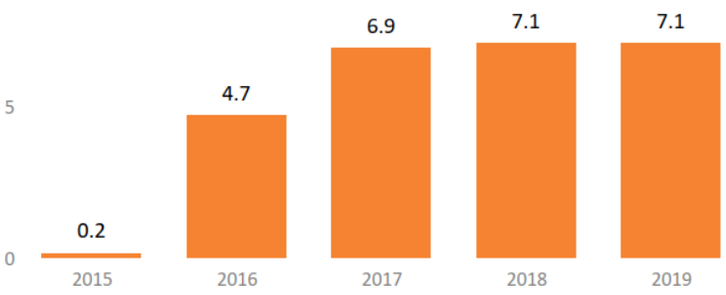
Areas of Improvement → Energy Imperatives; Infrastructure

Key Insights

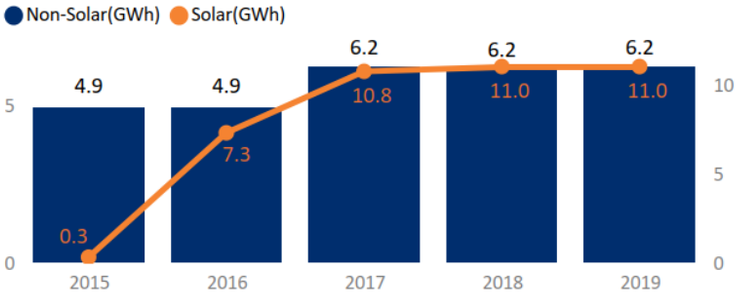
Drivers	Insights
Macro-economy	• GDP (at current prices) was poised at USD 1.13 Bn in 2020. Real GDP contracted by 13% in 2020 while it had grown by 4.7% in 2019 .[2,3,8] • Tourism and fishing sectors are the main contributors to the economy.[8] • Seychelles is at the forefront of the "Blue economy" movement focused on using oceans for economic growth while maintaining the ocean's ecosystem.[9] • Seychelles is classified as an upper-middle income country and has the highest per capita GDP (at current prices) of USD 11,425 as of 2020 in Africa.[9,10]
Policy enablers	• Seychelles Energy Policy 2010-2030 focuses on the need to reduce its dependency on oil through increased energy efficiency and promotion of RE.[12] • Seychelles Energy-Efficiency and Renewable Energy Programme (SEEREP) loan scheme launched in 2014 aims at providing subsidized lending for adopting RE technologies.[13] • Net metering is introduced in Seychelles to promote the use of RE in both residential and commercial sectors.[15] • In Seychelles, imported renewable energy-related goods are exempted from goods and services tax.[15]
Technological Feasibility	• Owing to very high average solar irradiation level (GHI) of 5.63 kWh/m^2/day and specific yield of 4.53 kWh/kWp, very high technical feasibility is envisaged for solar projects in Seychelles.[1] • Renewable generation is 12 GWh which constitutes 3% of total electricity generated as of 2018.[4] • Seychelles Energy Commission recognizes the country's potential to harness marine RE sources as it is surrounded by almost 1.3 Mn Km^2 of ocean and is prepared to work with interested parties to use it as test bed for their marine RE target.[12]
Market Maturity	• 100% of population had access to electricity as of 2019.[6] • RE share in total electricity consumption is 1.2% as of 2018.[6] • Seychelles targets to generate 5% of the country's electricity from renewables by 2020 and take it up to 15% by 2030.[12]
Infrastructure	• A rooftop grid-connected PV project with total capacity of 250 kWp developed by the Seychelles Energy Commission (SEC) and the Public Utilities Corporation (PUC) is in the development stage.[13] • Seychelles is developing world's largest floating solar power plant of 5 MW being built by a French IPP.[14] • The Seychelles Energy Act 2012 has created provisions for IPPs to generate energy from renewable sources by providing access to the T&D network of the Public U li es Corpora on (PUC).[13]
Financing	• The objective of the World Bank Group's (WBG) Seychelles country partnership framework FY'18-FY'23 is to consolidate the country's path to inclusive and sustainable prosperity.[11] • The World Bank is supporting the management and conservation of marine areas South West Indian Ocean Fisheries governance and shared growth program (SWIOFish3) which is co-financed by a Seychelles blue bond, IBRD, GEF.[11]
Energy Imperatives	• Per capita electricity consumption in 2019 was 4,422 kWh, relatively high in comparison to the global average.[5] • Seychelles' total installed capacity was at 126 MW in 2019 with 8% (9 MW) share from renewables.[4] • As of 2019, wind constituted approximately 63% (6 MW) of renewable capacity with remaining 37% coming from Solar.[4] • Fossil fuels are the primary energy source used in Seychelles with a 97.5 % share, while a mere 2.5 % comes from the renewables.[12]

Somalia	Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
	350.0	22.5	22.5
Africa	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
	4.8	0.04	20.0

Cumulative Solar Installed Capacity (MW)

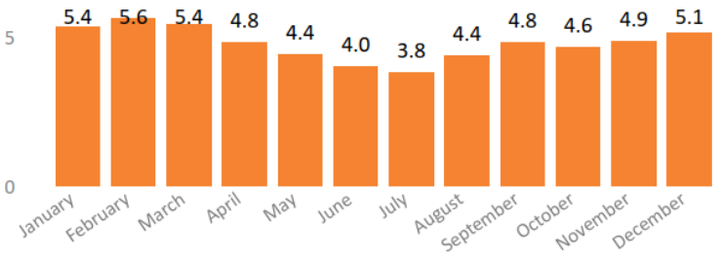


Renewable Energy Generation by Source

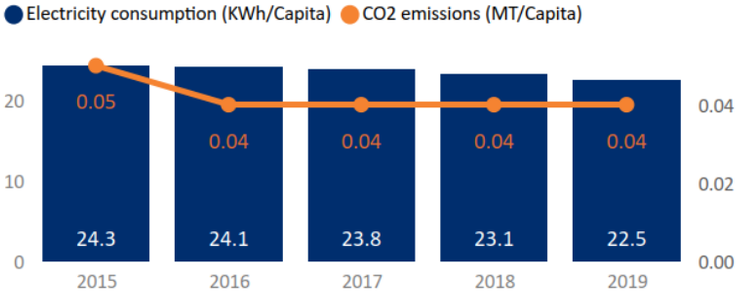


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



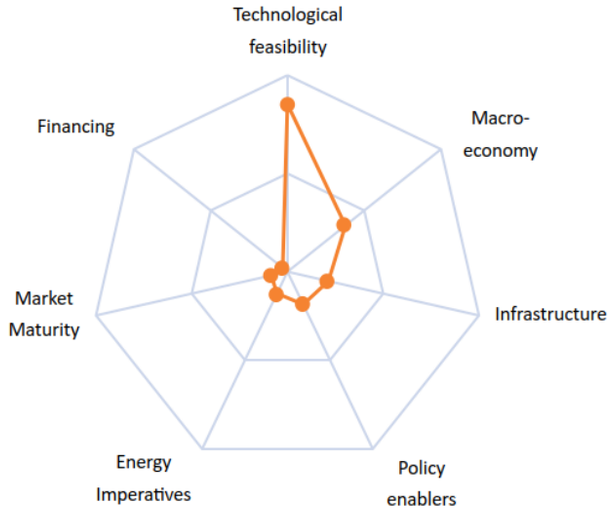
CO2 Emissions & Electricity Consumption



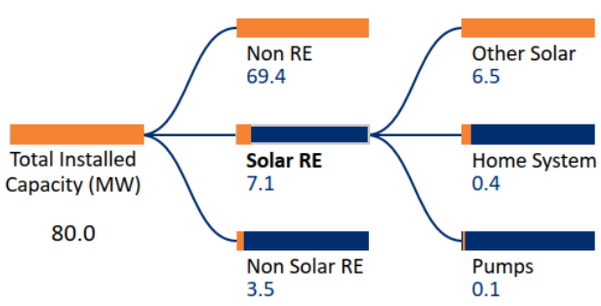
Ease of Doing Solar Classification

Potential

Performance against 7 drivers



Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
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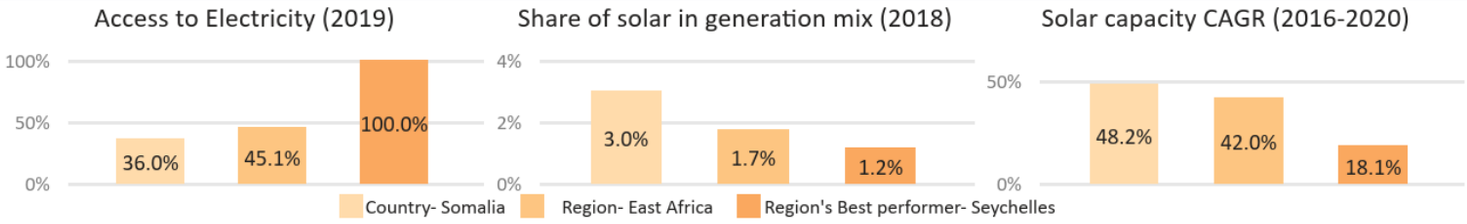
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Market Maturity

Key Insights

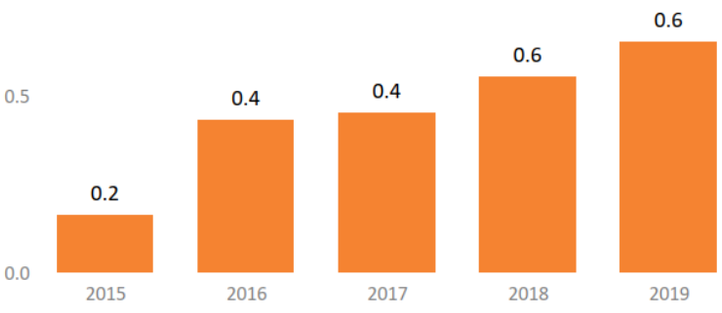
Drivers	Insights
Macro-economy	• Real GDP contracted by 1.5% in 2020 due to drought, floods, locust invasions and the COVID-19 pandemic .[3,7] • A recovery in household expenditures, agriculture and livestock exports are expected to drive GDP growth to 2.9% in 2021 and 3.2% in 2022.[7]
Policy enablers	• The Country Partnership Framework (CPF FY2019-22), endorsed in 2018, guides country engagement for an integrated World Bank Group (WBG) response.[8] • The Somaliland Electrical Energy Act was prepared with the support of USAID and the UK's Department for International Development.[9] • USAID currently supports the government and private sector to increase the availability of quality energy and to reduce tariffs.[9]
Technological Feasibility	• Owing to relatively high average solar irradiation level (GHI) of 6.03 kWh/m^2/day and specific yield of 4.75 kWh/kWp, strong technical feasibility is envisaged for solar projects in Nigeria.[1] • Renewable generation constitutes 5% of total electricity generated as of 2018.[10] • The supply chain for standalone off-grid will incentivize to establish Pay-As-You-Go (PAYG) business models and focused distribution networks.[11]
Market Maturity	• 36% of total population had access to electricity as of 2019. The country has set a target to achieve universal access by 2030.[5,6] • RE share in total final energy consumption was 94.9% as of 2018.[5] • Solar contributes 86% in renewable capacity and 18% in total capacity as of 2020.[10]
Infrastructure	• Generation and distribution losses are as high as 40% majorly due to poor infrastructure.[9] • The Beco company installed a photovoltaic solar power plant of 8 MWp and plans to increase the capacity to 100 MWp by 2022.[13]
Financing	• International fund flow, in 2018, was USD 3.5 mn (in PPP terms) to support clean and renewable energy.5 • Under GEF-7 Africa Minigrids Program, Somalia received a grant of USD 1.9 mn.[11]
Energy Imperatives	• Per capita electricity consumption in 2019 was 22 kWh which is significantly lower in comparison to the global average.[4] • 11% of rural population had access to electricity in 2019 indicating a lot of work to be done in the rural sector.[5] • Power Africa has set a target of 500 MW installed capacity by 2030 from 111 MW in 2019.[9,10]

South Sudan

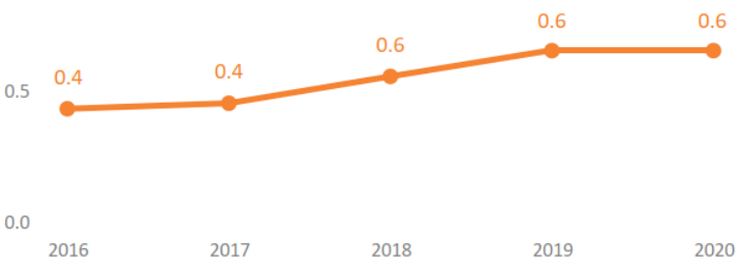
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
446.0	0.6	0.6
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.5	0.1	34.6

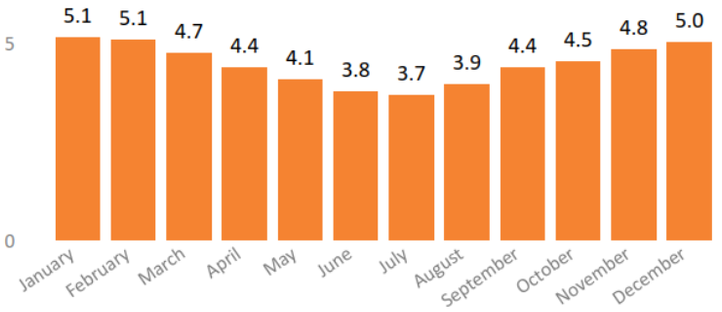
Cumulative Solar Installed Capacity (MW)



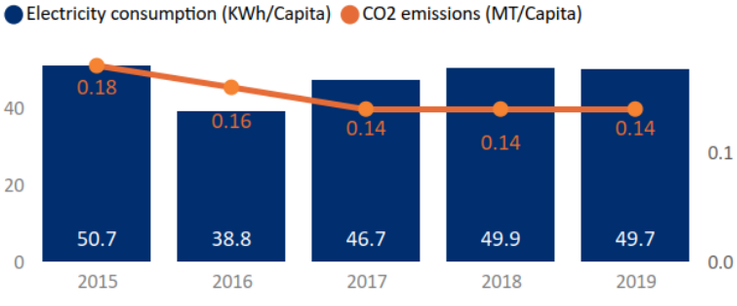
Cumulative Solar Off-grid Capacity (MW)



Monthly variation in PVout (kWh/kWp/day)



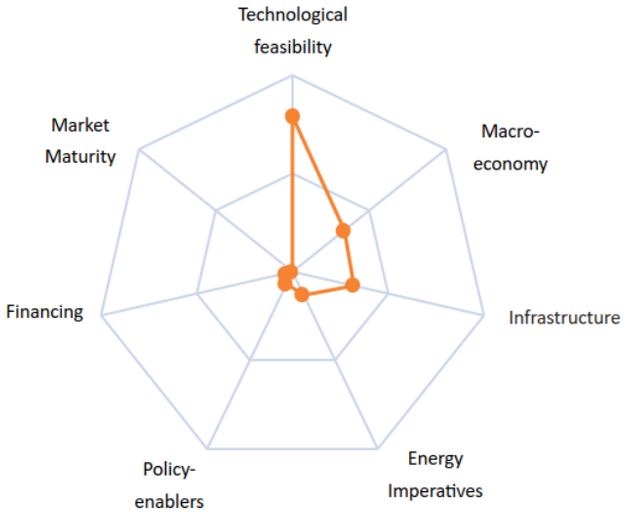
CO2 Emissions & Electricity Consumption



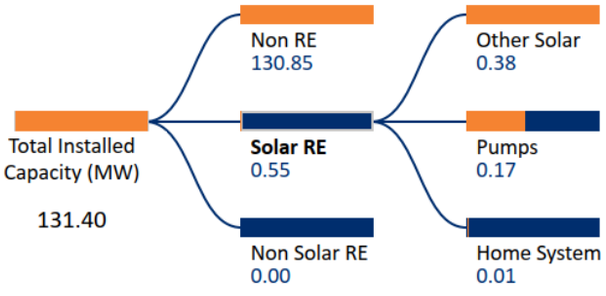
Ease of Doing Solar Classification

Potential

Performance against 7 drivers



Installed Generation Capacity by Source



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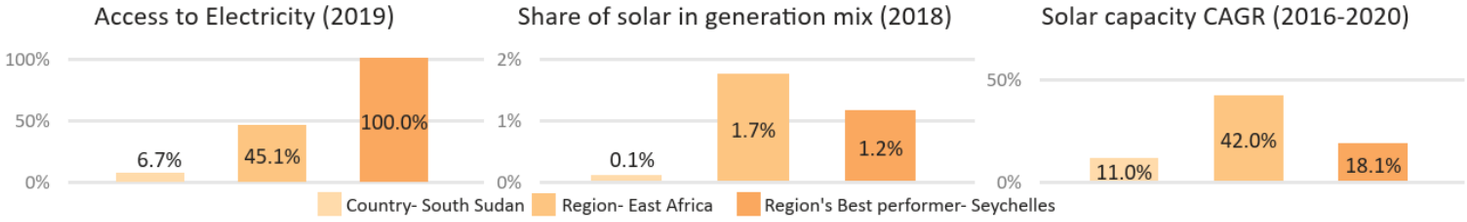
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics

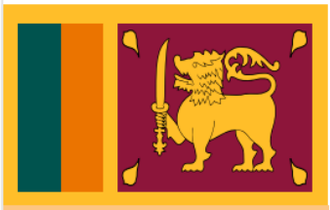


Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Market Maturity, Financing

Key Insights

Drivers	Insights
Macro-economy	• GDP (at current prices) of South Sudan was at USD 11.99 Bn in 2020. Oil and agriculture are the major contributors to the economy.[2,8] • Real GDP contracted by 6.6% in 2020 but is expected to grow by 2.5% in 2022 with the rebound in oil production.[3,8]
Policy enablers	• In 2019, the Renewable Energy Council of South Sudan (RECOSS) was founded with an aim to promote RE Technologies and energy efficiency in the country.[19] • The African Development Bank has proposed targets to achieve a 75% urban electrification rate by 2025.[18] • One of the most talked about projects in off-grid solar systems is the IndiGo pay-as-you-go solar project in Nimule.[20] • To achieve the implementation of rural electricity program, the Ministry of Electricity and Dam has established a "Rural Electrification Fund" (REF).[20]
Technological Feasibility	• Owing to relatively high average solar irradiation level (GHI) of 5.68 kWh/m^2/day and specific yield of 4.45 kWh/kWp, strong technical feasibility is envisaged for solar projects in South Sudan.[1] • South Sudan is expected to join the Eastern African Power Pool in the coming years which will certainly improve the access to electricity to some extent.[10] • Renewable generation was at 1 GWh as of 2019.[4]
Market Maturity	• 7% of total population had access to electricity as of 2019. Country is set to achieve a target of universal electricity access by 2050.[6,4] • RE share, in total Final electricity consumption, is 33.2% as of 2018.[6] • The power sector is regulated by South Sudan Electricity Regulation Authority. The sector is unbundled but managed by a sole holding company, South Sudan Electricity Corporation.[9]
Infrastructure	• Under the Juba Power Distribution System Rehabilitation and Expansion Project, funded by the African Development Bank, 395 kms HV lines and 145 transformers were installed in the country.[16] • With completion of the Uganda-South Sudan electricity interconnection project, South Sudan will join other countries such as Rwanda, Kenya, Tanzania, and the Democratic Republic of Congo (DRC) which import electricity from Uganda.[15]
Financing	• As of 2021, the South Sudan world bank group's portfolio stands at USD 195.4 Mn.[7] • According to UNCTAD's World Investment Report 2021, South Sudan has recorded FDI inflows of USD 18 mn in 2020.[13] • South Sudan has an Ease of Doing score of 34.6 (out of 100) and ranks 185th among 190 countries in 2020. Businesses face challenges in getting credit, construction permits, enforcing contracts, access to electricity, paying taxes and trading across borders.[11]
Energy Imperatives	• Per capita electricity consumption in 2019 was 50 kWh which is significantly lower in comparison to the global average.[5] • 5% of rural population had access to electricity in 2019.[6] • South Sudan's total installed capacity was 175 MW in 2020 with 1 MW coming from solar.[4] • Based on economic growth, the electricity demand is expected to reach 1,400 MW by 2030 from 300 MW levels in 2017, an annual growth rate of 7-8%.[12]

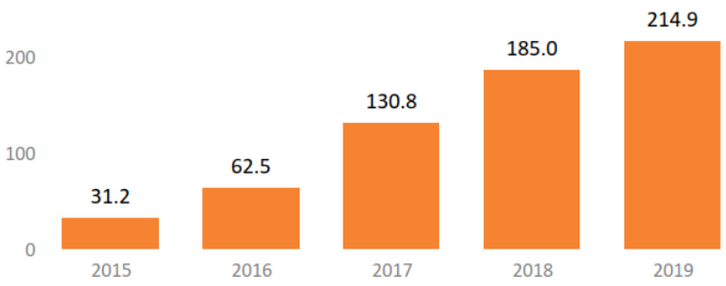


Sri Lanka

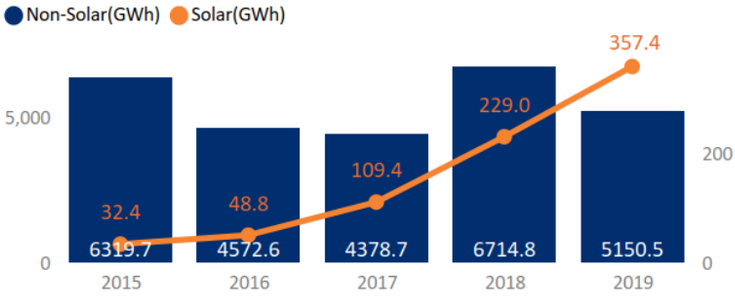
Asia & Pacific

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
14.1	230.4	7.9
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.2	1.2	61.8

Cumulative Solar Installed Capacity (MW)

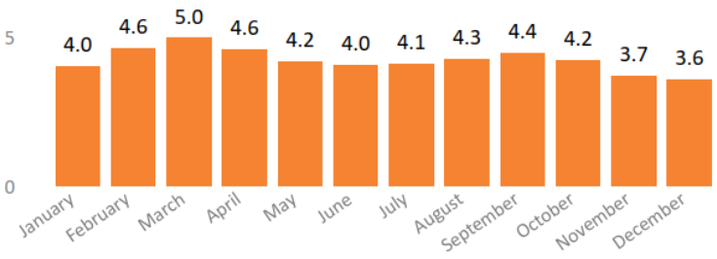


Renewable Energy Generation by Source

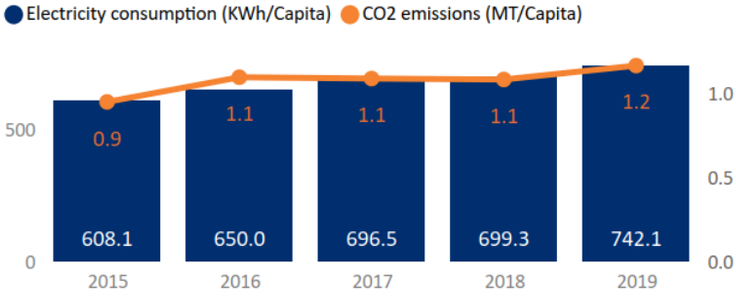


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



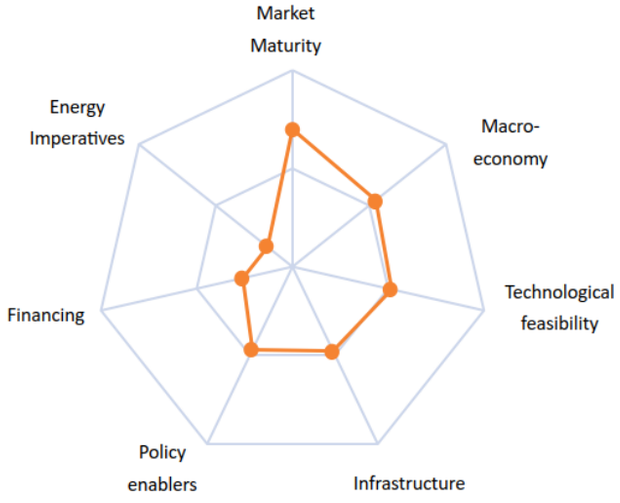
CO2 Emissions & Electricity Consumption



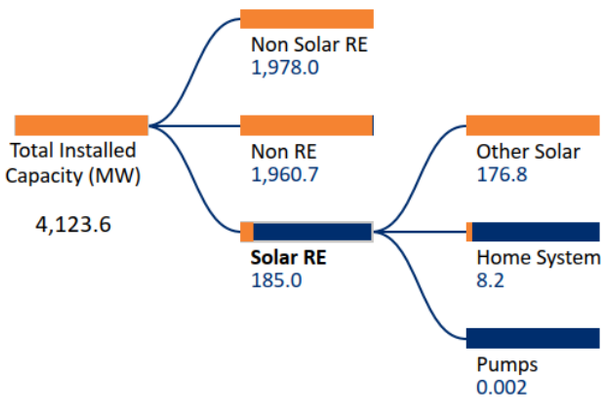
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

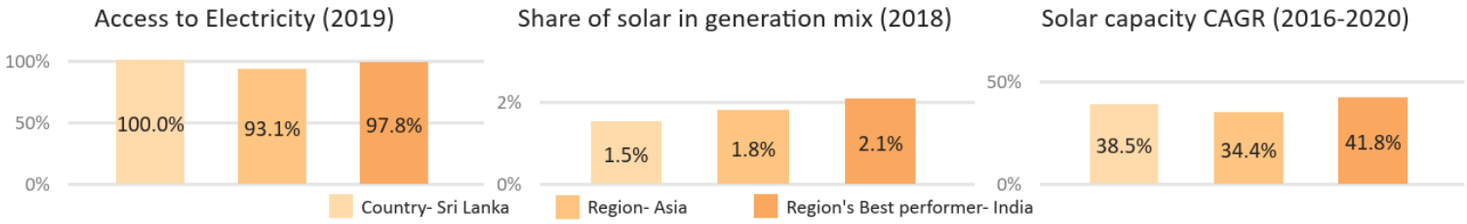


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Macroeconomy

Areas of Improvement → Energy Imperatives, Financing

Key Insights

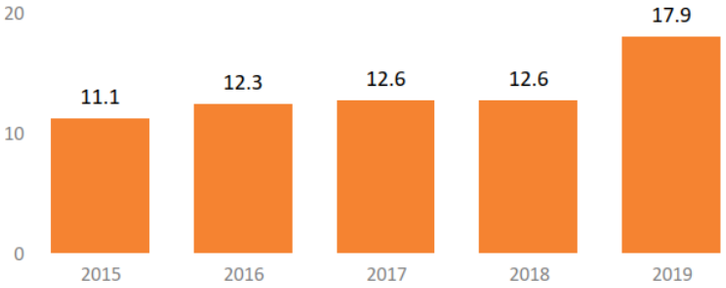
Drivers	Insights
Macro-economy	• Sri Lanka is a lower middle-income country. GDP (Real) grew at an annual rate of 2.3% in 2019 and declined by 3.6% in 2020 due to Covid19 impact.[1,3] • In 2020, the share of agriculture in Sri Lanka's GDP was 8.36%, industry contributed 26.25% and the services sector contributed 59.67%.[4]
Policy enablers	• Sri Lanka's energy policy is underpinned by the Government's ambitious target of generating 70% of power from renewables by 2030.[6] • Net Metering, Net Accounting, Micro Solar Power Producer schemes support rooftop solar deployment in Sri Lanka. As per Micro Solar Power Producer scheme, total electricity generated by the solar rooftop system would be purchased by the utility.[7] • The Government's "Battle for Solar Energy program" envisions 1,000 MW of solar power generation capacity by 2025 from the rooftops of homes and businesses.[8]
Technological Feasibility	• Sri Lanka receives relatively very high levels of solar irradiation of 5.28 kWh/m^2/day and specific yield of 4.17 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in Country.[9] • In Sri Lanka, share of electricity production from Renewables is 46.2% as of 2019.[10] • Encouraging public and the corporate sector to use and improve the EV infrastructure is a major goal of the Public Utilities Commission of Sri Lanka.[11]
Market Maturity	• The role of Ministry of Power, Energy and Business Development (MOPE&BD) is to improve the country's power distribution network in providing continuing quality of service and sustaining 100% household electrification.[12] • The Public Utilities Commission of Sri Lanka (PUCSL) is the economic, technical and safety regulator of the electricity industry in Sri Lanka.[13] • The Ceylon Electricity Board (CEB) is a state-owned utility which is engaged in power generation, transmission, distribution, and collection of revenue.[7]
Infrastructure	• The transmission network in Sri Lanka is operated at 220 kV and 132 kV and transports electricity from generation points to distribution bulk supply points.[14] • India has shown keen interest in developing a solar power park in Sri Lanka.[15]
Financing	• In 2017, ADB approved a USD 50 Mn loan for Sri Lanka's Rooftop Solar Power Generation Project.[8] • As of 2021, The Government of Sri Lanka and the World Bank signed a USD 92 Mn financing agreement for the Climate Resilience Program.[17] • The International Finance Corporation (IFC) is collaborating with the Commercial Bank of Ceylon (CBC) to help the lenders boost investments in Sri Lankan companies involved in RE and energy efficiency projects.[18]
Energy Imperatives	• As of 2019, Electricity Consumption per capita was 742.06 kWh that grew from 699.27 kWh in the past year.[19] • As of 2020, cumulative solar PV Capacity for the country was 230.36 MW that grew from 184.97 MW on the past year.[20] • Access to electricity in Sri Lanka was reported at 100% in 2019.[21]

Sudan

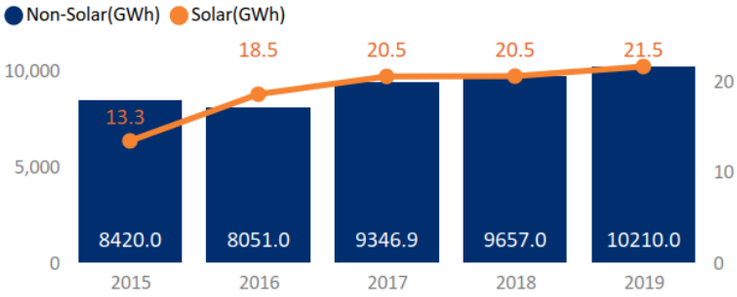
Africa

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
13.7	17.9	18.6
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
5.1	0.5	44.8

Cumulative Solar Installed Capacity (MW)

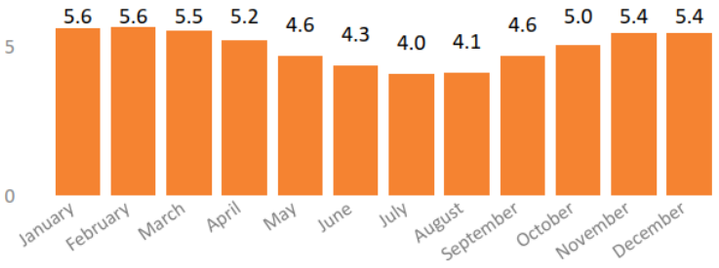


Renewable Energy Generation by Source

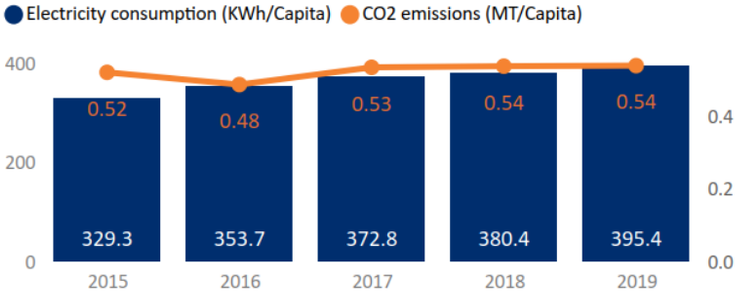


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



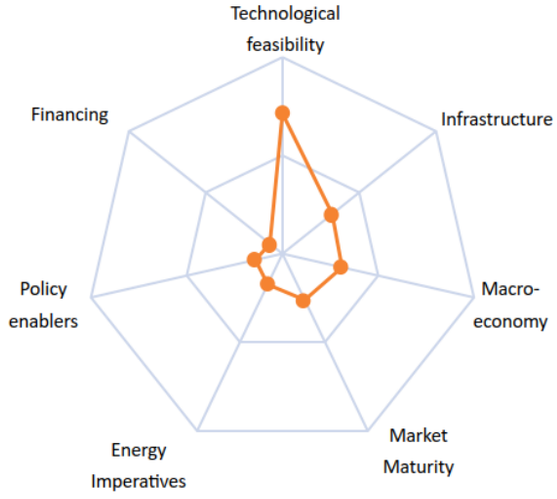
CO2 Emissions & Electricity Consumption



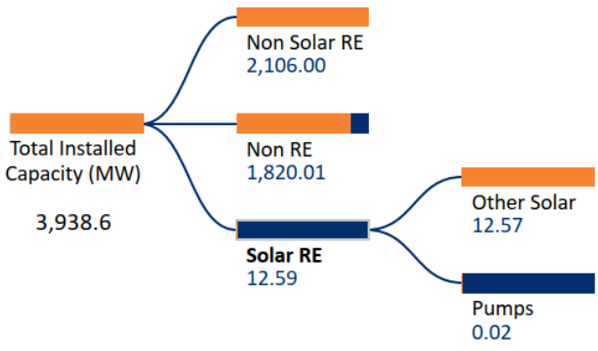
Ease of Doing Solar Classification

Potential

Performance against 7 drivers

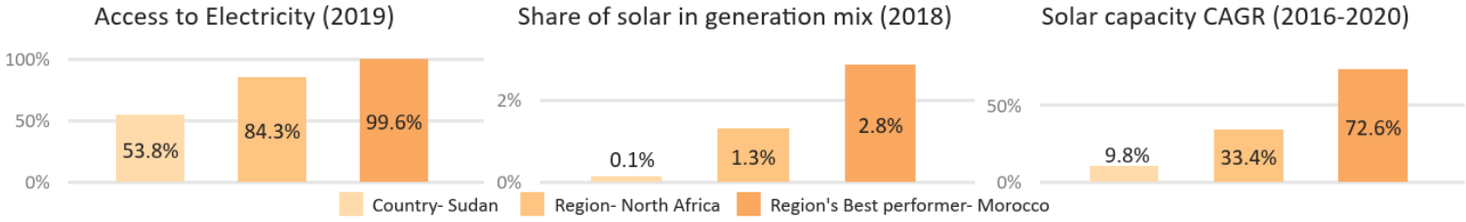


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Infrastructure

Areas of Improvement → Financing, Policy enablers

Key Insights

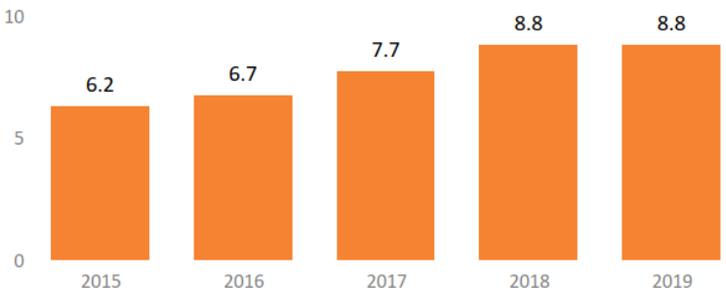
Drivers	Insights
Macro-economy	• Sudan's GDP (at current prices) was at USD 26.11 Bn in 2020. Real GDP contracted by 3.6% in 2020 due to pandemic's impact on commodity prices, trade, travel, and financial flows. [2,3,9] • Agricultural, service sector and industrial sector are the major contributors to the economy.[9]
Policy enablers	• In 2014, Government of Sudan started National Appropriate Mitigation Action (NAMA) with an objective to implement favourable policies such as net metering, feed-in-tariff, import duty exemption for renewable energy components to stimulate growth of solar and wind power in the country.[13] • NAMA is also aligned with Sudan's National Strategic Vision 2001-2025 which focuses on capacity enhancement of exisiting renewable technologies to increase their share in energy mix.[13] • Sudan National Quarter-Century Strategy (2007–2031) presents the national development goals across sectors that includes loss reduction, interconnection with East Nile Basin countries and energy efficiency.[11]
Technological Feasibility	• Owing to relatively high average solar irradiation level (GHI) of 6.32 kWh/m^2/day and specific yield of 5.08 kWh/kWp, strong technical feasibility is envisaged for solar projects in Sudan.[1] • Renewable generation was at 10341 GWh which constituted 61% of total electricity generated in 2019.[8] • The GoS also plans to provide 2.5 mn stand-alone solar home systems (SHSs) by 2023 for areas where extending grid connection is not feasible.[11]
Market Maturity	• 54% of total population had access to electricity as of 2019.[6] • RE share, in total Final electricity consumption, is 61.4% as of 2018.[6] • Sudan is a member of the Eastern African Power Pool which aims to optimize the available energy resources and reduce electricity cost in the region.[4] • Power Sector in Sudan is regulated by Electricity Regulatory Authority (ERA). The National Electricity Corporation (NEC) is the sole generator, transmitter, and distributor of electric energy in Sudan.[14]
Infrastructure	• The Government of Sudan has 200 MW interconnections with Ethiopia at 220 kV and Eritrea at 66 kV levels both of which are operational.[11] • Sudan also is working on a 300 MW capacity interconnection with Egypt which is under construction.[11] • Annual Transmission & Distribution losses are 3996 GWh as of 2020.[12] • The infrastructure needs to be revamped to meet universal electrification target by 2031, with at least 80% electrification through grid.[11]
Financing	• International financial flow, in 2018, was USD 3 Mn (in PPP terms) to support clean technologies and RE.[6] • WBG continues to build a dynamic portfolio of projects financed by trust funds currently amounting to approximately USD 472 Mn by mobilizing third-party financial resources.[10] • Sudan has an Ease of Doing score of 44.8 (out of 100) and ranks 171st among 190 countries in 2020.[7]
Energy Imperatives	• Per capita electricity consumption in 2019 was 395 kWh which is significantly lower in comparison to the global average.[5] • 39% of rural population had access to electricity in 2019.[6] • Sudan's total installed capacity was 4,137 MW in 2020 with 51% (2124 MW) share coming from renewables.[8] • As of 2020, Hydro constitutes approximately 90% (1907 MW) of renewable capacity with remaining coming from solar and bioenergy.[8]

Suriname

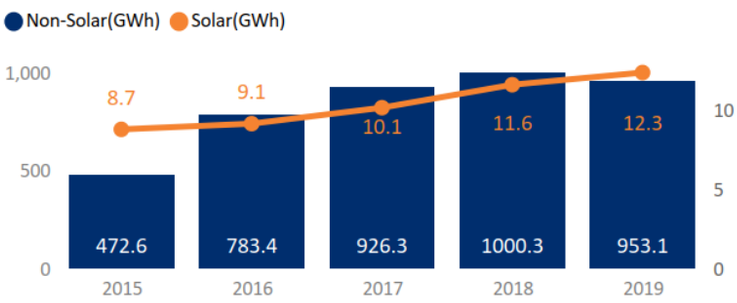
Latin America & Caribbean

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
1.8	9.4	1.9
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.2	4.5	47.5

Cumulative Solar Installed Capacity (MW)

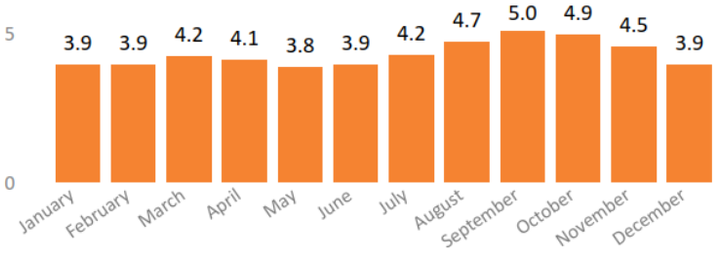


Renewable Energy Generation by Source

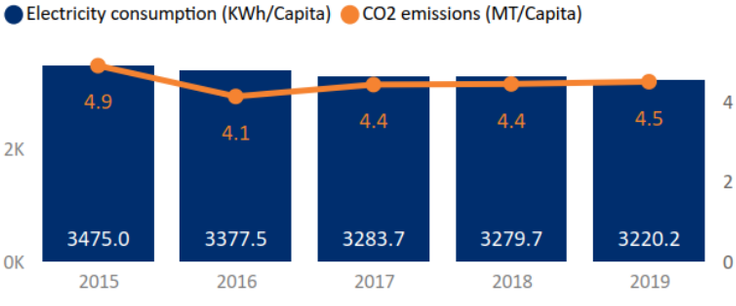


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



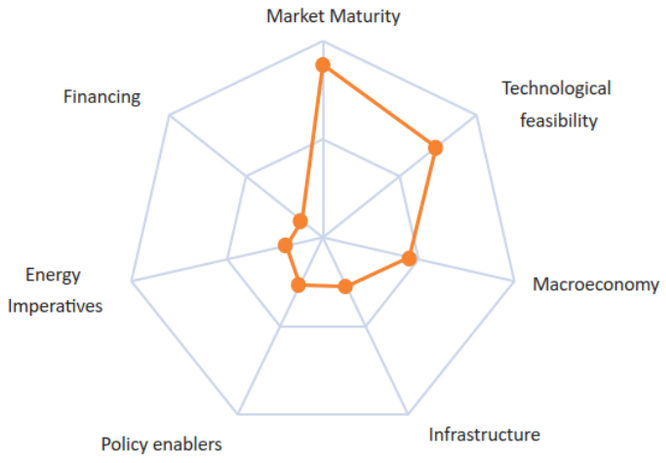
CO2 Emissions & Electricity Consumption



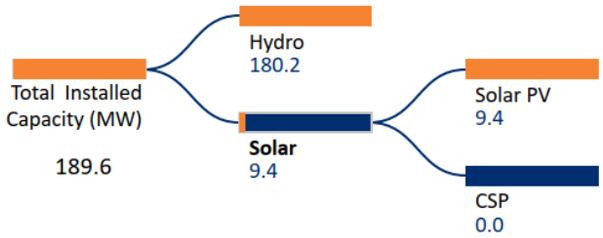
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

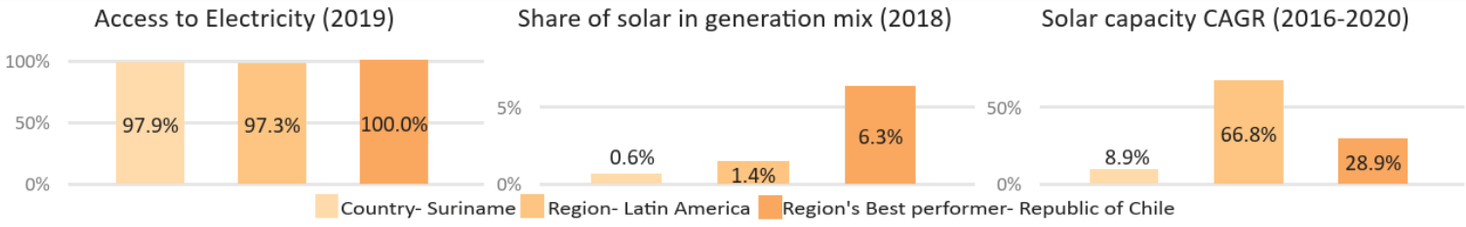


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

Areas of Improvement → Financing, Energy Imperatives

Key Insights

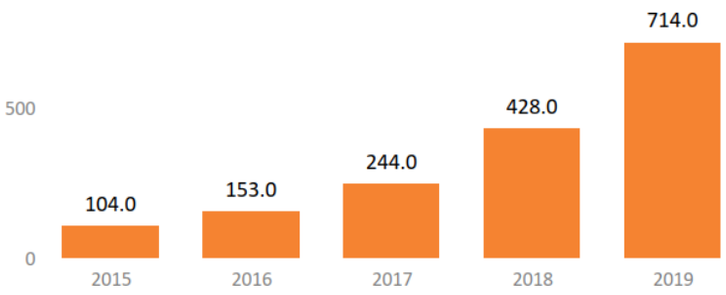
Drivers	Insights
Macro-economy	• Suriname is an upper-middle income economy2 with a GDP per capita (PPP) of USD 14,702 in 2021.[1] • The GDP (Real) growth is expected to recover from -13.5% in 2020 to 0.7% in 2021 as the pandemic impacts are decreasing.[1] • Suriname's economy is heavily dependent on mineral resources, mainly oil, gold, and bauxite.[3]
Policy enablers	• Ministry of Natural resources is responsible for energy related development along with mining and water.[4] • The country targets to generate 28% and 47% of total electricity through renewables by 2022 and 2027 respectively.[5] • INDC commitments of maintaining the share of electricity from RE sources above 35% by 2030.[6]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.38 kWh/m²/ day and specific yield 4.24 kWh/ kWp, a very strong technical feasibility is envisaged for solar projects in Suriname.[7] • In 2018, a solar mini-grid of capacity 500 kW combined with 8,000 Ah battery storage was installed to phase out 700 kW of DG generators. Due to this day long electricity was provided compared to 4-6 hours earlier through DGs.[8]
Market Maturity	• 98% of people had access to electricity in Suriname as of 2019.[10] • The country is mainly dependent on hydropower and fossil fuels which accounted for around 57% and 32% of total electricity generation in 2019.[9] • RE accounted for less than 1% of total electricity production, of which Solar PV accounted for only 0.53% in 2019.[9] • Energie Bedrijven Suriname (EBS) is a state-owned vertically integrated power utility which handles generation, transmission, and distribution of electricity in the country.[11]
Infrastructure	• Suriname has two large-scale generation centralized systems with several isolated off-grid systems.[6] • The 36.6 km of sub-transmission and distribution lines upgradation project started in 2017 from Caribbean Development Bank funding.[12] • In 2019, OPEC approved loan of USD 26 Mn for expansion of Power Generation, Transmission and Distribution Systems Project.[18]
Financing	• Suriname offers incentives of nine-year tax holiday for foreign investors under the Suriname Investment Act.[14] • Policy based programmatic loan of USD 15 Mn was provided by IDB and GEF in 2012 for development of RE and energy efficiency projects.[15]
Energy Imperatives	• Total installed capacity in Suriname was 504 MW in 2018.[16] • Per capita electricity consumption of 3.21 MWh is slightly lower in comparison to the global average of 3.35 MWh as of 2019.[9] • Installed solar PV capacity in Suriname stood at 9 MW in 2020.[17]

Sweden

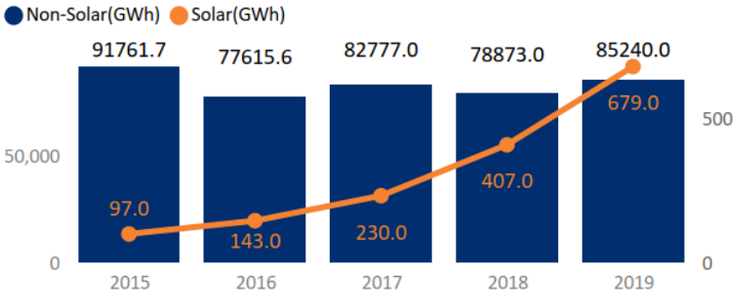
Europe

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in GW (2020)	Off-Grid Solar Capacity in MW (2019)
127.6	1.4	16.0
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
2.8	4.3	82.0

Cumulative Solar Installed Capacity (MW)

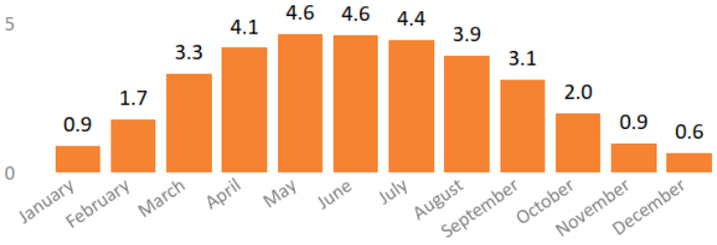


Renewable Energy Generation by Source

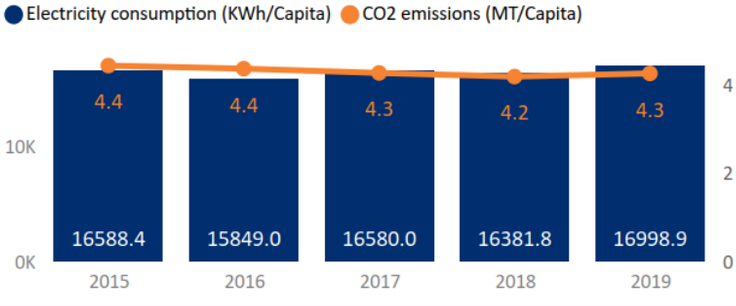


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



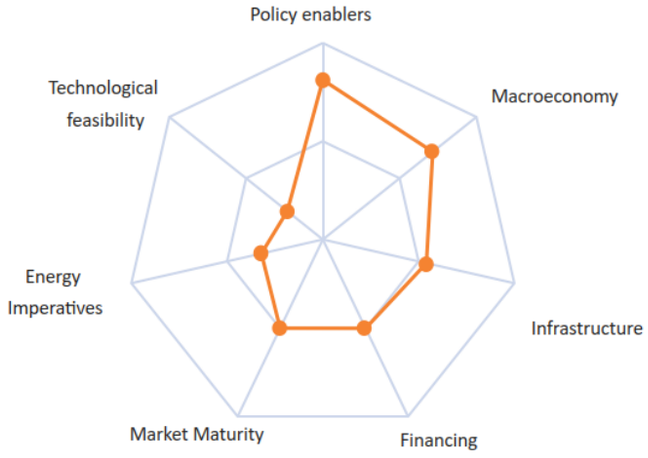
CO2 Emissions & Electricity Consumption



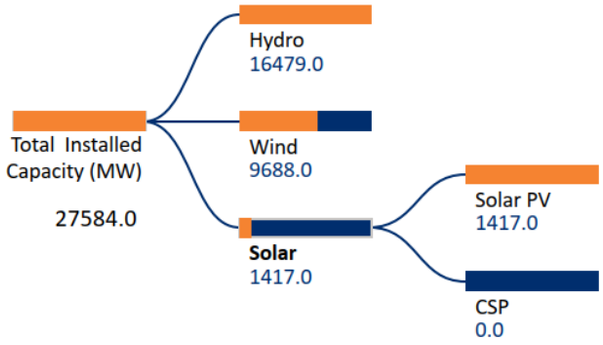
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

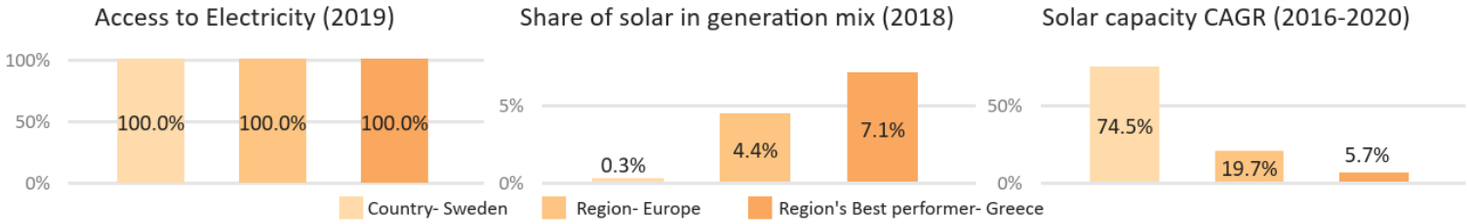


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Policy enablers, Macroeconomy

Areas of Improvement → Technological feasibility, Energy Imperatives

Key Insights

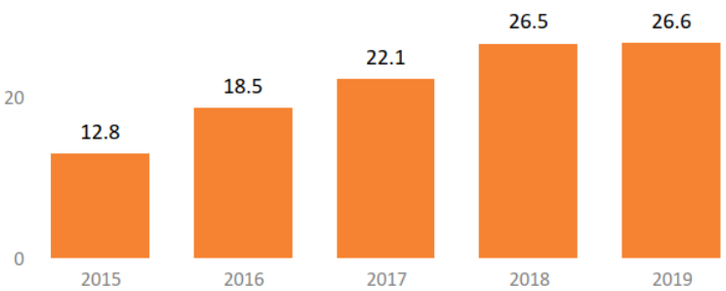
Drivers	Insights
Macro-economy	• GDP(Real) has grown at an annual rate of 1.4% in 2019 and declined by 2.8% in 2020.[1] • In 2020, agriculture contributed 1.4% to the GDP, 21.6% came from the industry and 65.68% from the service sector.[2] • HICP inflation is expected to rise in 2021 with increasing energy prices, freight costs and commodity prices.[4]
Policy enablers	• Sweden is a global leader in decarbonisation and has targets to cut GHG emissions 59% by 2030 from 2005 levels and to have a net-zero carbon economy by 2045. [5] • Sweden has set out to meet 100% of its electricity needs from renewable sources by 2040.[6] • Sweden was the first country to introduce carbon pricing and has the highest carbon price in the world.[5]
Technological Feasibility	• Sweden receives an average of 1,973 hours of sunlight per year. It is sunny 45% of daylight hours and 55% of daylight hours are likely cloudy or with shade, haze, or low sun intensity.[8] • Sweden receives moderate levels of solar irradiation of 2.69 kWh/m^2/day and specific yield of 2.82 kWh/ kWp, a moderate technical feasibility is envisaged for solar projects in Country.[9] • The government has a target to reduce transport emissions by 70% from 2010 to 2030 and is supporting transport decarbonisation through electrification and advanced biofuels.[5]
Market Maturity	• The Swedish Energy Agency (SEA), under the Ministry of the Environment and Energy, is a government agency providing policy analysis and oversees the implementation of energy efficiency measures.[10] • The Swedish National Grid (Svenska kraftnät) is the TSO that owns and operates the national HV electricity grid and is responsible for the electricity system's short-term balance.[10] • In Sweden, EPEX SPOT operates as an electricity exchange market. The Company provides market spot to buy, sell, and trade electricity, secure transactions, and auctioning services.[11]
Infrastructure	• The Swedish national grid for electricity consists of approximately 17,000 km of power lines, about 200 substations and switching stations and 16 connections to other countries.[13] • Ellevio is one of Sweden's leading distribution network operators[14] and manages network of 71,000 kms power lines.[15] • The network in Sweden is heavily interconnected with its neighbouring countries: Denmark, Germany, Finland, Poland.[16]
Financing	• Sweden's largest municipal funding agency, Kommuninvest, is issuing green bonds to institutional investors to fund green loans for investment projects.[18] • The EIB has invested over €30 Bn in Sweden since 1994. In 2020, the EIB Group invested €2.5 Bn in Sweden alone with 70% going to climate projects.[19]
Energy Imperatives	• As of 2019, Electricity Consumption per capita stood at 16,998 kWh growing from 16,381 kWh in 2018, which was almost 5 times the global average.[20] • As of 2020, cumulative solar PV Capacity for the country stood at 1,417 MW growing from 714 MW in 2019.[21] • Since 1990, 100% of the population in Sweden had access to electricity.[22] • As of 2020, cumulative solar off-Grid Capacity for the country is 16 MW growing from 13 MW in 2017.[23]

Tanzania

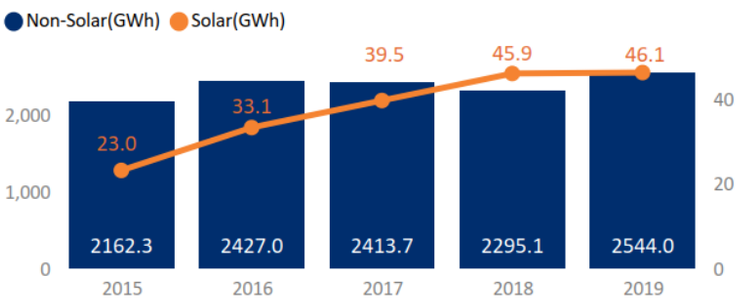
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
6,372.0	23.6	NA
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.5	0.20	54.5

Cumulative Solar Installed Capacity (MW)

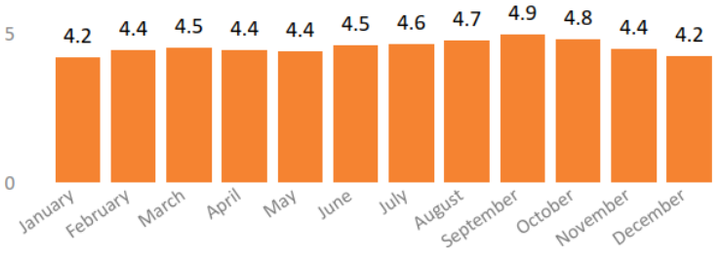


Renewable Energy Generation by Source

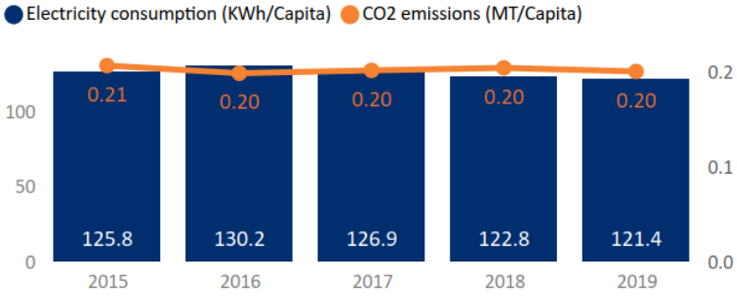


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



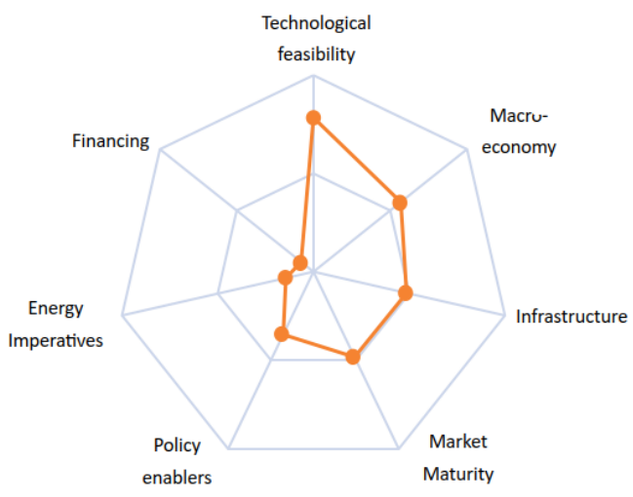
CO2 Emissions & Electricity Consumption



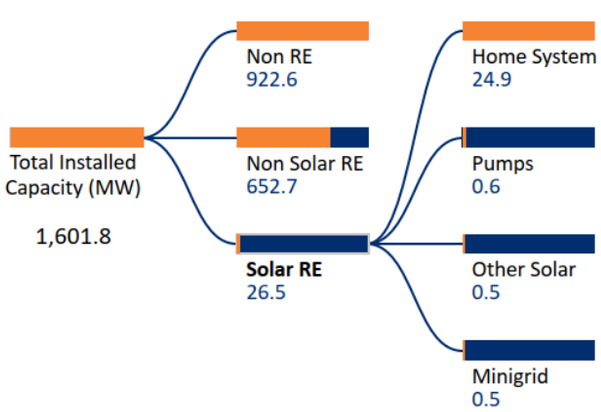
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

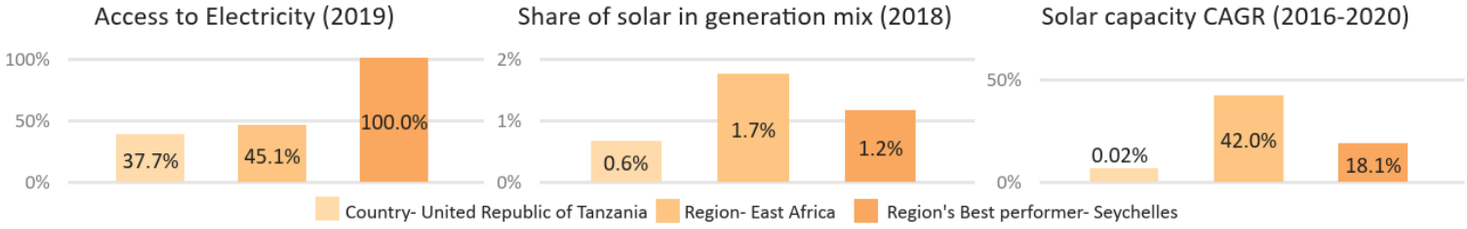


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

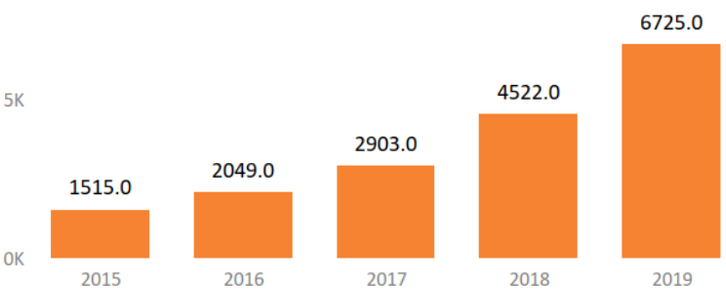
Areas of Improvement → Financing, Energy Imperatives

Key Insights

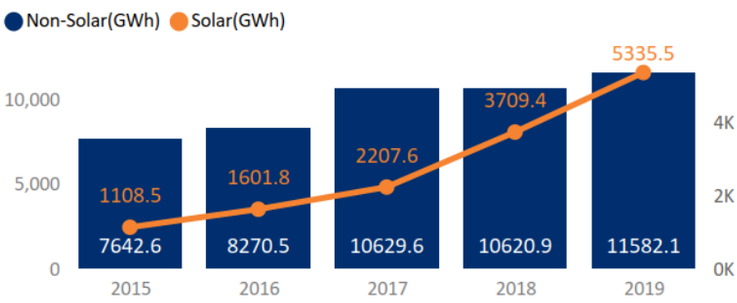
Drivers	Insights
Macro-economy	• GDP (at current prices) was USD 62.41 Bn in 2020. Real GDP expanded by 1% in 2020 but slowed down from 6.8% levels in 2019 due to pandemic.[2,3,8] • Growth was driven mainly by construction and manufacturing on the supply side and investments on the demand side.[8] • The economic outlook is positive with real GDP projected to grow 4.1% in 2021 and 5.8% in 2022 due to improved performance of the tourism sector and the reopening of trade corridors.[8]
Policy enablers	• The development of energy infrastructure is one of the pillars of Tanzania Development Vision 2025.[17] • To make solar PV more attractive, VAT and import tax for main solar components have been removed reducing cost to the end consumers.[17] • National rural electrification program (NREP) aims to support for grid extension and off grid electrification including solar PV.[16] • The National Five-Year Development Plan 2016-17 – 2020-21 (FYDP II) aims to increase the share of renewables in electricity genera on to 70%, by 2025-26.[18]
Technological Feasibility	• Owing to relatively high solar irradiation level (GHI) of 5.66 kWh/m^2/day and specific yield of 4.51 kWh/kWp, strong technical feasibility is envisaged for solar projects in Tanzania.[1] • Renewable genera on is 2739 GWh which contributes 35% to the total electricity generated as of 2019.[11] • Power Africa helped Tanzania-based solar company Simusolar to gain access to financial resources to fuel livelihoods of rural farmers and fishers.[12]
Market Maturity	• 38% of total population had access to electricity as of 2019. Country is set to achieve a target of universal electricity access by 2030.[6,12] • Renewable energy share in total electricity consumption is 83.7% as of 2018.[6] • As per the assessment done by USAID in 2018, approximately 55% of the population has access to mobile money platforms indicating high potential for solar home systems.[13] • Many off-grid solar products are paired with PAYGO offerings for easy financing options.[13]
Infrastructure	• The National Grid of Tanzania is interconnected to Uganda, Kenya, and Zambia. Tanzania imports up to 16 MW of electricity from these countries.[14] • The total length of Transmission and Distribution lines is expected to reach 13,280 ckm and 1,16,304 ckm respectively, by 2025.[14]
Financing	• International financial flow in 2018 was USD 13 Mn (in PPP terms) to support clean and renewable energy.[6] • Sovereign rating of B2 with stable financial outlook reflects country's credit view.[7] • In December 2018, the World Bank and the International Monetary Fund (IMF) completed the Financial Sector Assessment Program (FSAP) to review the financial sector landscape in Tanzania.[9] • The World Bank's active portfolio in Tanzania includes 17 national International Development Association (IDA) projects with total net commitments of USD 3.86 Bn.[9]
Energy Imperatives	• Per capita electricity consumption in 2019 was 121 kWh which is significantly lower in comparison to the global average.[5] • As of 2020, Hydro constitutes approximately 86% (589 MW) of renewable capacity with remaining coming from solar and bioenergy.[11] • The residential sector is estimated to account 45% of total electricity consumption, whereas industrial sector to have 25% and commercial sector to have 23% share as of 2017.[14] • With economic and population growth, the annual electricity consumption is expected to reach 12.1 BUs by 2022 from 7.6 BUs in 2017 growing at a CAGR of 9.8%.[14]

The Netherlands	Electricity Consumption in BU (2018)	Cumulative Solar Capacity in GW (2020)	Off-Grid Solar Capacity in MW (2019)
	108.0	10.2	NA
Europe	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
	2.9	9.1	76.1

Cumulative Solar Installed Capacity (MW)

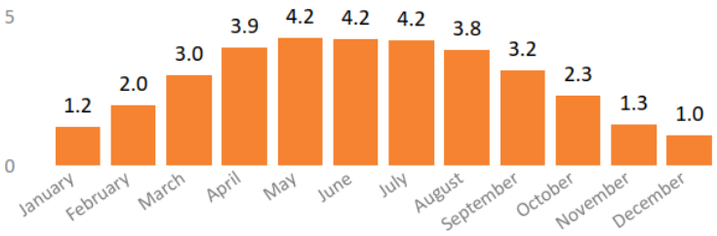


Renewable Energy Generation by Source

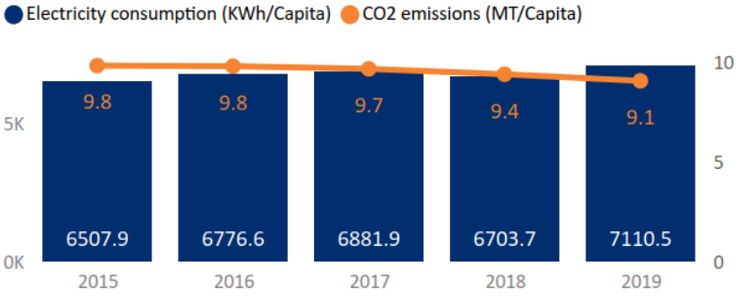


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



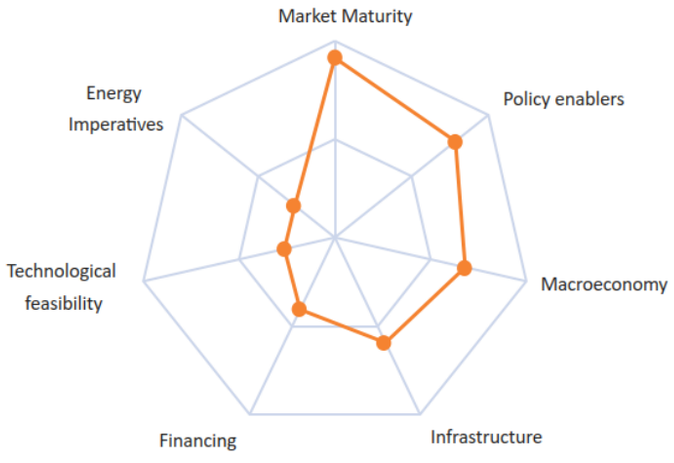
CO2 Emissions & Electricity Consumption



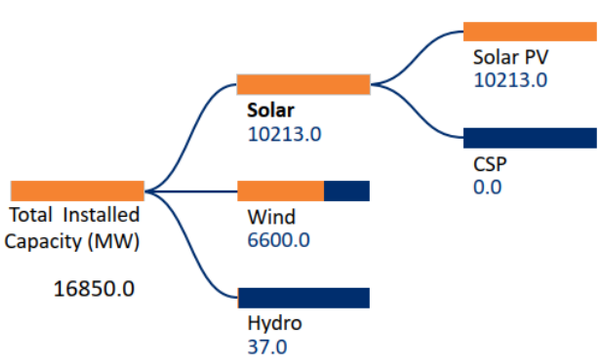
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

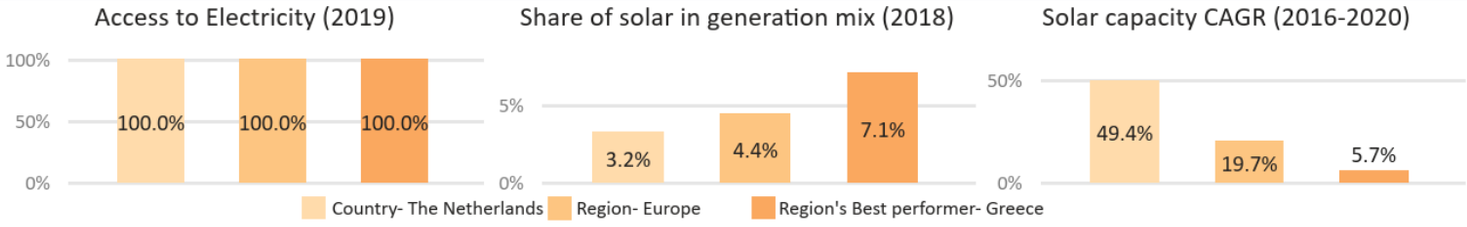


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Policy enablers

Areas of Improvement → Energy Imperatives, Technological feasibility

Key Insights

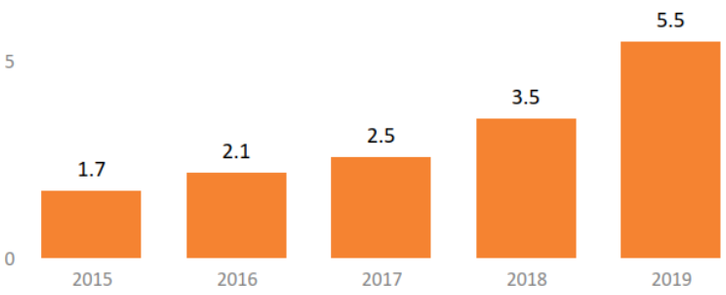
Drivers	Insights
Macro-economy	• A European transportation hub, Netherlands has the EU's fifth-largest economy supported by exports of chemicals, refined petroleum, electrical machinery, and agriculture.[1] • GDP (Real) has grown at an annual rate of 1.7% in 2019 and declined by 3.8% in 2020 owing to Covid19 pandemic.[2]
Policy enablers	• The 2019 Climate Act requires Netherlands to reduce GHG emissions (from 1990 levels) to 49% by 2030 and to 95% by 2050.[5] • The Netherlands supports small-scale PV deployment via a well-established net-metering scheme.[5] • From 2011 to 2020, SDE+ allocated EUR 60 billion of subsidies, which are paid out over a period of up to 15 years based on the amount of RE generated.[5]
Technological Feasibility	•The Netherlands receives relatively moderate levels of solar irradiation of 2.865 kWh/m²/day and specific yield of 2.86 kWh/ kWp, a moderate technical feasibility is envisaged for solar projects in Country.[6] • The Netherlands is highly reliant on fossil fuels. In 2018, fossil fuels (mainly natural gas and oil) covered 90% of total primary energy supply.[5] •The Netherlands is a global leader in electric vehicle (EV) deployment and EV charging infrastructure, with around 200,000 registered EVs and over 50,000 EV charging stations as of 2019.[5]
Market Maturity	•The Netherlands Authority for Consumers and Markets (ACM) regulates the electricity and gas TSOs and DSOs.[5] • TenneT is a leading European electricity transmission system operator (TSO), manages operations in the Netherlands and in Germany.[7] • In Netherlands, EPEX SPOT operates as an electricity exchange market. The Company provides market spot to buy, sell, trade electricity, secure transactions, and auctioning services.[8]
Infrastructure	• TenneT transmits electricity at 110 kV and higher. With around 23,500 kms of HV lines, it crosses borders and connect other EU countries.[9] • Since 2019, the Danish and Dutch high-voltage grid are interconnected via a HVDC submarine cable, the COBRA cable. The interconnector has a capacity of 700 MW and is around 325 kms long.[10]
Financing	• EIB signed a EUR 250 Mn loan agreement with TenneT to finance the 40 km high voltage electricity transmission corridor in the North of the Netherlands between Eemshaven and Vierverlaten supporting renewable energy production.[12] • The European Investment Bank (EIB) approved EUR 4.1 bn of new financing to accelerate RE investment.[13]
Energy Imperatives	• As of 2019, Electricity Consumption per capita was 7.11 MWh that grew from 6.70 MWh in 2018 and is almost double of the global average.[14] • As of 2020, cumulative solar PV Capacity for the country stood at 10.21 GW growing from 6.73 GW levels in 2019.[15] • Since 1990, 100% of the population in Netherlands had access to electricity.[16]

Togolese Republic

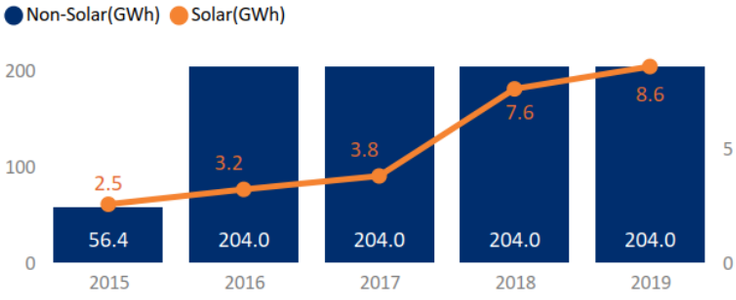
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
1,239.0	5.6	3.1
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.1	0.4	62.3

Cumulative Solar Installed Capacity (MW)

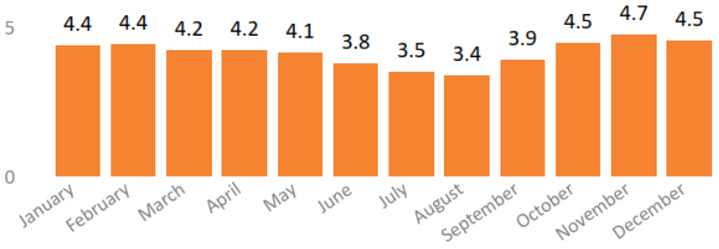


Renewable Energy Generation by Source

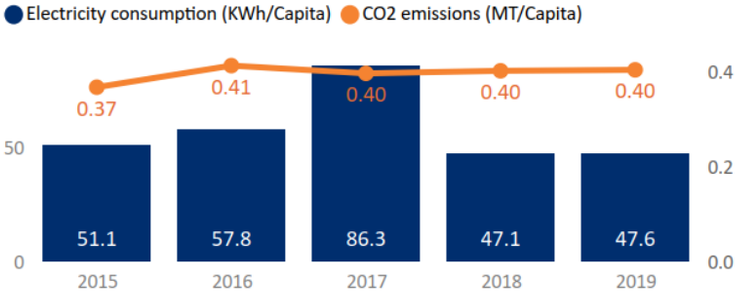


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



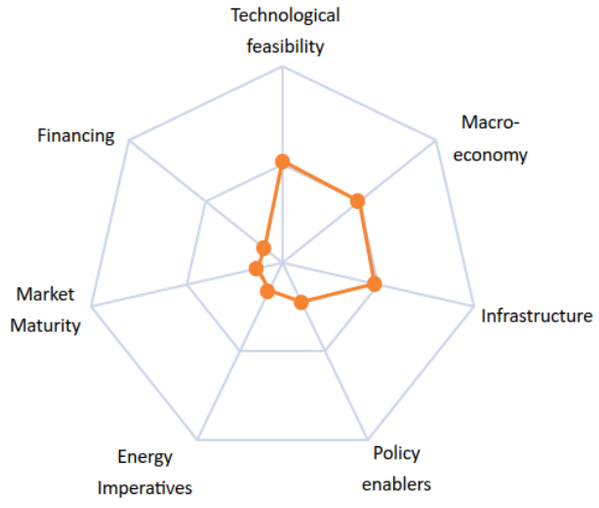
CO2 Emissions & Electricity Consumption



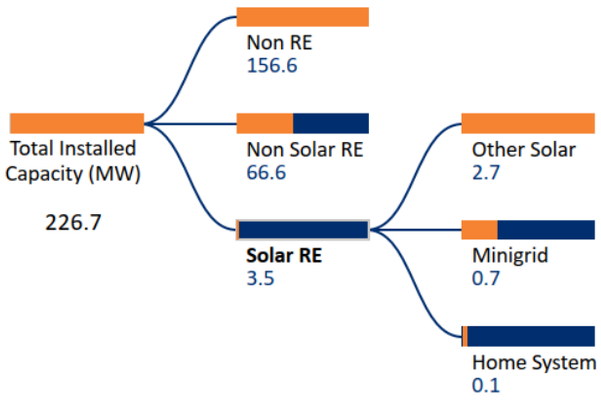
Ease of Doing Solar Classification

Potential

Performance against 7 drivers

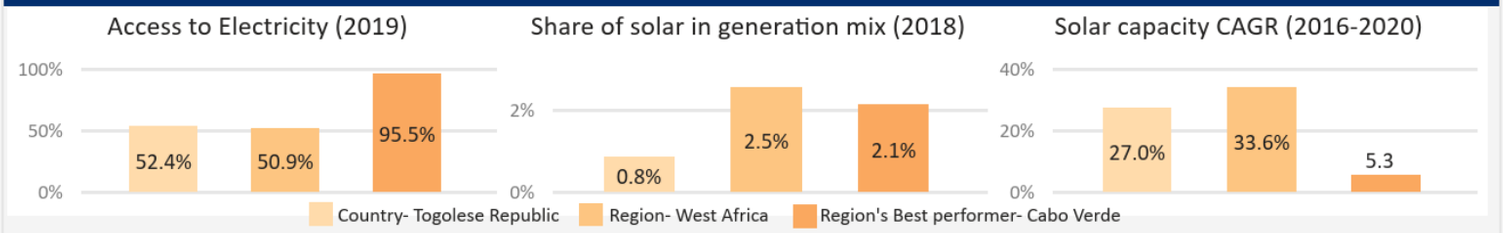


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics

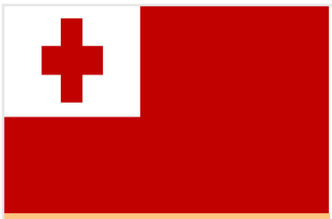


Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Market Maturity

Key Insights

Drivers	Insights
Macro-economy	• On account of slowdown in global trade and decline in FDIs due to Covid-19 pandemic, Togo's GDP (Real) growth rate slumped from 5.5% in 2019 to 1% in 2020.[3,12] • Agricultural and manufacturing sectors are main contributors to the economy.[12]
Policy enablers	• Togo is a member of the West African Economic Monetary Union (UEMOA). UEMOA and The Economic Community of West African States (ECOWAS) have set ambitious goal of achieving Universal access to sustainable energy services and increasing share of RE in the generation mix to 31%.[11,20] • Togo is also a part of West African Power Pool (WAPP) which is a specialized institute of ECOWAS to cover public and private generation, transmission, and distribution companies.[5] • Togo aims to deploy over 300 mini-grids by 2030 and plans to exempt VAT and custom duty on mini-grid components.[7]
Technological Feasibility	• Owing to relatively high solar irradiation level (GHI) of 5.22 kWh/m^2/day and specific yield of 4.12 kWh/kWp, strong technical feasibility is envisaged for solar projects in Togo.[1] • Renewable generation is 208 GWh which constituted 23% of total electricity generated in 2018.[10] • In 2019, Togo joined Scaling Solar program and signed an agreement with International Finance Corporation (IFC) to develop up to 90 MW of solar power projects.[16]
Market Maturity	• 52% of the population had access to electricity as of 2019. Country is set to achieve a target of universal electricity access by 2030.[6,7] • RE share in total final energy consumption is 75.1% as of 2018.[6] • Togo has launched one of the largest solar plants in west Africa, a 50MW solar plant financed under IRENA-ADFD facility to deliver clean energy to nearly 160,000 homes.[18]
Infrastructure	• Interconnections such as the Ghana-Togo-Benin transmission line of 338 kV is proposed project as part of WAPP programme which will increase transmission capacity and enable the flow of energy between countries.[9] • The government is interested in increasing private sector investment in power sector and launch off-grids in Togo to increase access to electricity in rural areas.[17] • The Abu Dhabi Fund for Development (ADFD) and the International Renewable Energy Agency (IRENA) have announced a USD 15 Mn loan for a 30 MW grid-connected solar PV plant.[13]
Financing	• In 2019, The World Bank's International Development Association (IDA) approved a USD 150 Mn development policy financing for Togo to promote greener and more resilient future.[14] • World bank portfolio in Togo had 10 national projects and 6 regional projects for a commitment of over USD 490 Mn as of 2020.[15] • International Finance Corporation's (IFC) portfolio in Togo stands at approximately USD 330 Mn allocated primarily to the financial, energy, and transport sectors.[15]
Energy Imperatives	• Per capita electricity consumption in 2020 was 48 kWh which is significantly lower in comparison to the global average of 3.35 MWh.[5] • Only 24% of rural population had access to electricity in 2019 indicating a substantial scope for electrification in the country.[6] • As of 2019, Total installed capacity in the country was, including 70 MW of renewable energy.[10] • As of 2019, Hydro constitutes approximately 96% (67 MW) of renewable capacity and remaining 4% (3MW) coming from solar PV.[10]

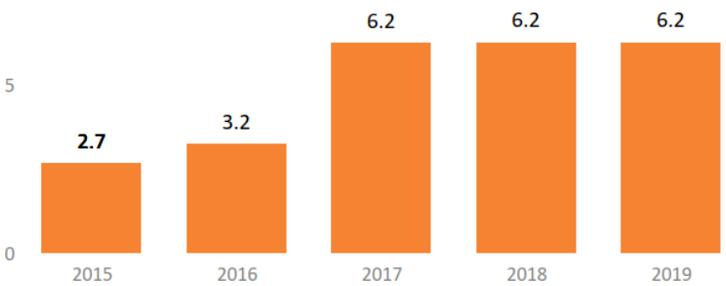


Tonga

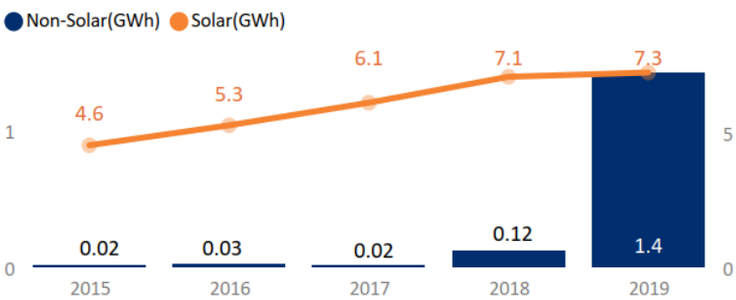
Asia & Pacific

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
58.4	6.2	0.3
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.0	1.7	61.4

Cumulative Solar Installed Capacity (MW)

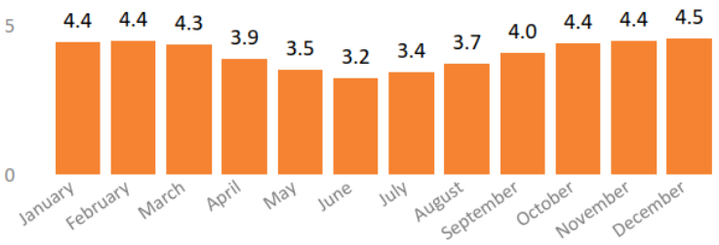


Renewable Energy Generation by Source

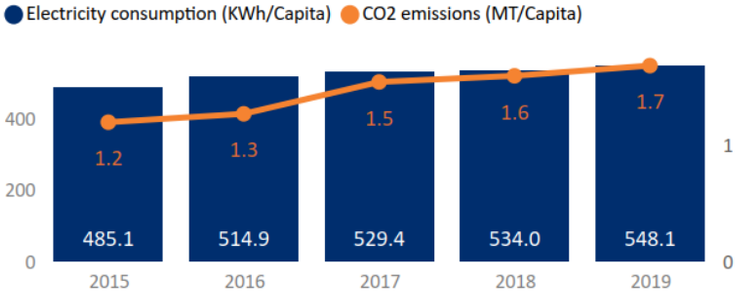


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



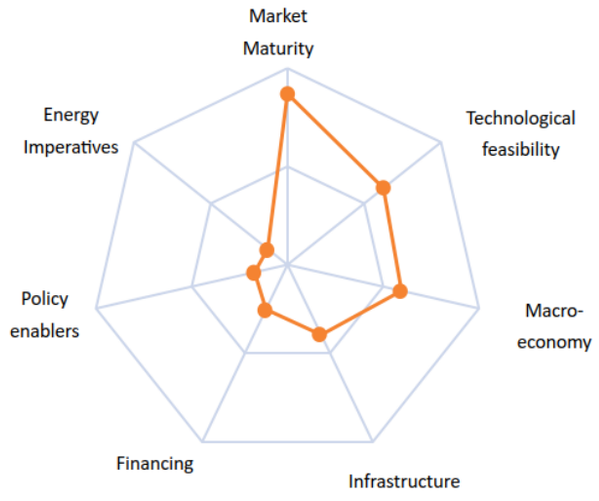
CO2 Emissions & Electricity Consumption



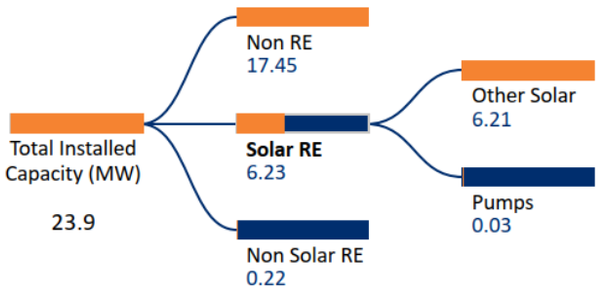
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers



Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
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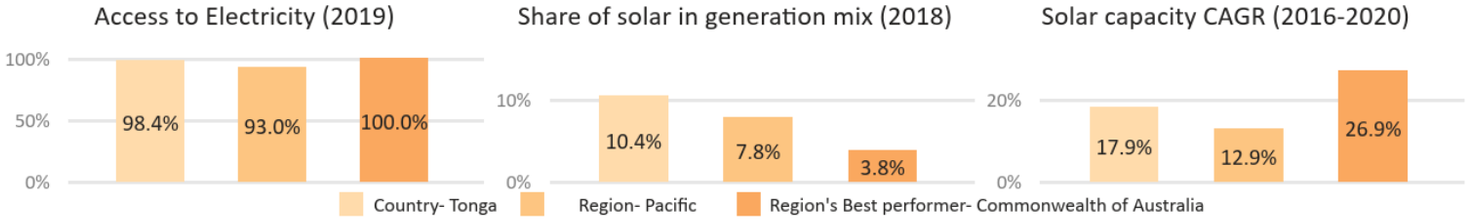
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

Areas of Improvement → Energy Imperatives, Policy enablers

Key Insights

Drivers	Insights
Macro-economy	• On account of COVID-19 Pandemic, the GDP (Real) has declined by 0.5% in 2020.[1] • The inflation rate (CPI) of Tonga has stabilized reaching 0.2% in 2020 from 3.5% in 2019.[1] • In 2018, the services sector was a major GDP contributor having 59.8% share followed by industrial and agricultural sector having 20.3% and 19.9% share respectively.[6] • As of 2019, the agricultural products have dominated the total exports with a share of 50.0% followed by manufactures and fuels & mining products having 13.6% share respectively.[6]
Policy enablers	• The government has set a target to meet 70% of its electricity demand through RE sources by 2030.[9] • The Tonga Energy Roadmap 2010-2020 aims to reduce the dependence on oil through development of RE through capacity building, adoption of favourable policies and formation of institutions in the country.[13] • The Tonga RE Project aims to increase the share of RE in the country by developing green mini grids in the outer islands and attract private investment in RE.[14]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 4.80 kWh/m^2/day and specific yield 4.01 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[2] • Tonga is vulnerable to fluctuating prices of fossil fuels because of its over dependence on them for electricity generation.[10]
Market Maturity	• 98% of the population in Tonga had access to electricity as of 2019.[3] • The Electricity Commission regulates the power sector in the country. The state-owned Tonga Power Ltd (TPL) generates, transmits and distributes electricity to four Tonga islands.[8] • The total RE generation in FY20 increased by 38.2% to 9.3 MUs from 6.7 MUs in FY 19.[8]
Infrastructure	• As of June 2020, TPL has a total consumer base of 23,607 with residential consumers having 80.8% share followed by commercial consumers having 19.1% share respectively.[8] • The systems losses stood at 10.96% in June 2020, indicating an efficient power delivery network.[8] • To upgrade the power infrastructure in the country, the Tonga Power Ltd (TPL) aims to invest USD 33 mn in the next 5 years.[8]
Financing	• To support the Government's aim to shift towards RE, the Asian Development Bank has granted USD 12.2 mn to Tonga's RE project.[9] • For the Outer Island RE Project, ADB has sanctioned USD 2 mn in 2013 with an additional financing of approximately USD 40 mn from Government of Australia, European Union and Global Environment Facility Grant etc.[11,12] • The Green Climate Find (GCF) has sanctioned a grant of USD 29.9 mn and USD 17.7 mn grant through cofinancing to help Tonga's transition towards RE.[10]
Energy Imperatives	• Per capita consumption of 0.54 MWh is substantially lower in comparison to the global average of 3.35 MWh (2019).[5] • The total installed solar capacity in Tonga has increased at a CAGR of 17.9% reaching 6.2 MW in 2020.[7] • In the last decade, the total power demand in the country has increased at a CAGR of 1.7% reaching 57.0 GWh in 2019 from 49.0 GWh in 2010.[4]

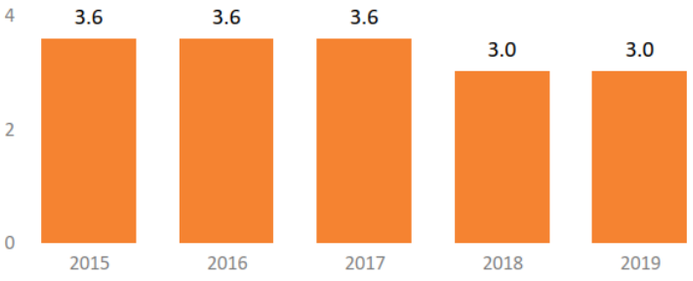
Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
8.5	3.0	NA

Trinidad and Tobago

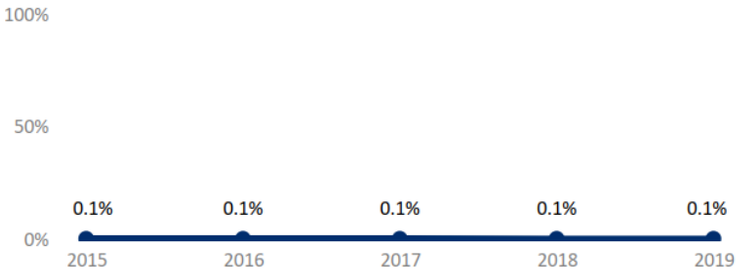
Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
4.3	27.1	61.3

Latin America & Caribbean

Cumulative Solar Installed Capacity (MW)

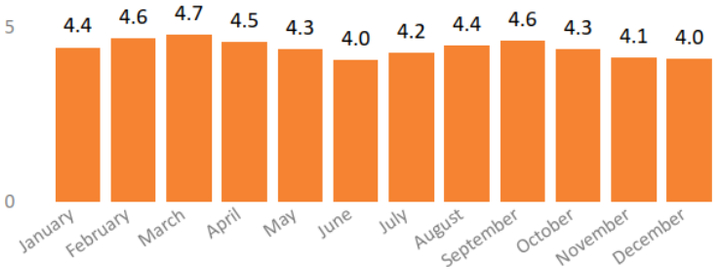


Share of electricity production from RE

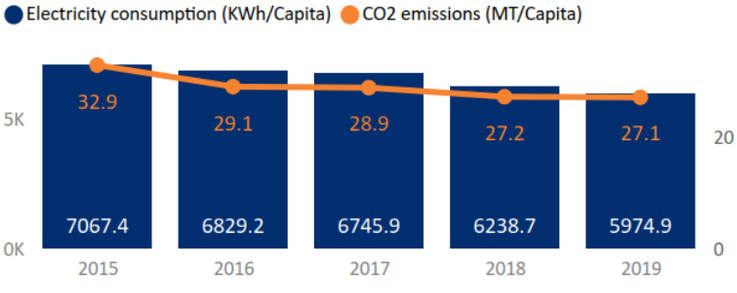


Renewables include electricity production from hydropower, solar, wind, biomass. and waste, geothermal, wave and tidal sources.

Monthly variation in PVout (kWh/kWp/day)



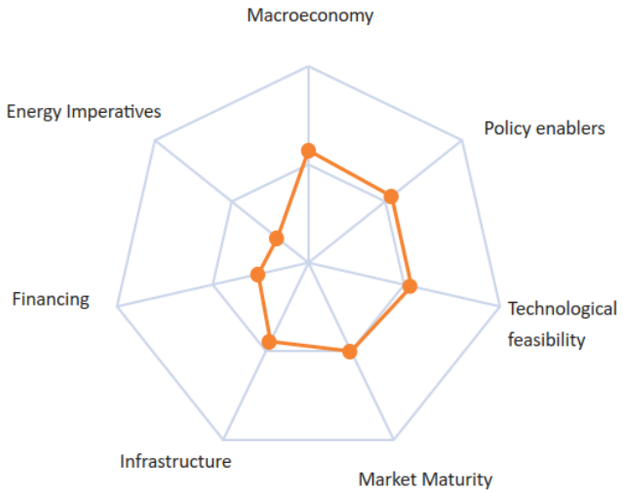
CO2 Emissions & Electricity Consumption



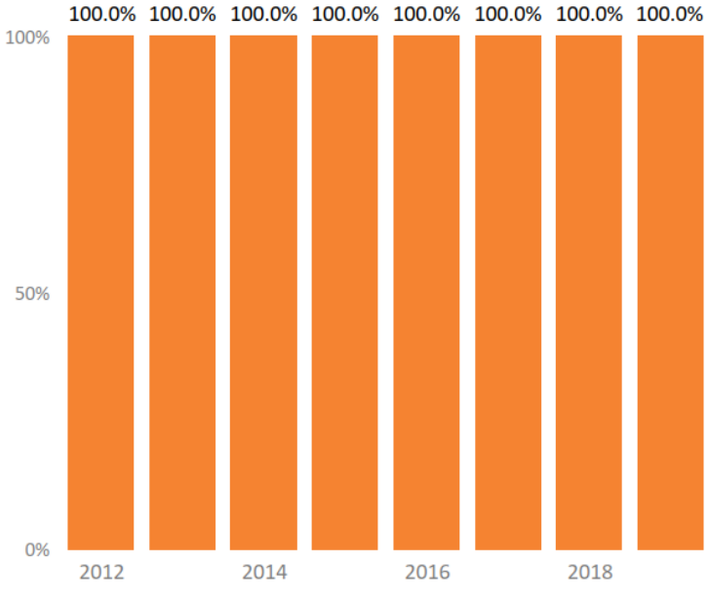
Ease of Doing Solar Classification

Influencer

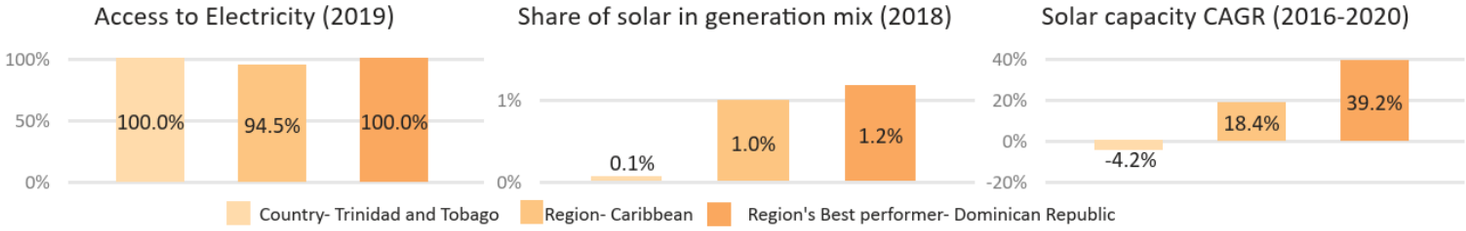
Performance against 7 drivers



Access to Electricity



Country's regional performance and characteristics



Areas of Strength → Macroeconomy, Policy enablers

Areas of Improvement → Energy Imperatives, Financing

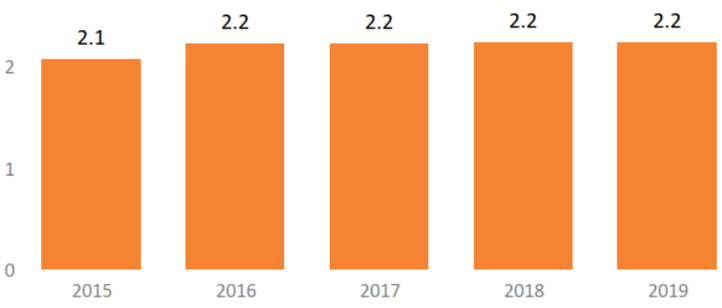
Key Insights

Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, the country's GDP (Real) declined by 7.9% in 2020.[1] • The inflation rate (CPI) of Trinidad & Tobago has stabilized in 2020 reaching 0.6% from 1% in 2019.[1] • In 2019, the services sector is major GDP contributor with 55.2% share followed by industrial and agricultural sector with 43.7% and 1.1% share respectively.[6] • As of 2019, the exports manufacturing products dominated the total exports with a share of 50.2% followed by fuel & mining products and agricultural with 46.7% and 3.0% share respectively.[6]
Policy enablers	• For catalysing the growth of renewable energy, the Government is developing the Feed in Tariff Policy (FIT) allowing renewable power producers to sell electricity back to the grid.[9] • To attract private investments various incentives such as import duty exemptions, tax credits, 0-rated VAT and accelerated depreciation is provided for certain wind and solar equipment.[10] • Several policies such as National Renewable Energy Policy, National Environment Policy and National Climate Change Policy were implemented by the Government in the past with an aim to reduce dependence on fossil fuels and support the development of renewable in the country.[8]
Technological Feasibility	• Owing to very high levels of solar irradiation (GHI) of 5.38 kWh/m^2/day and specific yield 4.33 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• Since 2011, 100% of the population in the country had access to electricity.[3] • Trinidad & Tobago is blessed with high solar irradiation index, however in 2019, solar PV accounted for a mere of 0.06% share in the generation mix.[4] • The Regulated Industries Commission regulates the power sector of the country.The generation sector has presence of three independent power producers, while transmission and distribution sectors in the country is controlled by government owned utility Trinidad & Tobago Electricity Commission.[7]
Infrastructure	• The transmission system of Trinidad & Tobago operates between 12 kV to 132 kV AC voltage levels. The T&D losses stood at 2.0%, indicating a highly efficient power infrastructure.[8] • Absence of an interconnection between the two islands of the nation is a major roadblock to the growth of grid infrastructure.[7]
Financing	• IRENA, in 2019, sanctioned USD 3 Mn funds to the country to support the development of renewable energy-based power plants in the country.[11] • The CARICOM Development Fund (CDF) and the Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE) together launched the initiative "Accelerating Sustainable Energy Solutions: From Ideas to Investments" to finance renewable energy projects in the CARICOM region.[12] • In 2019, the European Commission along with Airport Authority of Trinidad & Tobago sanctioned EUR 1.5 Mn for the development of 750 KW Solar PV to be constructed at the Piarco International Airport.[9,13]
Energy Imperatives	• Per capita consumption of 5.97 MWh was relatively high as compared to the global average of 3.35 MWh in 2019.[5] • The total generation from solar PV has risen at a CAGR of 2.5% between 2010-19 reaching 5 GWh in 2019 from 4 GWh in 2010.[4] • In 2019, gas & oil based thermal power plants dominated the generation mix with 99.9% share in the generation mix.[4] • In the last decade, the total power demand in the country has risen at a CAGR of 0.5% reaching 8,334 GWh in 2019 from 7,979 GWh in 2010.[4]

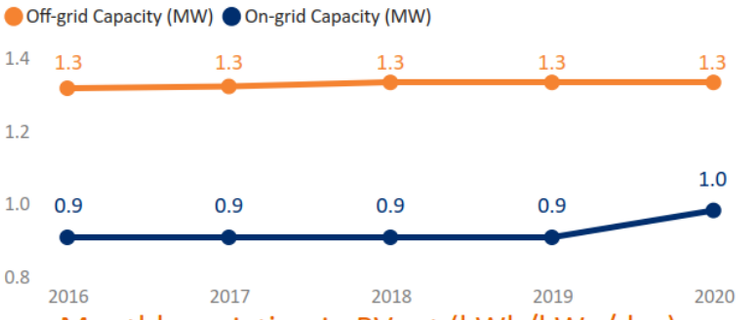
Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
6.9	2.3	1.3

Tuvalu	Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
Asia & Pacific	4.3	1.0	NA

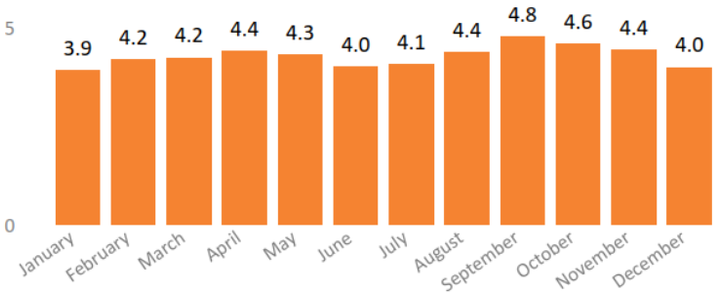
Cumulative Solar Installed Capacity (MW)



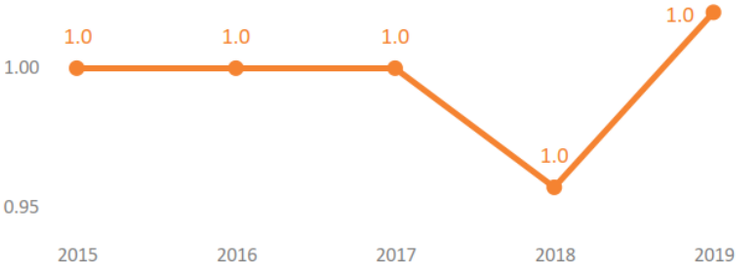
Cumulative Solar Off-grid & On-grid Capacity



Monthly variation in PVout (kWh/kWp/day)



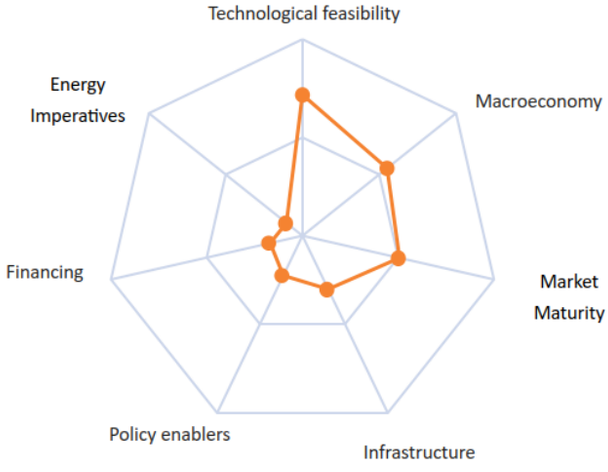
CO2 Emissions (Metric Tonnes/Capita)



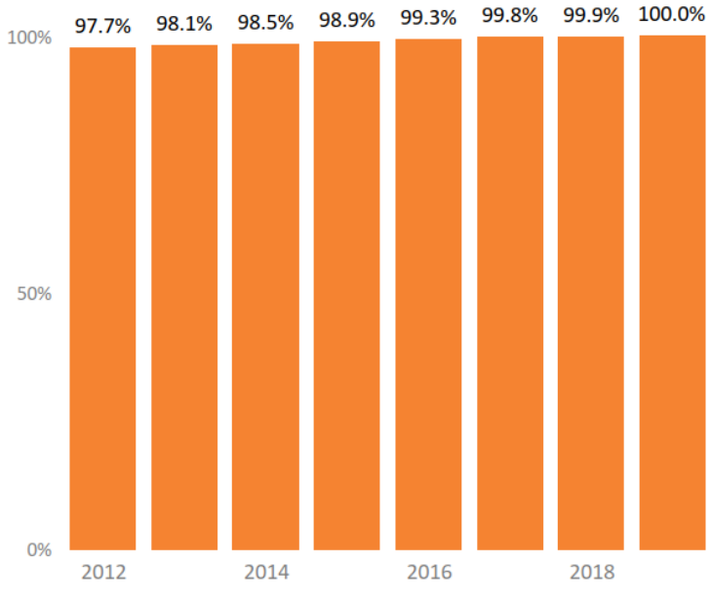
Ease of Doing Solar Classification

Progressive

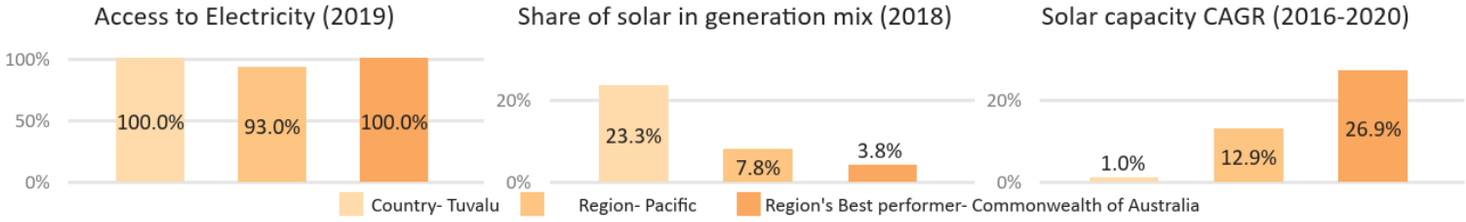
Performance against 7 drivers



Access to Electricity



Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Energy Imperatives, Financing

Key Insights

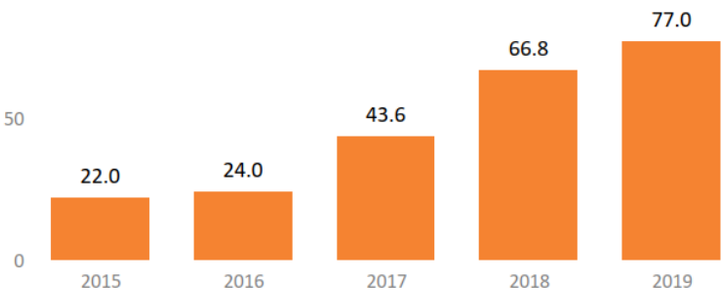
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, World average GDP (Real) declined by 3.6% in 2020. However, in Tuvalu it had grown by 0.5% making it one of the few countries in the world to have positive GDP growth in 2020.[1] • The inflation rate (CPI) of Tuvalu has improved to 1.6% in 2020 from 3.5% in 2019.[1] • Energy is one of the significant sectors of the country's economy as 7-10% of its GDP is spent on imported fuels for genera on of power.[2]
Policy enablers	• The National Energy Roadmap aims to have 100% share of renewable energy in the generation mix by 2025.[15] • "Funafuti Road Map to 100% Renewable Energy" as part of the "Tuvalu Renewable Energy Project" establishes a framework towards a 100% renewable energy contribution for current and future phases of renewable energy development.[16]
Technological Feasibility	• Owing to very high levels of solar irradiation (GHI) of 5.34 kWh/m^2/day and specific yield 4.26 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[3]
Market Maturity	• Since 2017, 100% of the population in the country has access to electricity.[4] • In 2018, solar PV has accounted a share of 23.32% share in the generation mix.[8,10] • The power sector in Tuvalu is controlled by state owned Tuvalu Electricity Corporation, which is responsible for generation, transmission, and distribution of electricity.[11]
Infrastructure	• The proposed Energy Access Project with USD 18 mn funding aims to extend the grid infrastructure and increase the electrification rate in Malekula and Espiritu Santo islands of the country.[13] • Funafuti's high reliance on diesel for most of its electricity has resulted in high generation cost across the capital.16 • High AT&C losses of 28% (2017) is one the key challenges that the power sector is facing.[16]
Financing	• The Asian Development Bank has sanctioned USD 7 mn grant to the government for installation of solar rooftop PV systems and energy storage in the country.[14] • The government of Tuvalu is planning to invest AUD 52 mn to increase the renewable capacity to 6 MW from 2.3 MW in 2020.[15] • In 2017, Tuvalu became the first recipient of the Green Climate Fund (GCF) contributions for climate change adaption in the Pacific region for the Tuvalu Coastal Adoption Project.[16]
Energy Imperatives	• The total installed capacity of solar PV has risen at a CAGR of 1.0% between 2015-20 reaching 2.3 MW in 2020.[8] • As of 2019, 94% of the total land area is available for developing utility scale solar parks across the country indicating favourable environment of the sector.[9] • The overall electricity consumption has risen at a CAGR of 9.9% between 2014-18 reaching 6.9 MUs in 2018 from 5.2 MUs in 2014.[10]

Uganda

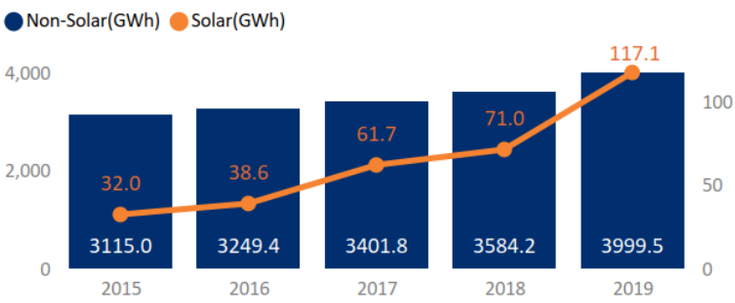
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
3,067.1	77.3	28.3
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.5	0.1	60.0

Cumulative Solar Installed Capacity (MW)

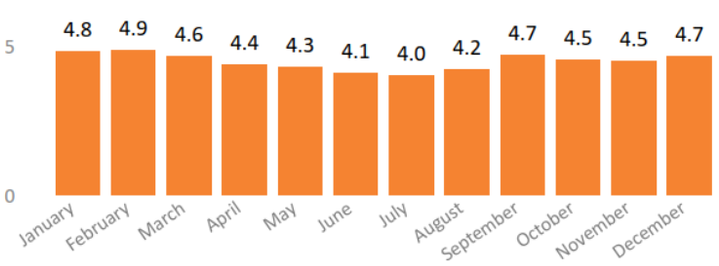


Renewable Energy Generation by Source

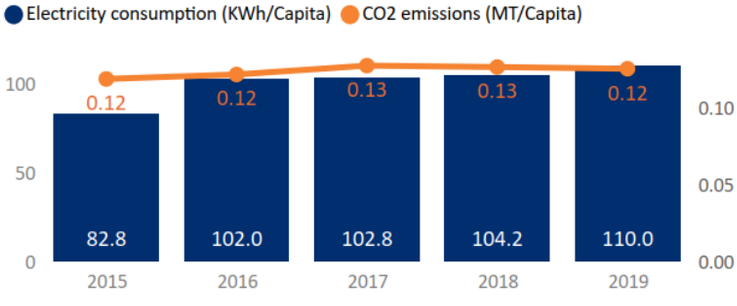


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



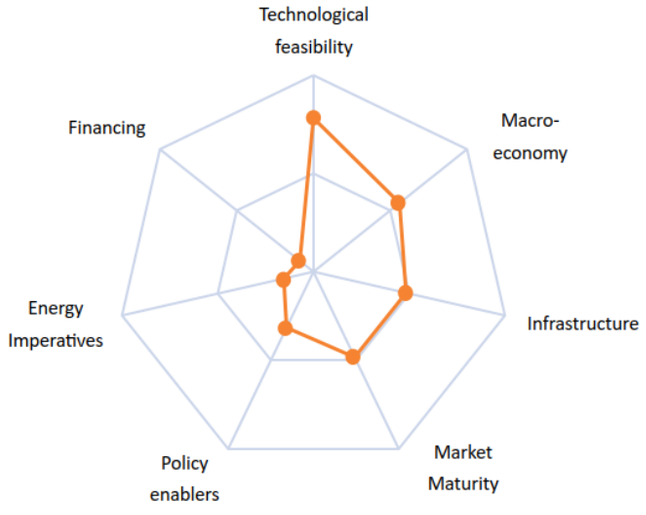
CO2 Emissions & Electricity Consumption



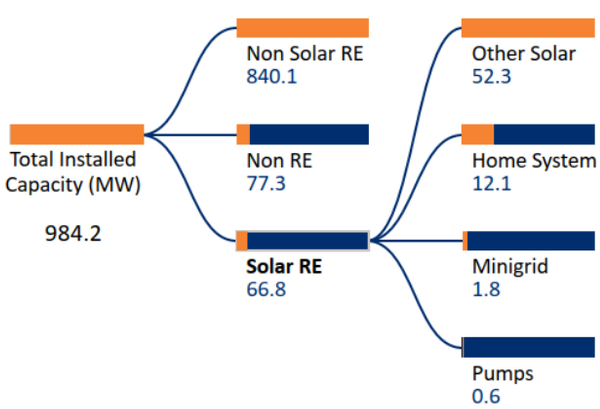
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

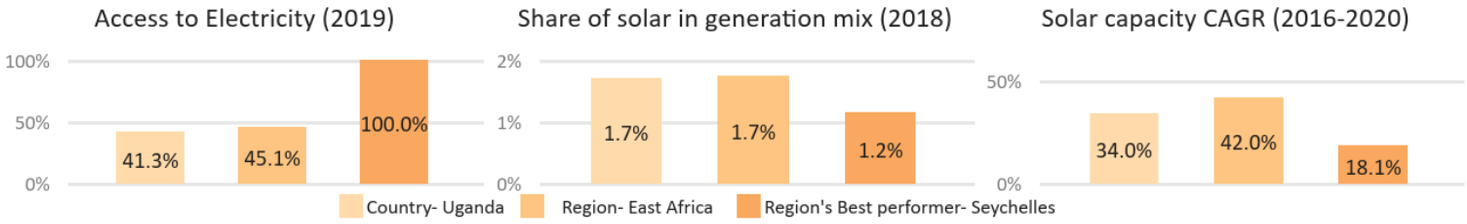


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Macroeconomy

Areas of Improvement → Financing, Energy Imperatives

Key Insights

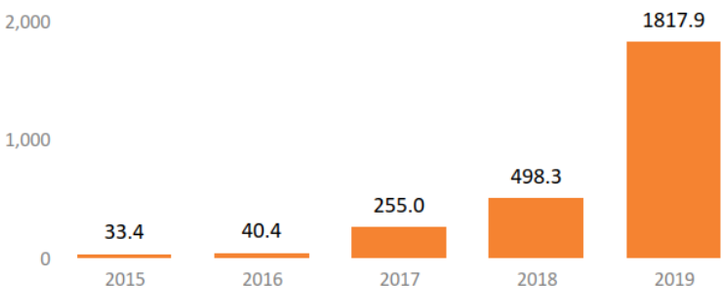
Drivers	Insights
Macro-economy	• Due to COVID-19 Pandemic, Uganda's GDP (Real) has declined by 2.1% in 2020.[1] • The inflation rate (CPI) of Uganda has risen to 3.8% in 2020 from 2.9% level in 2019.[1] • In 2019, the services sector was the major contributor to the GDP with 55.9% share followed by industrial and agricultural sector with 20.8% and 23.3% share respectively.[6] • As of 2019, agricultural products dominated the total exports having a share of 37.9% followed by travel services and manufacturing products having 21.6% and 11.4% share respectively.[6]
Policy enablers	• To attract investments for renewable, various incentives such as exemption of VAT & import duties for solar panels and policies for feed-in-tariff are deployed in the country.[10,13,14] • The Rural Electrification Strategy and Plan 2013-2022 has a primary objective to achieve 100% electrification by 2040.[15,16] • GoU has shown a strong commitment towards deployment of renewable energy with a roadmap to achieve 3,200 MW by 2030 and reach 100% RE by 2050.[11,12]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.64 kWh/m^2/day and specific yield 4.45 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• As of 2019, 41% of the population in the country has access to electricity.[3] • Although having a high solar potential, solar PV has accounted for only 1.4% share in generation mix in 2019.[4] • The Power sector in Uganda is regulated by Electricity Regulatory Authority (ERA).[7] • The generation and distribution sectors have presence of private sector players, while transmission sector is wholly controlled by the government entity.[7]
Infrastructure	• The national grid of Uganda is interconnected with Kenya, Tanzania, Rwanda, and the Democratic Republic of Congo (DRC). In 2020, the country's net export of electricity stood at 221 GWh.[8] • The Uganda Electricity Transmission Company Limited (UETCL) operates the transmission network in the country. The transmission losses have improved in the last 5 years reaching 3.6% in 2020 from 4.4% in 2016.[8] • UMEME is the major distribution in the country, selling 98% of the total energy. In 2020, the total length of distribution lines reached 37,752 km and distribution losses were at 16.6%.[8,9]
Financing	• The European Investment Bank (EIB) in 2020 sanctioned a USD 12.5 mn loan for the deployment of 240,000 high-quality solar home systems to provide clean and reliable energy in the country.[19] • Under the SREP investment plan, Uganda has sanctioned USD 50 mn financing to attract investments for renewable energy.[17] • Under the Uganda Electricity Access Scale-up Project (EASP), USD 400 mn fund has been committed to Uganda with an objective to increase energy access in the country.[18]
Energy Imperatives	• Per capita consumption of 0.1 MWh is significantly low as compared to the global average of 3.35 MWh in 2019.[5] • The total generation from solar PV has risen at a CAGR of 14.8% between 2010-19 reaching 73.0 GWh in 2019 from 21.0 GWh in 2010.[4] • In 2019, Hydro power plants dominated the generation mix having 82.1% share in the generation mix.[4] • In the last decade, the total power demand in the country has risen at a CAGR of 5.4% reaching 4,482 GWh in 2019 from 2,802 GWh in 2010.[4]

United Arab Emirates

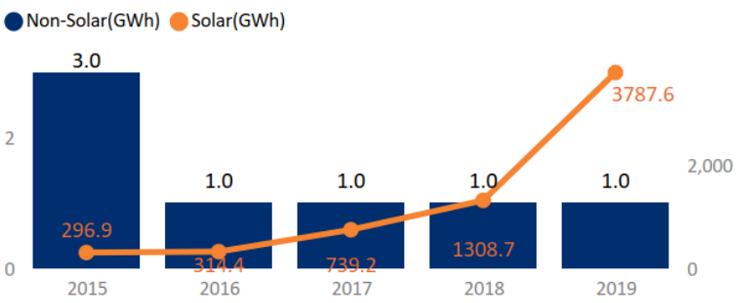
Middle East

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
122.8	2,439.1	5.6
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
5.0	19.5	80.9

Cumulative Solar Installed Capacity (MW)

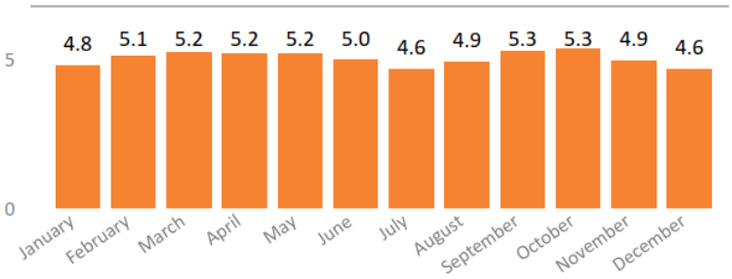


Renewable Energy Generation by Source

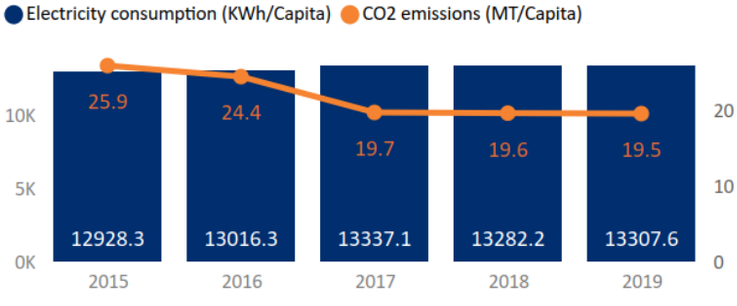


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



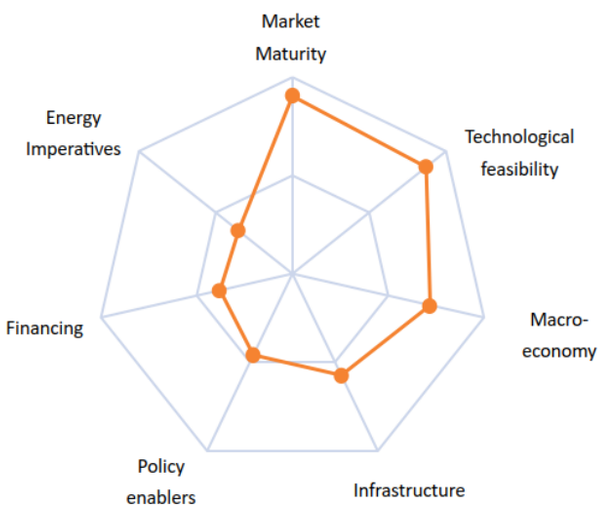
CO2 Emissions & Electricity Consumption



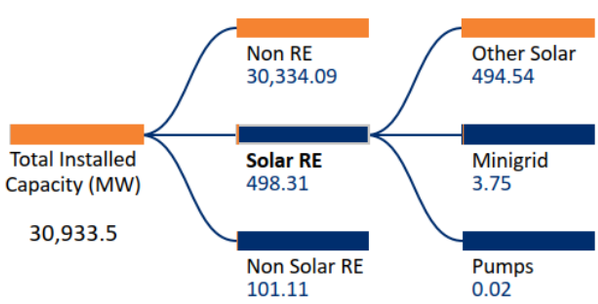
Ease of Doing Solar Classification

Achiever

Performance against 7 drivers

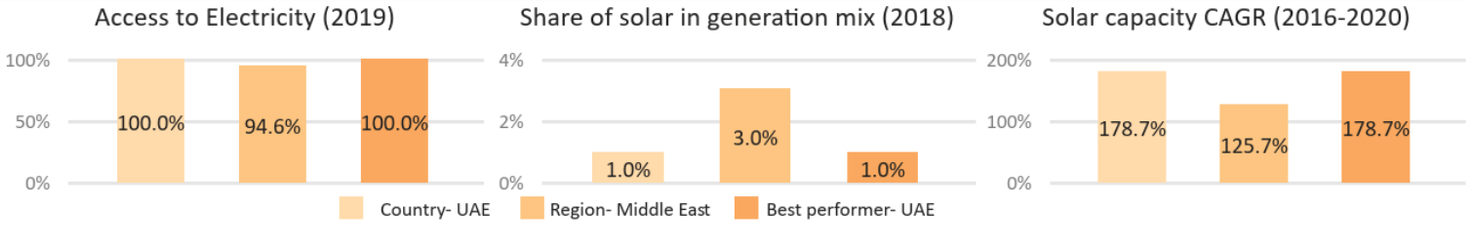


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Technological feasibility

Areas of Improvement → Energy Imperatives, Financing

Key Insights

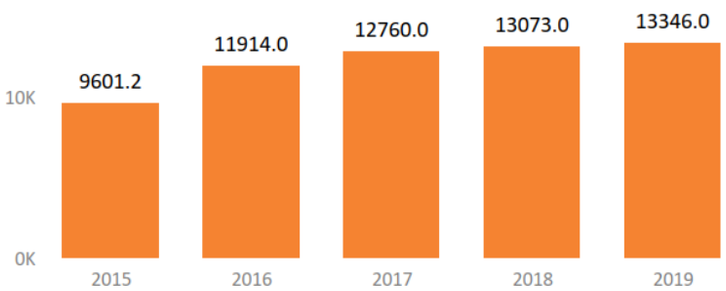
Drivers	Insights
Macro-economy	• On account of COVID-19 Pandemic, the GDP (Real) has declined by 5.9% in 2020.[1] • UAE is one of the few countries in the world that has reported negative inflation rate (deflation) of 2.1% while the world average is at 3.2% as of 2020.[1] • As of 2019, the exports of fuel and mining products dominated the total exports having a share of 46.2% followed by manufacturing products and Transport & travel services having 27.3% and 10.5% share respectively.[6]
Policy enablers	• Launched in 2017, the UAE Energy Strategy 2050, aims to have 50% share of renewable energy in the generation mix by 2050.[7] • To promote development of solar rooftop PV installations Dubai and Abu Dhabi have introduced the net metering regulations.[14] • Dubai and Abu Dhabi have launched several initiatives like regulatory policy for clean energy certificates, green building codes, renewable energy standards to attract clean energy investments.[15, 16, 17]
Technological Feasibility	• Owing to very high levels of solar irradiation(GHI) of 6.05 kWh/m^2/day and specific yield 5.02 kWh/kWp, a very strong technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• Since 2001, 100% of the population in the country has access to electricity.[3] • UAE is blessed with very high solar potential, however in 2019, solar PV accounted only 3.20% share in generation mix.[4] • Investments totalling to USD 8.11 Bn for clean energy projects during 2010 to 2019 have been deployed with USD 4.7 Bn alone clocked in 2019.[11]
Infrastructure	• The transmission system of UAE operates above 132 kV AC voltage levels. The Dubai, Abu Dhabi and Sharjah have their own Electricity & Water Authority while Federal Electricity & Water Authority manages the rest of the Emirates.[9] • The Emirates National Grid (ENG) interconnects the transmission network of 7 emirates of UAE. The country is also part of Gulf Cooperation Council (GCC), which has Bahrain, Kuwait, Oman, Qatar, and the Saudi Arabia among its members.[9,10]
Financing	• To achieve its 2050 renewable energy target, UAE will allocate AED 600 bn for the development of clean energy in the country.[8] • As of 2019, under its Overseas Renewable Energy Development Assistance Program, UAE has provided USD 700 mn for development of renewable energy projects in the developing member countries of IRENA.[8,12] • UAE has strong presence of both domestic institutions as well as international institutions such as First Abu Dhabi Bank, Mistubishi UFJ etc. for financing of renewable energy projects in the country.[11]
Energy Imperatives	• Per capita consumption of 13.3 MWh is almost four times of the global average of 3.35 MWh in 2019.[5] • The total generation from solar PV has risen at a CAGR of 81.0% between 2010-19 reaching 4,170 GWh in 2019 from 20 GWh in 2010.[4] • In 2019, Fossil fuel (oil, gas & coal) based thermal power plants dominated the generation mix having 96.7% share in the genera on mix.[4] • In the last decade, the total power demand in the country has risen at a CAGR of 4.4% reaching 129,995 GWh in 2019 from 88,332 GWh in 2010.[4]

United Kingdom

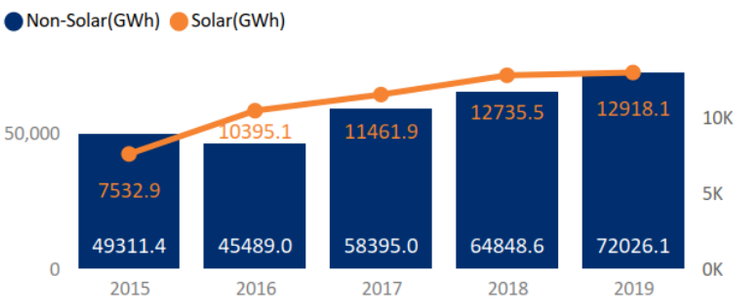
Europe

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in GW (2020)	Off-Grid Solar Capacity in MW (2019)
299.8	13.5	NA
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
2.6	5.5	83.5

Cumulative Solar Installed Capacity (MW)

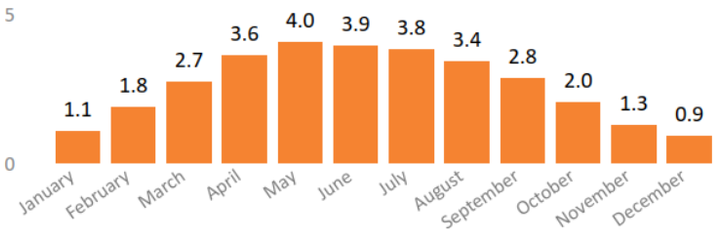


Renewable Energy Generation by Source

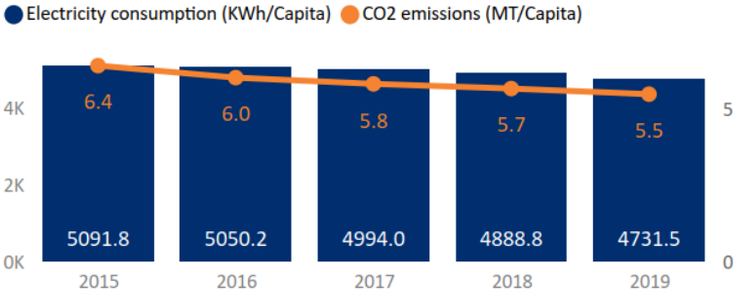


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



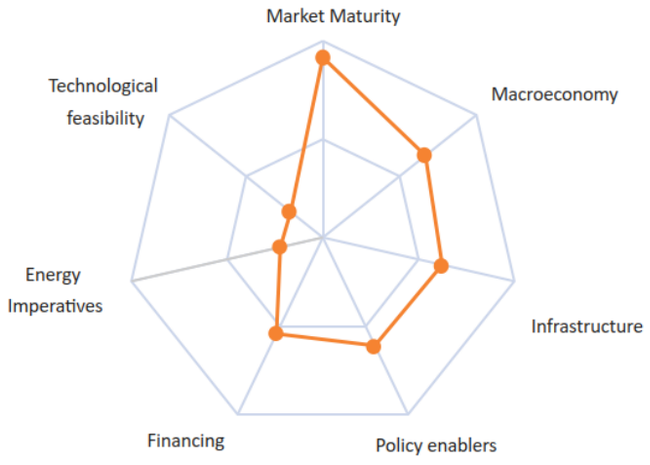
CO2 Emissions & Electricity Consumption



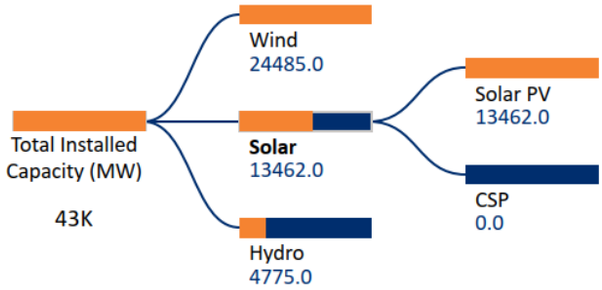
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

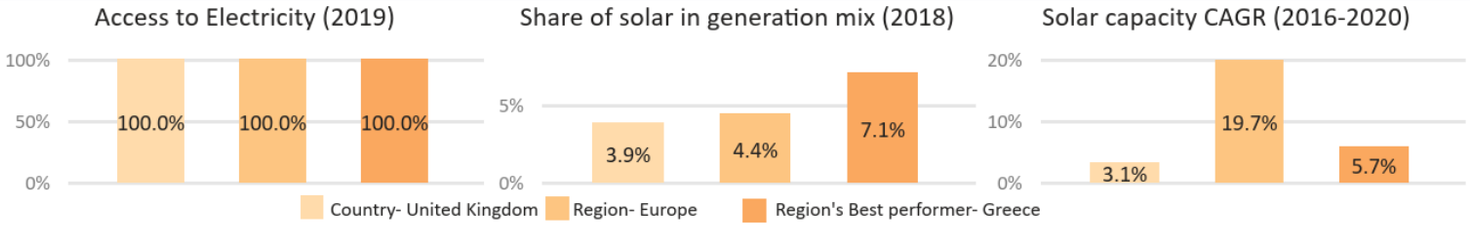


Installed Capacity by Source



Hydro includes Renewable hydropower and Pumped storage;
Wind includes Onshore and Offshore wind energy;
Year: 2020.

Country's regional performance and characteristics



Areas of Strength → Market Maturity, Macroeconomy

Areas of Improvement → Technological feasibility, Energy Imperatives

Key Insights

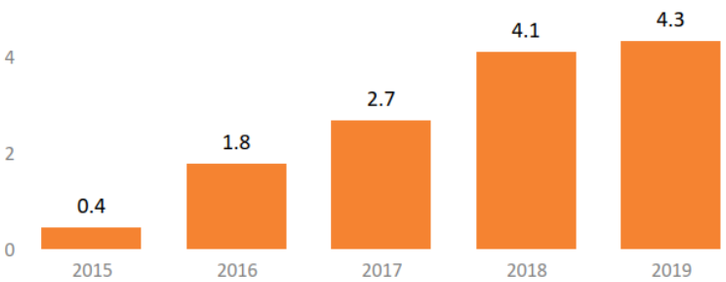
Drivers	Insights
Macro-economy	• GDP (Real) has grown at an annual rate of 1.4% in 2019 and declined by 9.9% in 2020.[1] • In 2020, agriculture contributed 0.6% to the GDP, 16.9% came from the industry and 72.8% from the service sector.[2] • In United Kingdom, sectors with strong potential include information and communication on technologies, biotech-nologies, aviation, renewable energies, and defence.[3]
Policy enablers	• The Department for Business, Energy, and Industrial Strategy (BEIS) owns the responsibility for ensuring UK's secure, clean, and affordable energy supplies and promotes international action on energy security.[5] • UK government has set the world's most ambitious climate change target, cutting emissions by 78% by 2035 compared to 1990 levels.[6] • The Feed-in Tariffs (FIT) scheme is a government programme designed to promote the uptake of renewable and low-Carbon electricity generation technologies.[7]
Technological Feasibility	• UK receives an average of 1460 hours of sunlight per year. It is sunny 33.3% of daylight hours and 66.7% of daylight hours are likely cloudy or with shade, haze, or low sun intensity.[9] • UK receives relatively low levels of solar irradiation of 2.59 kWh/m^2/day and specific yield of 2.6 kWh/ kWp, a low technical feasibility is envisaged for solar projects in Country.[10]
Market Maturity	• The Office of Gas and Electricity Markets (Ofgem) is the main regulator of the UK gas and electricity networks and is governed by the Gas and Electricity Markets Authority.[5] • Eastern Power Networks (EPN), London Power Networks (LPN) and South Eastern Power Networks (SPN) are the three licensed Distribution Network Operators (DNOs) regulated by Ofgem.[13] • The European Power Exchange EPEX SPOT SE and its affiliates operate physical short-term electricity markets in Central Western Europe and the UK.[14]
Infrastructure	• National Grid has 7,212 kms of overhead electricity lines and 2,239 kms of underground electricity cables in the UK.[15] • National Grid plans to invest £7.4bn to establish the future electricity transmission system over the next five years (2021 – 2026).[16] • The UK electricity network is connected to systems in France, the Netherlands and Ireland through cables called interconnectors.[17]
Financing	• In 2017, EIB and Santander UK Plc signed an agreement worth EUR 244 Mn for the project Santander UK RE Framework Loan from UK. The total cost of the project is es mated at EUR 700 Mn.[19] • The 20-year EIB loan facility to support UK Power Networks GBP 1.2 Bn of network investment to improve critical energy infrastructure across the region over the next seven years.[20]
Energy Imperatives	• As of 2019, Electricity Consumption per capita stood at 4,731 kWh declining from 4,993 kWh in 2017, yet significantly higher compared to the global average.[21] • As of 2020, cumulative solar PV Capacity for the country was 13,462 MW which was 13,346 MW in 2019.[22] • Since 1990, 100% of population in UK had access to electricity.[23] • The export tariff for selling surplus energy to the electricity supplier is 5.24p per unit of electricity.[24]

Vanuatu

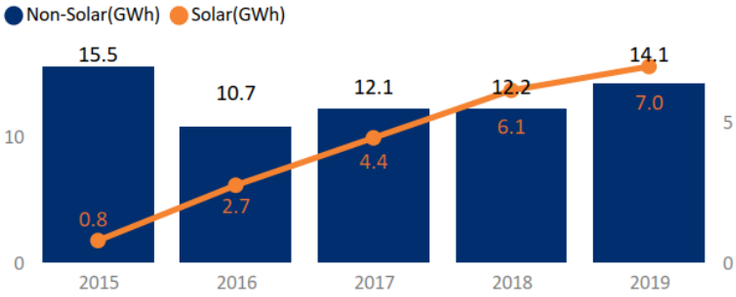
Asia & Pacific

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
70.3	4.2	1.7
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
3.5	0.5	61.1

Cumulative Solar Installed Capacity (MW)

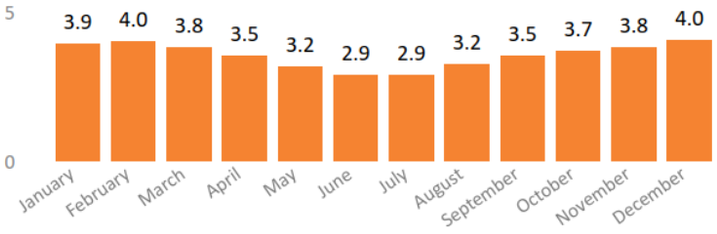


Renewable Energy Generation by Source

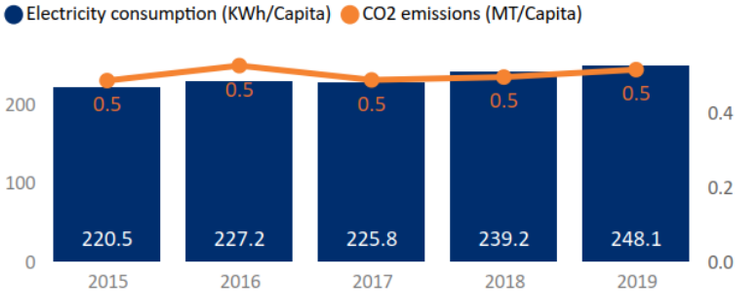


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



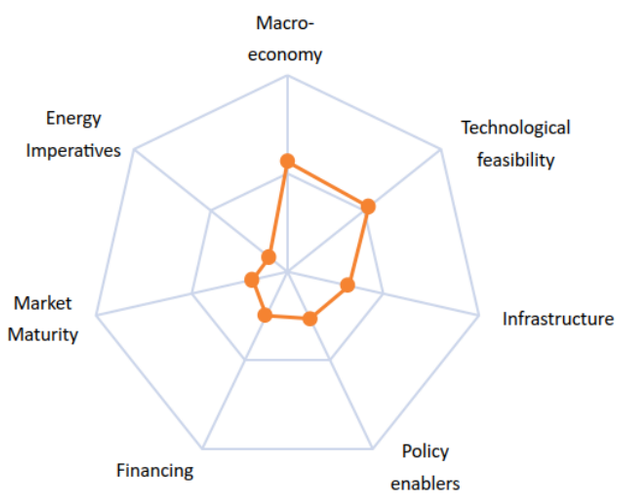
CO2 Emissions & Electricity Consumption



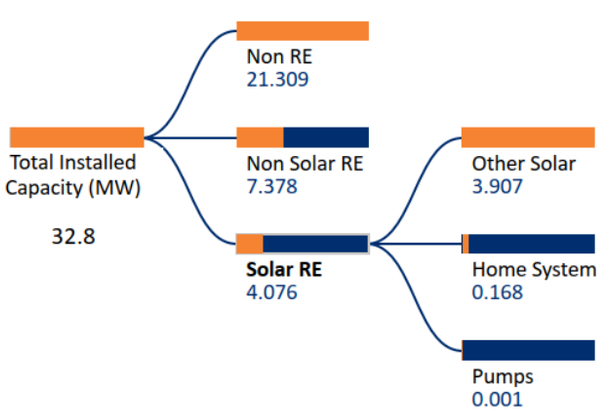
Ease of Doing Solar Classification

Potential

Performance against 7 drivers

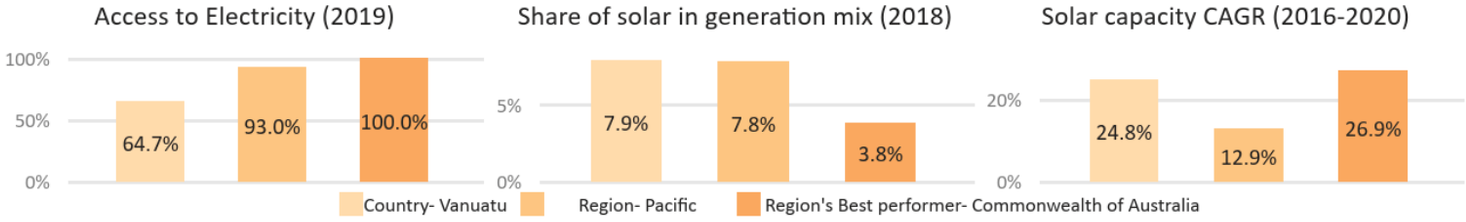


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Macroeconomy; Technological feasibility

Areas of Improvement → Energy Imperatives; Market Maturity

Key Insights

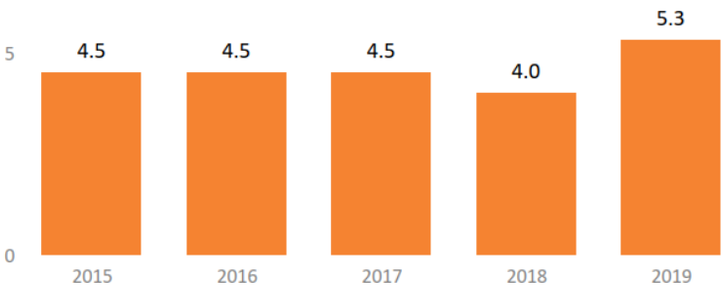
Drivers	Insights
Macro-economy	• On account of COVID-19 Pandemic, the country's GDP (Real) declined by 9.2% in 2020.[1] • The inflation rate (CPI) of Vanuatu has risen to 2.9% in 2020 from 2.7% in 2019.[1] • The services sector is major GDP contributor with Tourism alone contributing 36% to the GDP in 2020 followed by agricultural and industrial sector respectively.[6]
Policy enablers	• Vanuatu National Energy Roadmap (NERM) 2016-2030 targets to achieve 100% share of RE in the country by 2030.[11] • Vanuatu Rural Electrification Project (VREP) II 2017, funded by World Bank, aims to subsidize the cost of solar home systems, mini grids and microgrids in rural areas benefiting approximately 42,000 people.[8] • To boost growth of solar PV in the country initiatives like net metering, import duty exemptions on RE equipment (case by case basis) and feed in tariff are already implemented in the country.[9]
Technological Feasibility	• Owing to relatively average levels of solar irradiation (GHI) of 4.30 kWh/m^2/day and specific yield 3.54 kWh/kWp, good technical feasibility is envisaged for solar projects in the country.[2] • Vanuatu is vulnerable to fluctuating prices of fossil fuels because of its high dependence on them for electricity generation.[4]
Market Maturity	• 65% of the population in Vanuatu had access to electricity as of 2019.[3] • In 2019, solar PV accounted for 7.11% share in the electricity generation mix.[4] • Nationally Appropriate Mitigation Action (NAMA), implemented in 2015, is supporting NERM targets by installing RE micro grids and extending the existing grid in the country.[7] • The Power sector in Vanuatu is regulated by Utilities Regulatory Authority (URA). UNELCO and Vanuatu Infrastructure & Utilities (VIU) are the utilities operating in the country through Electricity Concession Contracts.[10]
Infrastructure	• The total consumers in Vanuatu has risen at a CAGR of 6.5% reaching 22,061 in 2019 from 16,093 in 2014. Also, the length of electricity lines has reached 908 kms in 2019 with voltage levels ranging from 230V to 33KV.[10] • Integration of the National grid in all parts of the country considering many dispersed islands is a major challenge.[7] • The Government aims to invest USD 20 mn to improve the power infrastructure of the country including development of RE projects to achieve country's RE goals.[12]
Financing	• The National Green Energy Fund (NGEF), created under the National Energy Road Map (NERM), aims to provide funding to RE projects and a ract foreign investments in the country.[13] • The Asian Development Bank (ADB) in 2015 sanctioned USD 7 mn grant for the development of RE projects in the country to reduce its dependence on the fossil fuels for electricity genera on.[15] • Key roadblocks to private sector investments in Vanuatu are unclear land ownership, regulatory restrictions, high up-front capital cost and constraints to equipment maintenance.[16]
Energy Imperatives	• Per capita consumption of 0.25 MWh is substantially lower in comparison to the global average of 3.35 MWh (2019).[5] • The total generation from solar PV has risen at a CAGR of 64.2% between 2011-19, reaching 5.29 GWh in 2019 from 0.1 GWh in 2011.[4] • In 2019, Oil based thermal power plants dominated the generation mix having 61.6% share in the genera on mix.[10] • In the last decade, the total power demand in the country has risen at CAGR of 2.8% reaching 74.4 GWh in 2019 from 58.0 GWh in 2010.[4]

Venezuela

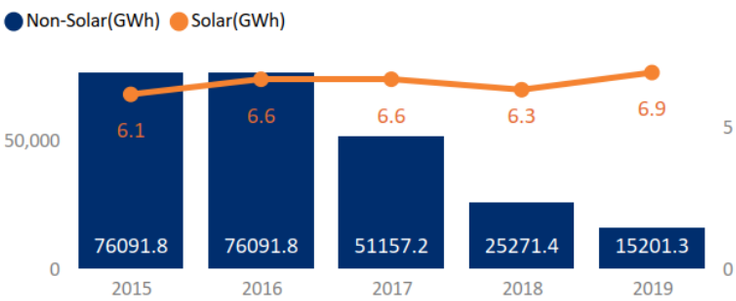
Latin America & Caribbean

Electricity Consumption in BU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
65.6	5.3	3.0
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.3	4.1	30.2

Cumulative Solar Installed Capacity (MW)

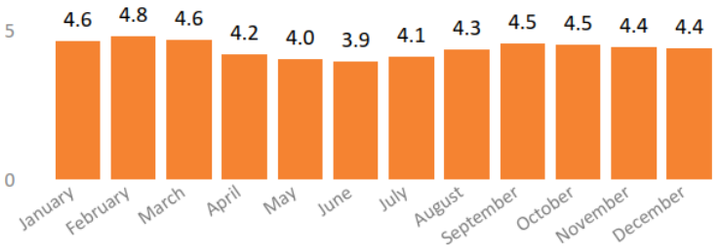


Renewable Energy Generation by Source

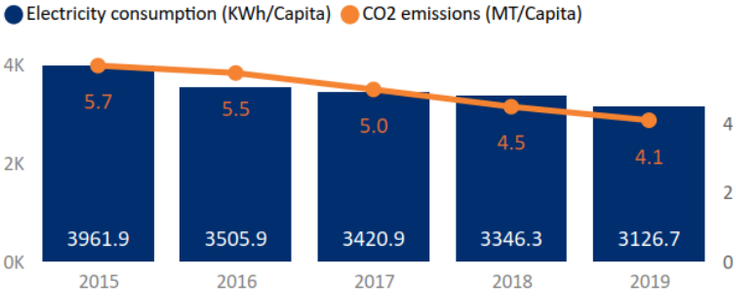


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



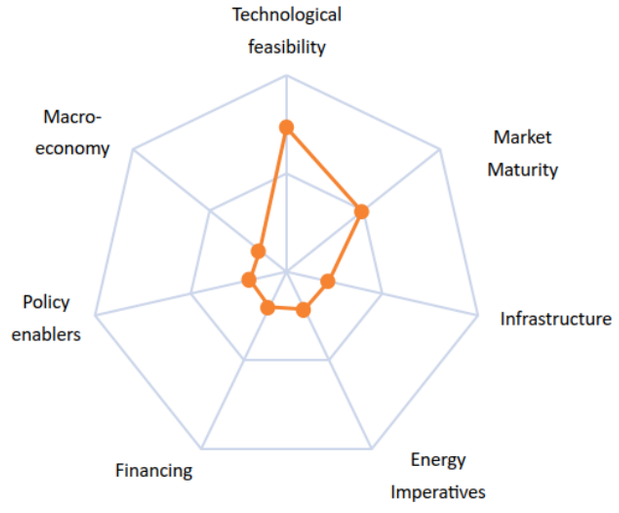
CO2 Emissions & Electricity Consumption



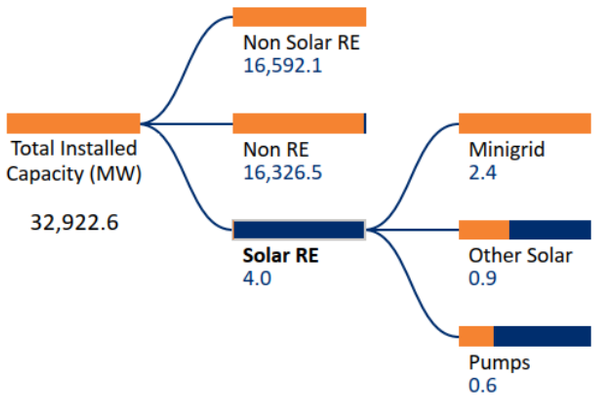
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers



Installed Generation Capacity by Source



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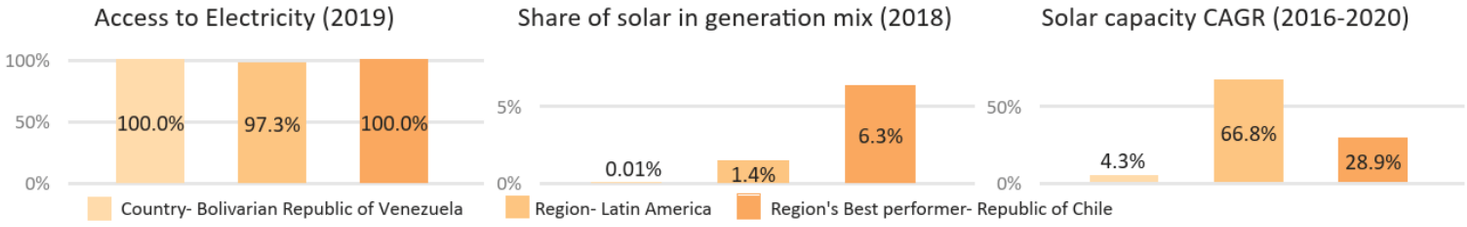
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Market Maturity

Areas of Improvement → Macroeconomy, Policy enablers

Key Insights

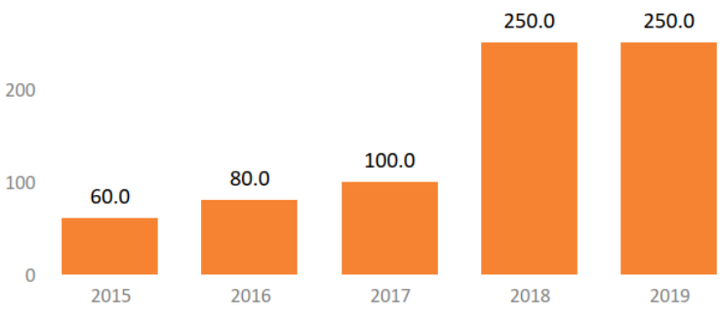
Drivers	Insights
Macro-economy	• Due to COVID-19 pandemic, GDP (Real) declined at a rate of 30% in 2020 and is expected to recover to -10% in 2021.[1] • The economy of the country is primarily based on Petroleum produce.[2] • In 2019 and 2020, the US imposed sanctions making it difficult for foreign companies to do business in Venezuela.[3]
Policy enablers	• The Ministry for Popular Power for Electric Energy (MPPEE) is responsible for formulation, monitoring and evaluation of policies and regulation and planning of electric power and RE.[4] • Electric Mission Venezuela (Misión Eléctrica Venezuela) seeks to strengthen the electricity Sector and promote the use of RE.[6] • The "Development Plan for the National Electric System" aims to integrate RE in the electric system of Venezuela.[13]
Technological Feasibility	• Owing to relatively high levels of solar irradiation (GHI) of 5.35 kWh/ m^2/ day and specific yield 4.25 kWh/ kWp, a high technical feasibility is envisaged for solar projects in Venezuela.[14] • 70% of electricity generated in the country comes from hydroelectric plants, while the remaining 30% comes from thermal power.[4] • Venezuela aims to develop 613 MW of RE for isolated and rural communities.[13]
Market Maturity	• 100% of population has access to electricity as of 2019.[9] • CORPOELEC is an integrated state-owned operating company in charge of carrying out the activities of Generation, transmission, distribution and marketing of power.[5] • There is no electricity regulatory commission or an independent planning body in the country.[7] • Share of solar power in generation is only 0.01%.[10]
Infrastructure	• In 2017, the electric power transmission network comprised 32,480 ckm of high-voltage transmission lines, which increased at a CAGR of 3% between 2007 and 2017.[17] • The country's electricity distribution network totalled approximately 143,375 ckm as of 2017. It increased at a CAGR of 3% between 2007 and 2017 and is expected to increase at a CAGR of 2% between 2018 and 2025 to approximately 171,900 ckm.[17] • During 2013 to 2015, 862 kms of new transmission lines were built.[5] • Power blackouts are frequent due to low electricity generation, rationing of power and technical failures.[4] • Modernization of the electricity sector has been difficult because of inefficiency of transmission, inefficiencies in plant and equipment and lack of investments.[6]
Financing	• Foreign investments are encouraged in Venezuela and protected by a new legal framework especially through the dispositions stipulated in the Decree 2095.[16] • According to UNCTAD, the country recorded a slight increase in FDI inflows reaching USD 959 million in 2020, compared to USD 934 million in 2019.[16]
Energy Imperatives	• Total Installed power generation capacity in Venezuela is 32.9 GW.[8] • Per capita consumption of 3.09 MWh was almost at par with the global average of 3.35 MWh in 2019.[11] • Installed solar PV capacity in the country is 5 MW in 2019.[12]

Yemen

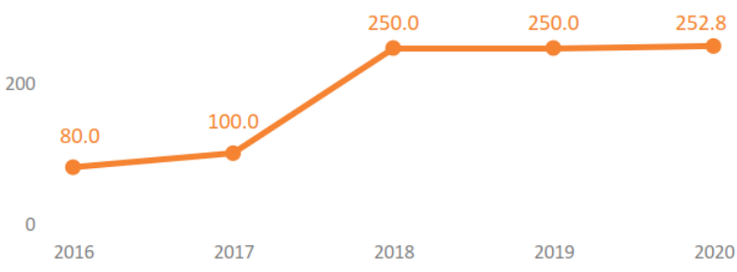
Middle East

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
2,192.0	252.8	252.8
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
5.2	0.4	31.8

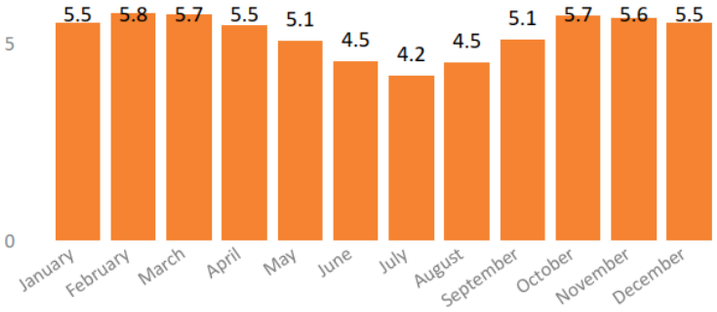
Cumulative Solar Installed Capacity (MW)



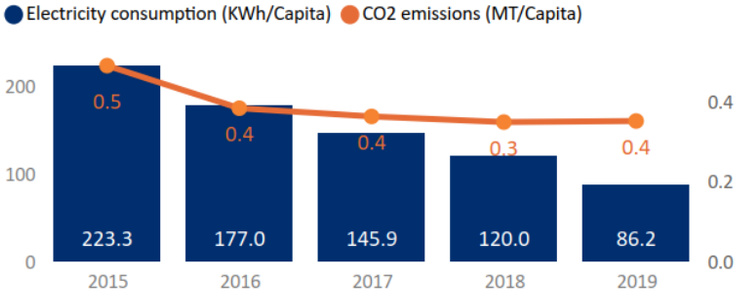
Cumulative Solar Off-grid Capacity (MW)



Monthly variation in PVout (kWh/kWp/day)



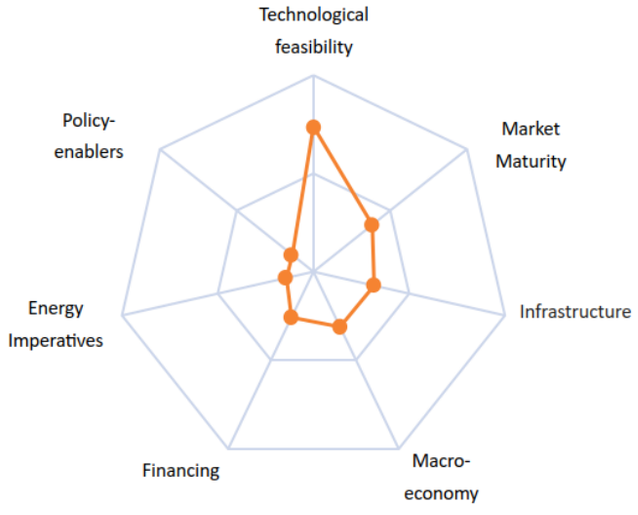
CO2 Emissions & Electricity Consumption



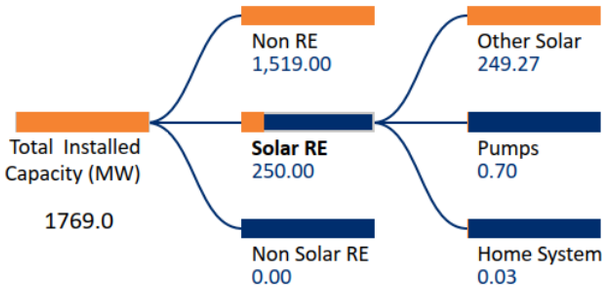
Ease of Doing Solar Classification

Progressive

Performance against 7 drivers



Installed Generation Capacity by Source



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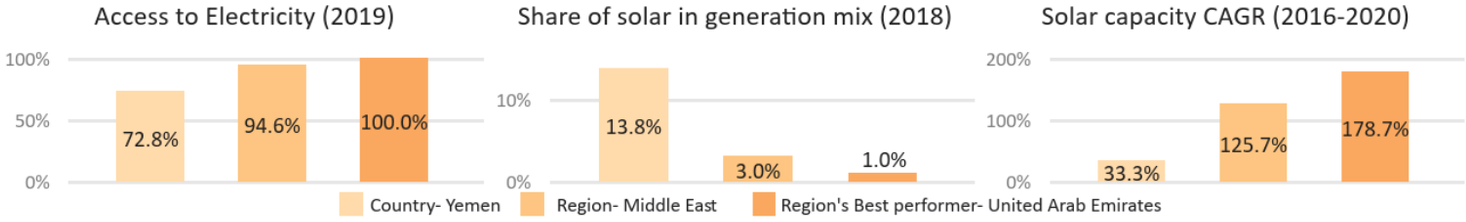
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Market Maturity

Areas of Improvement → Policy enablers, Energy Imperatives

Key Insights

Drivers	Insights
Macro-economy	• GDP (at current prices) of Yemen was at USD 23.48 Bn in 2020. Real GDP contracted by 5% in 2020.[2,3] • Total public debt is estimated at 76.53% of GDP in 2020 which is substantially high.[4] • Agriculture, fisheries and oil exports are main contributors of its economy.[12,19]
Policy enablers	• The National Strategy for Renewable Energy and Energy Efficiency 2010 aims to achieve 15% share of renewable sources in energy mix by 2025.[8] • World Bank funded USD 50 mn towards "Yemen Emergency Electricity Access Project" in 2018 with a goal to expand electricity access to schools, hospitals and rural areas using solar.[13] • "Enhanced Rural Resilience in Yemen (ERRY)" project started by the United Nations Development Programme (UNDP) in 2016 aims to increase solar penetration in the country by installing solar micro-grids.[16]
Technological Feasibility	• Owing to very high average solar irradiation level (GHI) of 6.47 kWh/m²/day and specific yield of 5.24 kWh/kWp, very strong technical feasibility is envisaged for solar projects in Yemen.[1] • Renewable genera on was 732 GWh (2019) which constitutes 14% of total electricity generated.[7] • Solar PV for water pumping, lighting and water heating are proven technologies deployed in Yemen's RE sector.[17]
Market Maturity	• 73% of total population had access to electricity as of 2019.[6] • RE share, in total Final electricity consumption, was 4.3% as of 2018.[6] • More than 50 percent of Yemeni households rely on the sun as their main source of energy.[18] • Absence of quality standards and skilled manpower/technicians for solar are areas of concern for the country.[14]
Infrastructure	• Annual Transmission & Distribution losses were 1318 GWh as of 2020 indicating a significant loss.[9] • Yemen's Minister of Electricity Saleh Sumai has signed MOU with Bharat company of India to build Yemen-Bharat solar PV park of 60 MW in Yemen.[10] • Sun City will purchase 25 MW PV modules from Yingli Energy (China) Co., Ltd in 2021 for the construction of water supply systems and other infrastructure in Yemen. SunCity also signed a strategic cooperation agreement to jointly develop the regional renewable energy market.[11] • The 2018, "Dynamic Damage and Needs assessment (DNA)" report shows that 6 out of 10 assessed cities have no access to public electricity.[13]
Financing	• International financial flow, in 2018, was USD 57 mn (in PPP terms) to support clean and RE.[6] • The IDA portfolio of Yemen comprises nine ac ve projects with a total commitment amount of USD 2078.48 mn.[12] • Solar loans are making 5% to 20% of total lending among assessed micro finance institutions.[13] • USD 1 bn has been invested in solar PV in the residential sector since 2012 thereby creating a strong business opportunity for private sector companies.[15]
Energy Imperatives	• Per capita electricity consumption in 2019 was 86 kWh which is significantly lower in comparison to the global average.[5] • 61% of rural population had access to electricity as of 2019.[6] • Yemen's total installed capacity was 1,947 MW in 2020 with 13% (253 MW) share coming from renewables.[7] • As of 2020, solar constitutes approximately 100% of renewable capacity.[7]

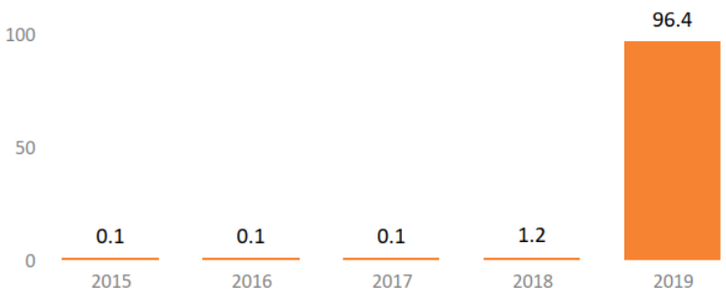
Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
12.9	99.4	10.4

Zambia

Africa

Average PVout in kWh/kWp (2020)	CO2 emissions in Metric Tons/capita (2019)	Ease of Doing Business Score (2020)
4.8	0.4	66.9

Cumulative Solar Installed Capacity (MW)



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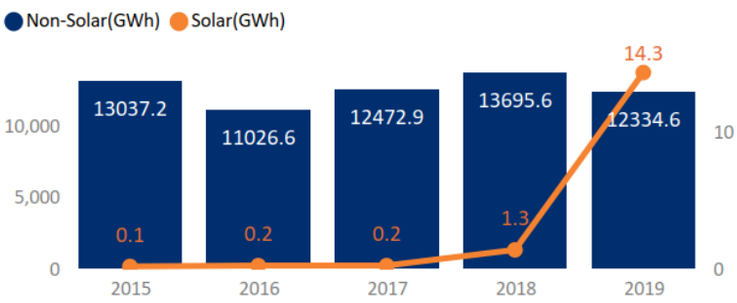

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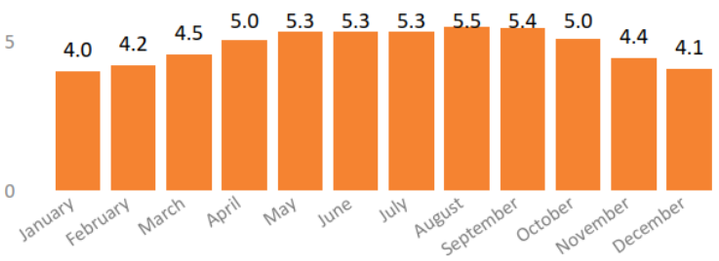
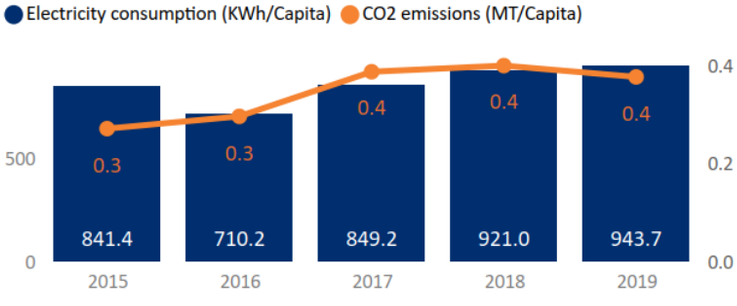


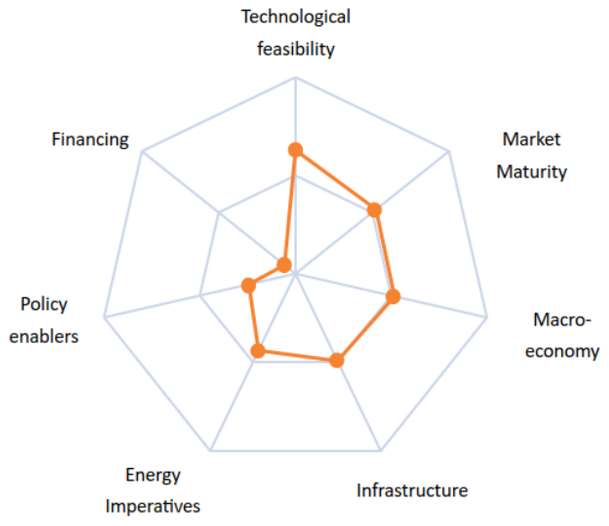
CO2 Emissions & Electricity Consumption



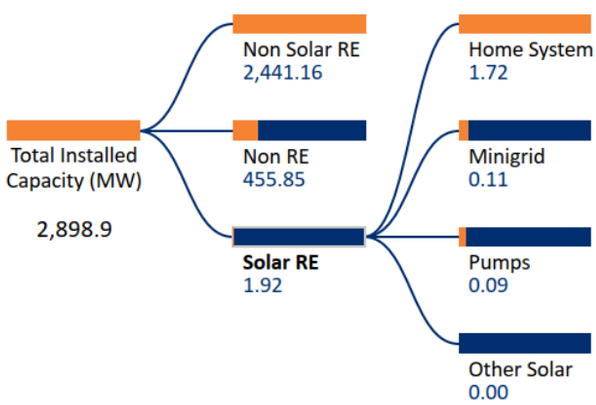
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

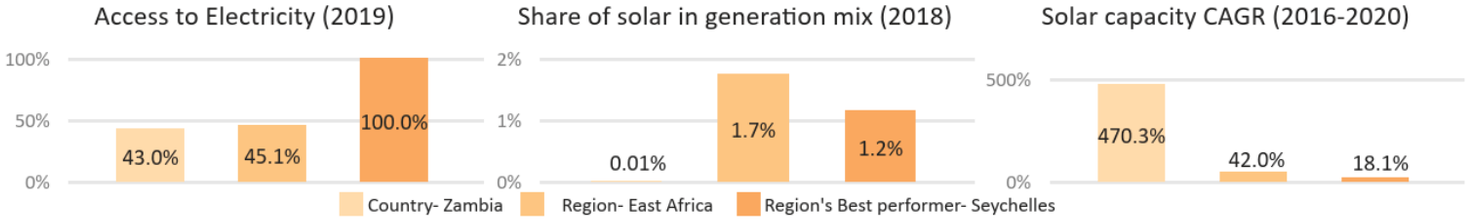


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Market Maturity

Areas of Improvement → Financing, Policy enablers

Key Insights

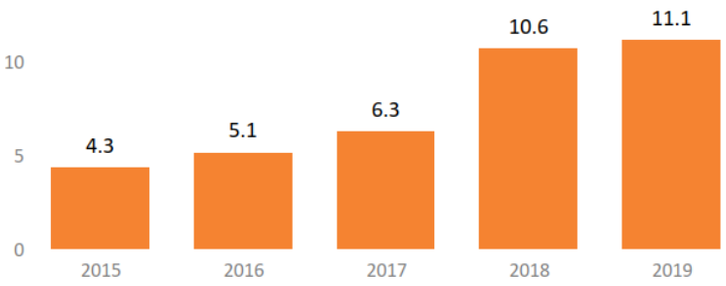
Drivers	Insights
Macro-economy	• On account of COVID-19 pandemic, Zambia's GDP (Real) declined by 3.5% in 2020.[1] • The inflation rate (CPI) of Zambia has risen to 16.3% in 2020 from 9.8% levels in 2019.[1] • As of 2019, the services sector was the major contributor to the GDP with 61.4% share followed by industrial and agricultural sector with 32.0% and 6.6% share respectively.[6] • As of 2019, the exports of manufactured products dominated the total exports having a share of 65.2% followed by manufacturing products and travel services having 13.5% and 10.2% share respectively.[6]
Policy enablers	• Zambia's Vision 2030 aims to achieve 100% urban and 50% rural electrification in the country by 2030.[8] • The Government of Zambia aims to have 50% share of renewable energy in the generation mix by 2030.[8] • To attract private sector investments for solar PV several incentives such as tax exemptions, improved quality standards for off-grid solar systems, schemes like Pay as you go for solar home systems and GET FiT auction program are already implemented in the country.[8,9]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.88 kWh/m²/day and specific yield 4.83 kWh/kWp, a strong technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• As of 2019, 43% of the population in the country had access to electricity.[3] • Zambia is blessed with high solar irradiation index, however in 2019, solar PV has accounted a mere of 0.002% share in genera on mix.[4] • The Power sector in Zambia is regulated by Energy Regulatory Board (ERB).[7] • The Zambia Electric Supply Corporation Limited dominates the power sector with limited participation of private players.[7]
Infrastructure	• Due to higher dependence on hydro power generation, the country has been facing persistent power outages due to low rainfall resulting in grid instability.[12] • The Zambia, Tanzania and Kenya Interconnector is expected to be operational by 2022. The interconnector will link the country to the Southern African Power Pool (SAPP) and the East African Power Pool (EAPP) enabling power trading and increased energy security in the country and the region.[14] • To meet the growing demand, the Government has planned to increase the generation capacity from 2,800 MW in 2019 to 6,000 MW by 2030 of which 10% share is to come from solar PV.[13]
Financing	• To increase the private sector participation in renewable energy, the Government launched the Increased Access to Electricity and Renewable Energy Production (IAEREP) programme providing financing to promote renewable energy.[10] • With support from the Government, the Beyond-the-Grid Fund provides result-based financing to companies for development of off-grid renewable energy projects with aim to provide electricity to 1 mn people in the country by 2021.[8] • In 2018, the African Development Bank & Green Climate Fund under the Zambia Renewable Energy Financing Framework has sanctioned USD 6.5 mn for renewable energy financing and private investment promotion in the sector.[11]
Energy Imperatives	• Per capita consumption of 0.9 MWh is significantly low in comparison with the global average of 3.35 MWh in 2019.[5] • The total generation from solar PV has risen at a CAGR of 24.6% between 2013-19 reaching 0.3 GWh in 2019 from 0.1 GWh in 2013.[4] • As of 2019, Hydro power plants dominated the genera on mix having 81.7% share in the genera on mix.[4] • In the last decade, the total power demand in the country has risen at a CAGR of 5.2% reaching 15,554 GWh in 2019 from 9,844 GWh in 2010.[4]

Zimbabwe

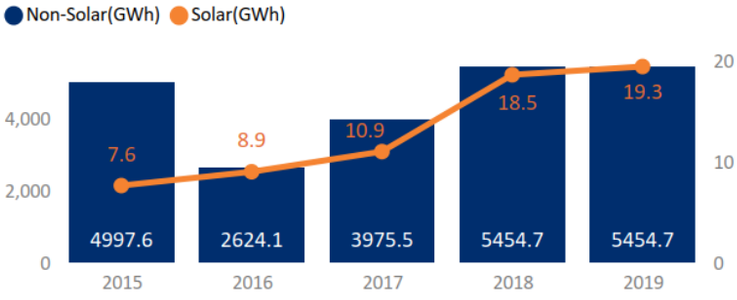
Africa

Electricity Consumption in MU (2018)	Cumulative Solar Capacity in MW (2020)	Off-Grid Solar Capacity in MW (2019)
8,506.0	17.0	11.3
Average PVout in kWh/kWp (2020)	**CO2 emissions in Metric Tons/capita (2019)**	**Ease of Doing Business Score (2020)**
4.9	0.7	54.5

Cumulative Solar Installed Capacity (MW)

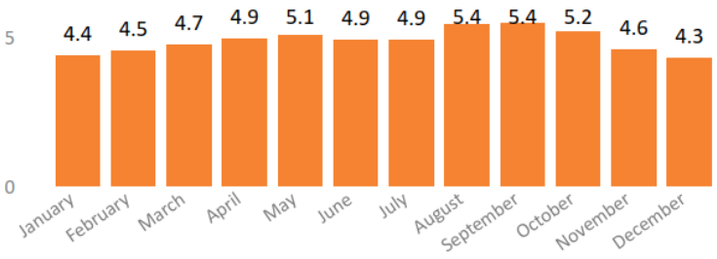


Renewable Energy Generation by Source

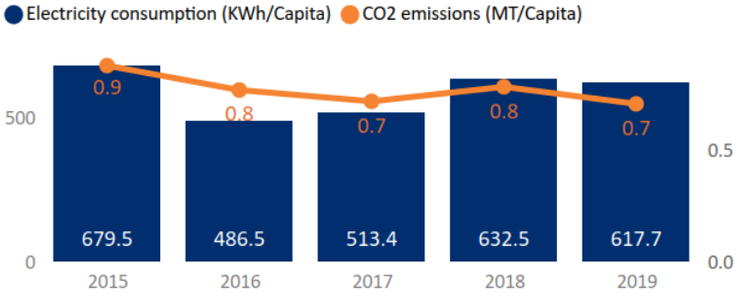


Non-Solar RE includes Wind and Hydro;
Year: 2015-2019.

Monthly variation in PVout (kWh/kWp/day)



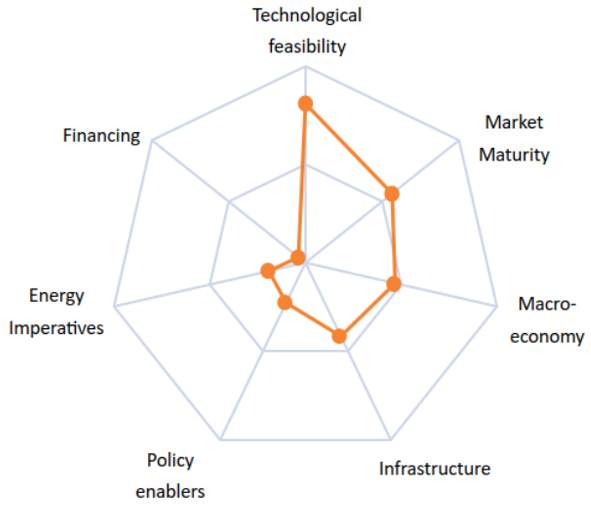
CO2 Emissions & Electricity Consumption



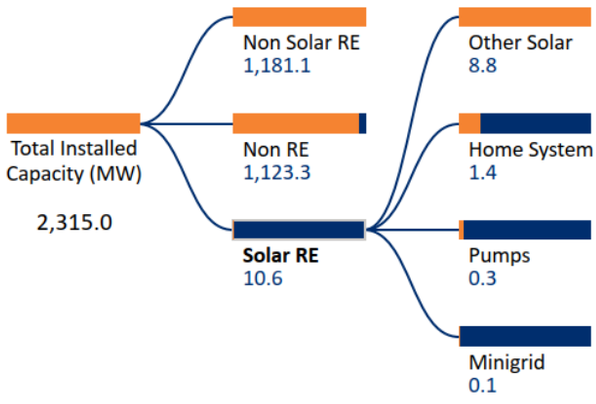
Ease of Doing Solar Classification

Influencer

Performance against 7 drivers

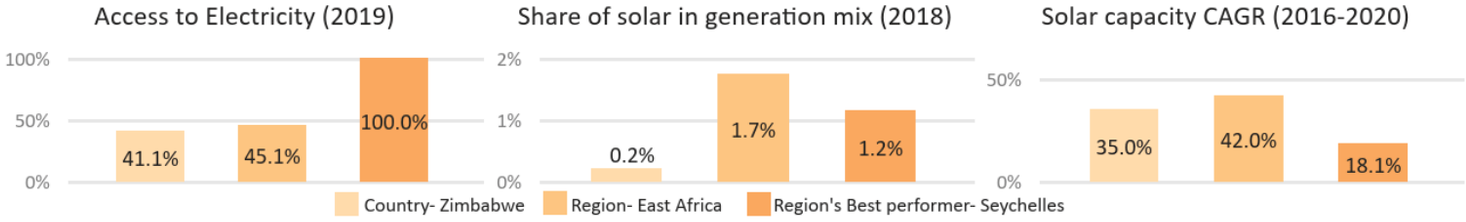


Installed Generation Capacity by Source



Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine;
Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.;
Other Solar includes Utility Scale Solar, Rooftop etc.;
Year: 2018.

Country's regional performance and characteristics



Areas of Strength → Technological feasibility, Market Maturity

Areas of Improvement → Financing, Energy Imperatives

Key Insights

Drivers	Insights
Macro-economy	• On account of COVID-19 Pandemic, the GDP (Real) declined by 8.0% in 2020.[1] • The inflation rate (CPI) of Zimbabwe has risen to 557.2% in 2020 from 255.3% in 2019 indicating a strong inflationary risk.[1] • In 2019, the services sector was the major contributor to the GDP having 66.1% share followed by industrial and agricultural sector having 24.5% and 9.5% share respectively.[6] • As of 2019, the exports of fuel & mining products dominated the total exports having a share of 33.1% followed by agricultural and manufacturing products having 23.4% and 12.0% share respectively.[6]
Policy enablers	• To catalyse the growth of renewable in the country, incentives such as import duty exemptions on solar PV equipment, net metering policy and ten-year tax holidays for renewable energy investors are already implemented in the country.[8,9] • The country aims to achieve universal access to clean energy through development of solar PV, mini-hydro power plants and promoting energy efficiency in the country.[10] • The National Renewable Energy Policy 2019 targets to achieve 26.5% share of renewable energy in the generation mix by 2030.[11]
Technological Feasibility	• Owing to relatively very high levels of solar irradiation (GHI) of 5.78 kWh/m²/day and specific yield 4.86 kWh/kWp, a strong technical feasibility is envisaged for solar projects in the country.[2]
Market Maturity	• As of 2019, 41% of the population in the country had access to electricity.[3] • Zimbabwe is blessed with high solar irradiation index, however in 2019, solar PV accounted a mere of 0.15% share in generation mix.[4] • The Power sector in Zimbabwe is regulated by Zimbabwe Energy Regulatory Authority (ZERA). The Zimbabwe Electricity Supply Authority Limited Holdings (ZESA) is a holding company that controls the power sector through its subsidiaries- Zimbabwe Power Company and Zimbabwe Electricity Transmission and Distribution Company.[7]
Infrastructure	• Low tariff of electricity, owing to heavy subsidies, is posing financial challenges for the sustainability of the utilities in the country.[7] • Land acquisition delays, lengthy process for obtaining operation license, lack of capacity for installation of mini grids are some of the challenges faced by the power sector in Zimbabwe.[12]
Financing	• To attract private sector and foreign investments the National Renewable Energy Policy aims to develop a robust mechanism for renewable financing in the country.[12] • The Sustainable Energy Fund for Africa (SEFA) managed by African Development Bank (AfDB), in 2017, sanctioned USD 965,000 for the development of 20 MW off-grid solar PV rooftop project in the country.[13] • The Rural Electrification fund provides funding for development of grid extension and renewable energy projects with an aim to achieve universal access to modern energy services by 2030.[14]
Energy Imperatives	• Per capita consumption of 0.6 MWh is significantly low compared to the global average of 3.35 MWh as of 2019.5 • The total generation from solar PV has risen at a CAGR of 56.0% between 2010-19 reaching 14.0 GWh in 2019, from 0.4 GWh in 2010.[4] • In 2019, Hydro power plants dominated the generation mix with 55.4% share in the generation mix followed by coal based thermal power plants with 42.0% share.[4] • In the last decade, the total power demand in the country has declined at CAGR of 0.1% reaching 9,101 GWh in 2019 from 9,171 GWh in 2010.[4]

Appendix 1
Regional outcomes

Regional outcomes

Africa (43 countries)

Countries are arranged in alphabetical order under each classification.

EoDS 2021 classification	ISA member countries	EoDS 2021 classification	ISA member countries
Achiever	Morocco	Progressive	Gambia
Influencer	Algeria	Progressive	Madagascar
Influencer	Botswana	Progressive	Mali
Influencer	Burkina Faso	Progressive	Namibia
Influencer	Cape Verde	Progressive	Niger
Influencer	Egypt	Potential	Burundi
Influencer	Ghana	Potential	Cameroon
Influencer	Malawi	Potential	Chad
Influencer	Mauritius	Potential	Comoros
Influencer	Mozambique	Potential	Congo (Dem. Rep.)
Influencer	Nigeria	Potential	Equatorial Guinea
Influencer	Rwanda	Potential	Eritrea
Influencer	Senegal	Potential	Gabon
Influencer	Seychelles	Potential	Guinea
Influencer	Tanzania	Potential	Guinea-Bissau
Influencer	Uganda	Potential	Liberia
Influencer	Zambia	Potential	Sao Tome and Principe
Influencer	Zimbabwe	Potential	Somalia
Progressive	Benin	Potential	South Sudan
Progressive	Côte d'Ivoire	Potential	Sudan
Progressive	Djibouti	Potential	Togolese Republic
Progressive	Ethiopia		

Asia & Pacific (22 countries)

Countries are arranged in alphabetical order under each classification.

EoDS 2021 classification	ISA member countries	EoDS 2021 classification	ISA member countries
Achiever	Australia	Progressive	Bangladesh
Achiever	India	Progressive	Cambodia
Achiever	Japan	Progressive	Kiribati
Achiever	Oman	Progressive	Myanmar
Achiever	Saudi Arabia	Progressive	Nauru
Achiever	United Arab Emirates	Progressive	Samoa
Influencer	Fiji	Progressive	Tuvalu
Influencer	Maldives	Progressive	Yemen
Influencer	Palau	Potential	Marshall islands
Influencer	Sri Lanka	Potential	Papua New Guinea
Influencer	Tonga	Potential	Vanuatu

Europe (9 countries)

Countries are arranged in alphabetical order under each classification.

EoDS 2021 classification	ISA member countries	EoDS 2021 classification	ISA member countries
Achiever	Denmark	Achiever	Netherlands
Achiever	France	Influencer	Luxembourg
Achiever	Germany	Influencer	Sweden
Achiever	Greece	Influencer	United Kingdom
Achiever	Italy		

Latin America & Caribbean (24 countries)

Countries are arranged in alphabetical order under each classification.

EoDS 2021 classification	ISA member countries	EoDS 2021 classification	ISA member countries
Achiever	Argentina	Influencer	Trinidad and Tobago
Achiever	Brazil	Progressive	Belize
Achiever	Chile	Progressive	Dominica
Achiever	El Salvador	Progressive	Grenada
Influencer	Barbados	Progressive	Guyana
Influencer	Bolivia	Progressive	Haiti
Influencer	Costa Rica	Progressive	Paraguay
Influencer	Dominican Republic	Progressive	Saint Kitts and Nevis
Influencer	Jamaica	Progressive	Saint Lucia
Influencer	Nicaragua	Progressive	Saint Vincent and the Grenadines
Influencer	Peru	Progressive	Venezuela
Influencer	Suriname	Potential	Cuba

Appendix 2
Driver wise assessment

1. Macroeconomy

S.no.	ISA member countries	S.no.	ISA member countries
1	Luxembourg	50	Djibouti
2	Australia	51	Malawi
3	Germany	52	Sri Lanka
4	United Arab Emirates	53	Bolivia
5	Sweden	54	El Salvador
6	Denmark	55	Cambodia
7	Japan	56	Bangladesh
8	France	57	Benin
9	Netherlands	58	Gambia
10	United Kingdom	59	Madagascar
11	Saudi Arabia	60	Argentina
12	Botswana	61	Barbados
13	Mauritius	62	Côte d'Ivoire
14	Chile	63	Zambia
15	Italy	64	Egypt
16	Oman	65	Papua New Guinea
17	Peru	66	Guinea
18	Palau	67	Nauru
19	Fiji	68	Belize
20	Saint Lucia	69	Guinea-Bissau
21	Saint Kitts and Nevis	70	Gabon
22	Guyana	71	Togolese Republic
23	Tonga	72	Nigeria
24	Brazil	73	Sao Tome and Principe
25	Ghana	74	Algeria
26	Saint Vincent and the Grenadines	75	Mozambique
27	India	76	Comoros
28	Namibia	77	Equatorial Guinea
29	Grenada	78	Ethiopia
30	Morocco	79	Burkina Faso
31	Kiribati	80	Nicaragua
32	Costa Rica	81	Niger
33	Seychelles	82	Zimbabwe
34	Dominica	83	Haiti
35	Trinidad and Tobago	84	Cameroon
36	Paraguay	85	Liberia
37	Rwanda	86	Mali
38	Cape Verde	87	Suriname
39	Tanzania	88	Myanmar
40	Marshall islands	89	Burundi
41	Greece	90	Chad
42	Maldives	91	Eritrea
43	Uganda	92	Democratic Republic of Congo
44	Vanuatu	93	Somalia
45	Senegal	94	South Sudan
46	Dominican Republic	95	Yemen
47	Jamaica	96	Sudan
48	Tuvalu	97	Cuba
49	Samoa	98	Venezuela

Note: Countries are arranged based on the scores in each driver category

2. Policy enablers

S.no.	ISA member countries	S.no.	ISA member countries
1	India	50	Mozambique
2	Greece	51	Mali
3	Chile	52	Malawi
4	Sweden	53	Bangladesh
5	Netherlands	54	Haiti
6	Denmark	55	Saint Vincent and the Grenadines
7	Germany	56	Zambia
8	France	57	Dominica
9	Argentina	58	Ethiopia
10	Italy	59	Namibia
11	Australia	60	Paraguay
12	United Kingdom	61	Côte d'Ivoire
13	Brazil	62	Benin
14	Ghana	63	Guyana
15	Seychelles	64	Cambodia
16	Dominican Republic	65	Belize
17	Nicaragua	66	Zimbabwe
18	Trinidad and Tobago	67	Papua New Guinea
19	Jamaica	68	Tuvalu
20	Peru	69	Kiribati
21	Fiji	70	Togolese Republic
22	Burkina Faso	71	Niger
23	Sri Lanka	72	Gambia
24	El Salvador	73	Madagascar
25	Cape Verde	74	Guinea
26	United Arab Emirates	75	Cameroon
27	Japan	76	Djibouti
28	Rwanda	77	Liberia
29	Nigeria	78	Marshall islands
30	Bolivia	79	Burundi
31	Luxembourg	80	Comoros
32	Palau	81	Chad
33	Senegal	82	Democratic Republic of Congo
34	Tanzania	83	Saint Kitts and Nevis
35	Barbados	84	Venezuela
36	Uganda	85	Eritrea
37	Morocco	86	Somalia
38	Saudi Arabia	87	Samoa
39	Mauritius	88	Tonga
40	Algeria	89	Myanmar
41	Costa Rica	90	Gabon
42	Saint Lucia	91	Sao Tome and Principe
43	Egypt	92	Equatorial Guinea
44	Oman	93	Guinea-Bissau
45	Grenada	94	Cuba
46	Botswana	95	Sudan
47	Maldives	96	Yemen
48	Suriname	97	Nauru
49	Vanuatu	98	South Sudan

Note: Countries are arranged based on the scores in each driver category

3. Technological feasibility

S.no.	ISA member countries	S.no.	ISA member countries
1	Oman	50	Rwanda
2	Egypt	51	Nicaragua
3	Chad	52	Mauritius
4	Saudi Arabia	53	Eritrea
5	United Arab Emirates	54	Kiribati
6	Botswana	55	Djibouti
7	Mali	56	Palau
8	Somalia	57	Dominica
9	El Salvador	58	Costa Rica
10	Senegal	59	Algeria
11	Ethiopia	60	Zambia
12	Nauru	61	Samoa
13	Gambia	62	Tonga
14	Barbados	63	Burkina Faso
15	Chile	64	Myanmar
16	Zimbabwe	65	Bangladesh
17	Cape Verde	66	Equatorial Guinea
18	Australia	67	Gabon
19	South Sudan	68	Guinea-Bissau
20	Tanzania	69	Guinea
21	Uganda	70	Greece
22	Morocco	71	Saint Lucia
23	Madagascar	72	Grenada
24	Malawi	73	Fiji
25	Seychelles	74	Trinidad and Tobago
26	Saint Kitts and Nevis	75	Cameroon
27	Maldives	76	Vanuatu
28	Haiti	77	Marshall islands
29	Nigeria	78	Sri Lanka
30	Bolivia	79	Togolese Republic
31	Dominican Republic	80	Democratic Republic of Congo
32	Cuba	81	Guyana
33	Yemen	82	Italy
34	Benin	83	Côte d'Ivoire
35	Suriname	84	Cambodia
36	Mozambique	85	Comoros
37	Venezuela	86	Belize
38	Brazil	87	Paraguay
39	Namibia	88	Liberia
40	Tuvalu	89	Japan
41	Sudan	90	France
42	Peru	91	Papua New Guinea
43	Jamaica	92	Sao Tome and Principe
44	Niger	93	Luxembourg
45	Burundi	94	Germany
46	Saint Vincent and the Grenadines	95	Netherlands
47	Ghana	96	Denmark
48	India	97	Sweden
49	Argentina	98	United Kingdom

Note: Countries are arranged based on the scores in each driver category

4. Market maturity

S.no.	ISA member countries	S.no.	ISA member countries
1	Italy	50	Tuvalu
2	Germany	51	Saint Kitts and Nevis
3	Greece	52	Sweden
4	Chile	53	Trinidad and Tobago
5	Japan	54	Mali
6	Luxembourg	55	Rwanda
7	United Kingdom	56	Burkina Faso
8	Australia	57	Saint Lucia
9	Netherlands	58	Venezuela
10	Denmark	59	Benin
11	France	60	Saint Vincent and the Grenadines
12	Mauritius	61	Uganda
13	Maldives	62	Tanzania
14	Morocco	63	Guinea-Bissau
15	Seychelles	64	Mozambique
16	United Arab Emirates	65	Grenada
17	Egypt	66	Niger
18	Algeria	67	Dominica
19	Saudi Arabia	68	Madagascar
20	Oman	69	Gabon
21	Argentina	70	Malawi
22	El Salvador	71	Guyana
23	Brazil	72	Paraguay
24	Costa Rica	73	Marshall islands
25	Suriname	74	Yemen
26	Dominican Republic	75	Samoa
27	Tonga	76	Fiji
28	Bolivia	77	Nicaragua
29	Peru	78	Namibia
30	Jamaica	79	Kiribati
31	Cape Verde	80	Sudan
32	Belize	81	Cuba
33	India	82	Equatorial Guinea
34	Sri Lanka	83	Cameroon
35	Botswana	84	Comoros
36	Cambodia	85	Vanuatu
37	Bangladesh	86	Sao Tome and Principe
38	Ghana	87	Eritrea
39	Senegal	88	Papua New Guinea
40	Myanmar	89	Djibouti
41	Côte d'Ivoire	90	Togolese Republic
42	Zimbabwe	91	Haiti
43	Nigeria	92	Guinea
44	Zambia	93	Somalia
45	Gambia	94	Liberia
46	Barbados	95	Democratic Republic of Congo
47	Palau	96	Burundi
48	Nauru	97	Chad
49	Ethiopia	98	South Sudan

Note: Countries are arranged based on the scores in each driver category

5. Infrastructure

S.no.	ISA member countries	S.no.	ISA member countries
1	United Kingdom	50	Namibia
2	Denmark	51	Gambia
3	Germany	52	Dominica
4	Netherlands	53	Tonga
5	France	54	Bolivia
6	United Arab Emirates	55	Saint Lucia
7	India	56	Cameroon
8	Italy	57	Bangladesh
9	Côte d'Ivoire	58	Botswana
10	Sweden	59	Saint Vincent and the Grenadines
11	Luxembourg	60	Guinea
12	Greece	61	Samoa
13	Morocco	62	Cape Verde
14	Rwanda	63	Papua New Guinea
15	Mauritius	64	Fiji
16	El Salvador	65	Grenada
17	Barbados	66	Palau
18	Ghana	67	Kiribati
19	Argentina	68	Algeria
20	Chile	69	Madagascar
21	Japan	70	Gabon
22	Cuba	71	Egypt
23	Zambia	72	Maldives
24	Oman	73	Guyana
25	Senegal	74	Sudan
26	Tanzania	75	Vanuatu
27	Australia	76	South Sudan
28	Malawi	77	Saint Kitts and Nevis
29	Uganda	78	Yemen
30	Togolese Republic	79	Nauru
31	Burkina Faso	80	Liberia
32	Sri Lanka	81	Guinea-Bissau
33	Brazil	82	Haiti
34	Jamaica	83	Ethiopia
35	Djibouti	84	Tuvalu
36	Costa Rica	85	Myanmar
37	Mozambique	86	Suriname
38	Nicaragua	87	Equatorial Guinea
39	Saudi Arabia	88	Niger
40	Trinidad and Tobago	89	Mali
41	Dominican Republic	90	Democratic Republic of Congo
42	Peru	91	Marshall islands
43	Cambodia	92	Comoros
44	Nigeria	93	Seychelles
45	Burundi	94	Venezuela
46	Zimbabwe	95	Somalia
47	Paraguay	96	Sao Tome and Principe
48	Belize	97	Chad
49	Benin	98	Eritrea

Note: Countries are arranged based on the scores in each driver category

6. Financing

S.no.	ISA member countries	S.no.	ISA member countries
1	Luxembourg	50	Jamaica
2	Japan	51	Egypt
3	Denmark	52	Bangladesh
4	Australia	53	Maldives
5	United Kingdom	54	Algeria
6	France	55	Nauru
7	Sweden	56	Tuvalu
8	Morocco	57	Djibouti
9	Netherlands	58	Argentina
10	Italy	59	Senegal
11	Cambodia	60	Botswana
12	Mauritius	61	Suriname
13	Germany	62	Comoros
14	United Arab Emirates	63	Gabon
15	Barbados	64	Côte d'Ivoire
16	Greece	65	Sao Tome and Principe
17	Palau	66	Ethiopia
18	Kiribati	67	Togolese Republic
19	Chile	68	Burkina Faso
20	Oman	69	Burundi
21	Fiji	70	Mali
22	Bolivia	71	Haiti
23	Saint Kitts and Nevis	72	Mozambique
24	Cape Verde	73	Rwanda
25	Samoa	74	Nigeria
26	Brazil	75	Myanmar
27	El Salvador	76	Equatorial Guinea
28	Costa Rica	77	Benin
29	Grenada	78	Uganda
30	Seychelles	79	Malawi
31	Saudi Arabia	80	Cameroon
32	Trinidad and Tobago	81	Niger
33	Sri Lanka	82	Ghana
34	Yemen	83	Sudan
35	Belize	84	Gambia
36	India	85	Tanzania
37	Tonga	86	Papua New Guinea
38	Saint Lucia	87	Guinea
39	Vanuatu	88	Zambia
40	Namibia	89	Liberia
41	Saint Vincent and the Grenadines	90	Madagascar
42	Dominica	91	Guinea-Bissau
43	Marshall islands	92	Cuba
44	Paraguay	93	Zimbabwe
45	Peru	94	Chad
46	Dominican Republic	95	South Sudan
47	Venezuela	96	Congo (Dem. Rep.)
48	Guyana	97	Somalia
49	Nicaragua	98	Eritrea

Note: Countries are arranged based on the scores in each driver category

7. Energy Imperatives

S.no.	ISA member countries	S.no.	ISA member countries
1	Japan	50	Dominican Republic
2	India	51	Jamaica
3	Zambia	52	Senegal
4	Germany	53	Saint Lucia
5	United Arab Emirates	54	Luxembourg
6	Sweden	55	Sri Lanka
7	Oman	56	Côte d'Ivoire
8	Brazil	57	Ethiopia
9	Australia	58	Sao Tome and Principe
10	Saudi Arabia	59	Guyana
11	Argentina	60	Togolese Republic
12	Egypt	61	Uganda
13	France	62	Madagascar
14	Italy	63	Cameroon
15	Netherlands	64	Saint Kitts and Nevis
16	Mozambique	65	Eritrea
17	Algeria	66	Palau
18	United Kingdom	67	Comoros
19	Nauru	68	Grenada
20	Cambodia	69	Fiji
21	Chile	70	Gabon
22	Venezuela	71	Cape Verde
23	Bolivia	72	Ghana
24	Trinidad and Tobago	73	Botswana
25	Congo (Dem. Rep.)	74	Tanzania
26	El Salvador	75	Malawi
27	Greece	76	Yemen
28	Morocco	77	Burundi
29	Belize	78	Nigeria
30	Myanmar	79	Samoa
31	Paraguay	80	Saint Vincent and the Grenadines
32	Zimbabwe	81	Gambia
33	Suriname	82	South Sudan
34	Guinea-Bissau	83	Cuba
35	Namibia	84	Papua New Guinea
36	Bangladesh	85	Tonga
37	Barbados	86	Benin
38	Liberia	87	Maldives
39	Guinea	88	Equatorial Guinea
40	Burkina Faso	89	Somalia
41	Peru	90	Kiribati
42	Denmark	91	Haiti
43	Mali	92	Vanuatu
44	Sudan	93	Djibouti
45	Seychelles	94	Marshall islands
46	Nicaragua	95	Chad
47	Mauritius	96	Tuvalu
48	Niger	97	Dominica
49	Costa Rica	98	Rwanda

Note: Countries are arranged based on the scores in each driver category

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