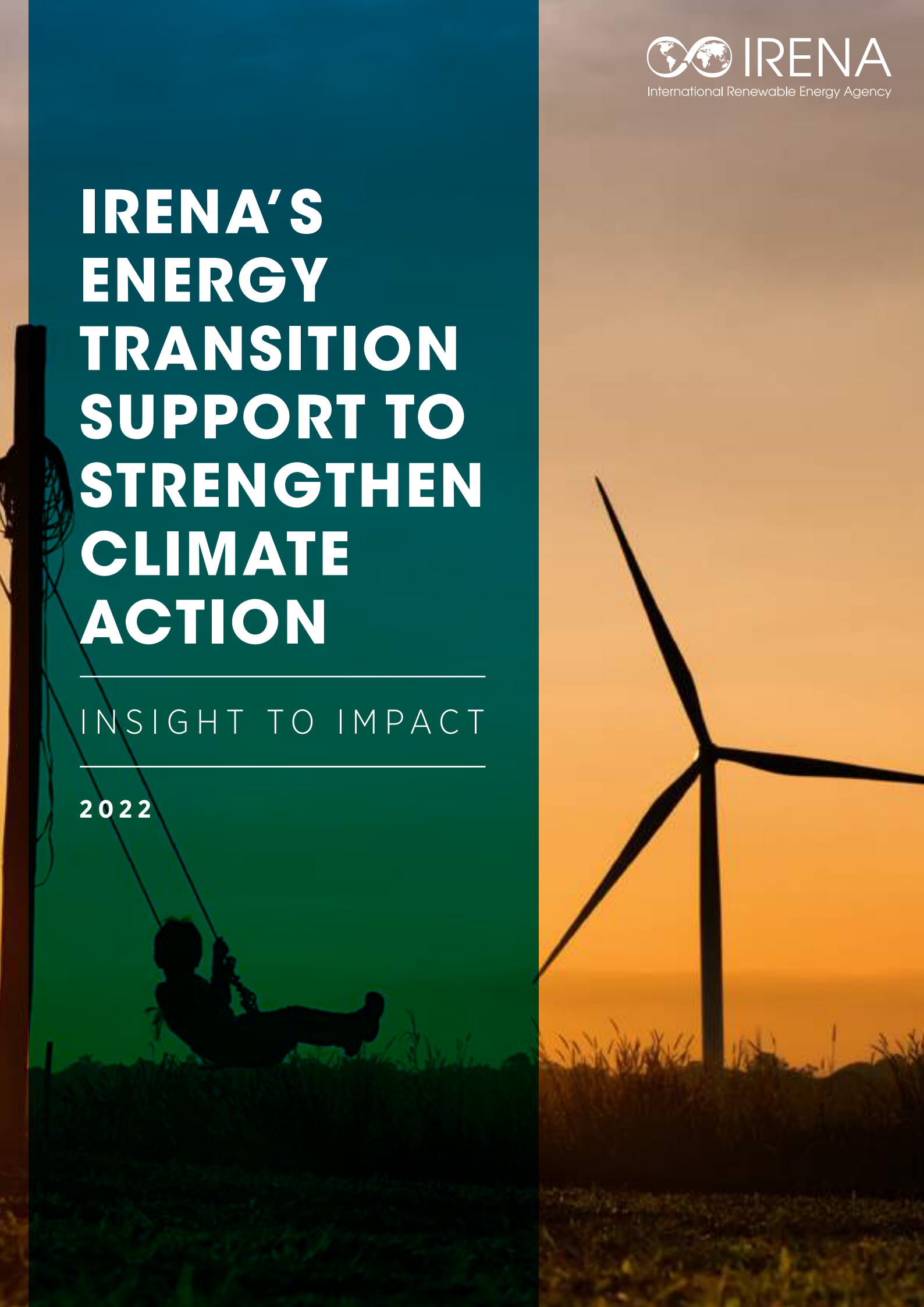
IRENA
International Renewable Energy Agency

IRENA'S ENERGY TRANSITION SUPPORT TO STRENGTHEN CLIMATE ACTION

INSIGHT TO IMPACT

2022



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About IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future and serves as the principal platform for international co-operation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy, in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity. **www.irena.org**

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ABBREVIATIONS

°C	degrees Celsius
CO_2	carbon dioxide
CSP	concentrating solar power
CVF	Climate Vulnerability Forum
EU	European Union
Gt	gigatonne
Gg CO_2eq	gigagrams of CO_2 equivalent
GWh	gigawatt hours
IRENA	International Renewable Energy Agency
kWp	kilowatt peak
LDC	least developed country
LLDC	landlocked developing country
MRV	monitoring, reporting and verification
m^2	square metres
MtCO_2eq	million tonnes of carbon dioxide equivalent
MW	megawatt
MWh	megawatt hour
MWh/kWp/yr	megawatt hour per kilowatt peak per year
NDC	Nationally Determined Contribution
NECP	National Energy and Climate Plan
REmap	Renewable energy roadmap
RRA	Renewables readiness assessment
SDG	Sustainable Development Goal
tC/ha/yr	tonnes of carbon per hectare per year
TJ	terajoules
tC/ha/yr	tonne carbon/ hectare/ year
TPES	total primary energy supply
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WETO	World energy transitions outlook
Wh/kWp/yr	watt hour per kilowatt peak per year
W/m^2	watts per square metre

EXECUTIVE SUMMARY

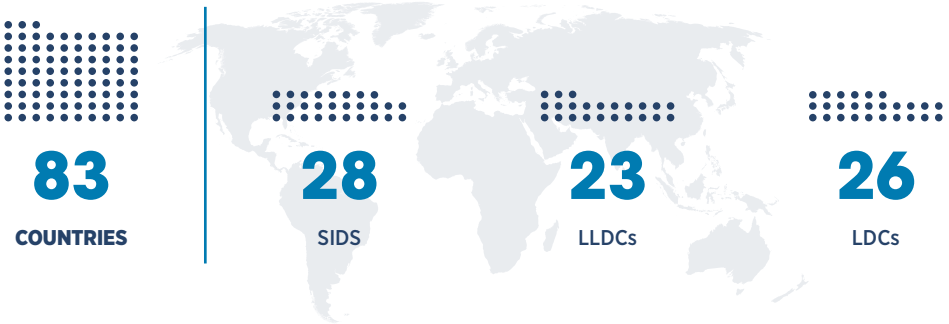
Renewable energy is a readily available, economically feasible option for mitigating the impacts of climate change. As such, it is an essential component of countries' Nationally Determined Contributions (NDCs) – their voluntary commitments to reduce greenhouse gas emissions to achieve the goals of the Paris Agreement. Increasingly, renewable energy is also considered a key element of resilience and adaptation strategies.

Because countries have different circumstances, resources and abilities, the NDCs vary widely in their level of detail. This is especially the case with respect to quantifiable information on renewable energy and electrification, including information on targets and costs.

The International Renewable Energy Agency (IRENA), as a leading inter-governmental organisation, assists its Members[1] in their efforts to transition to a sustainable energy future. It provides state-of-the-art knowledge that is the foundation of the Agency's capacity building, technical assistance and policy advice activities.

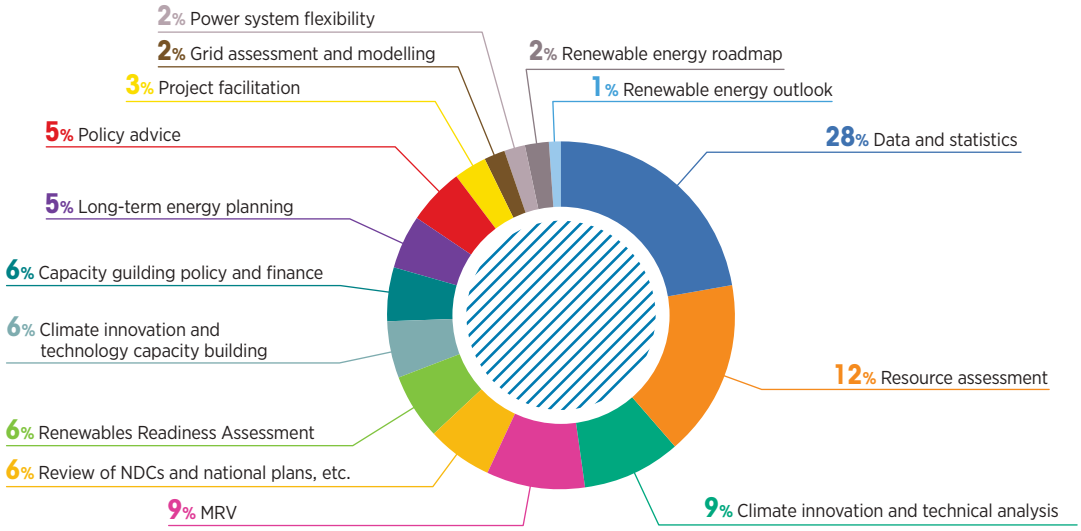
IRENA works with 83 countries that are Parties to the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). The Agency provides support to enhance the ambition of countries' climate commitments and to effectively implement national climate action policies and plans through energy transition. These include the NDCs as well as countries' long-term low-emission development strategies to reducing emissions under the Paris Agreement.

IRENA's support engagement in its Member countries covers a total population of around 2 billion people and combined emissions of an estimated 4 billion tonnes of carbon dioxide (CO_2) equivalent. The Agency's support activities dedicated to NDCs and long-term strategies (referred to as "work packages") offer a unique opportunity for countries to revise their climate change mitigation and adaptation targets and the associated implementation plans through sustainable energy transition (Figure 1).



[1] *IRENA's membership includes 167 States and the European Union. An additional 16 countries are in the process of accession.*

Figure 1 **Distribution of IRENA work packages (%)**



Given IRENA's global membership, the Agency provides NDC support for nearly all of the regional groupings of Parties to the UNFCCC (Table 1). Aligning with the support needs and priorities of Parties, IRENA provides technical assistance, capacity building and other support covering all aspects of the sustainable energy transition, made possible through renewable energy and the electrification of end uses.

Table 1 **IRENA's country engagement in NDC and long-term strategy support across regions**

UNFCCC regional grouping	Number of parties engaged	Number of work packages
Africa	29	46
Asia and the Pacific	27	47
Europe (mainly Eastern Europe)	5	12
Latin America and the Caribbean	22	59
TOTAL	**83**	**164**

Collaboration and institutional partnerships with other key development players strengthen IRENA's support for NDCs and long-term strategies. IRENA is a member of the NDC Partnership, an important avenue for engagement on NDCs. Moreover, IRENA is an expert energy partner in the United Nations Development Programme's (UNDP) Climate Promise, which allows the Agency to leverage its extensive knowledge with the direct and stable on-the-ground presence that UNDP offers.

As an inter-governmental organisation working on energy transition, IRENA's engagement ensures a country-driven process for the formulation, revision and implementation of both NDCs and long-term strategies. The Agency will continue to work closely with the Parties to the Paris Agreement and provide needs-oriented support for them to implement climate action plans and strategies through scaled-up renewables deployment, electrification and decarbonisation solutions.

IRENA is currently extending its support to provide inputs for Parties to develop their long-term strategies through technical analysis and assistance as well as through capacity building activities, such as analysis of the long-term scenarios for the energy transition (LTES). IRENA will also facilitate the development of Parties' climate action projects by supporting the mobilisation of investment towards energy transition projects, covering activities such as investment matchmaking and the development of capacities to develop projects.

Hon. Eng. Collins Nzovu
MP, Minister of Green Economy & Environment,
Republic of Zambia,
Chair of African Group of Climate Negotiators

"Access to appropriate finance mechanisms has the potential to fuel Africa's unique opportunity to accelerate energy access and drive development through renewable energy. We urge the developed countries to fully deliver on their climate finance pledges. Zambia worked with IRENA on enhancing energy statistics for developing energy balances, providing tools and capacity to update the balances in the future. Improved energy data help policy planning to accelerate deployment of renewable energy and establishing of NDC goals."

H.E. Mr. Tosi Mpanu Mpanu
CVF Thematic Ambassador for Renewable Energy, Chair, Subsidiary Body for Scientific and Technological Advice, UNFCCC, Ambassador, Cabinet of the Minister for Environment and Sustainable Development, the Democratic Republic of the Congo

"Climate Vulnerable Forum (CVF) and V20 member countries aspire to drive prosperity through climate action that ensures sustainability and resilient socio-economic growth. Energy transition through high shares of renewables is one of the main pillars of the Climate Prosperity Plan 2030 that is a strategic investment agenda to boost prosperity and tackle frontline climate threats. CVF and IRENA are working with several CVF members states in scaling up renewable energy ambition in implementing climate goals. CVF look forward to strengthening its collaboration with IRENA on climate action driven by high shares of renewable energy." (IRENA, 2021).

ENERGY TRANSITION AS A KEY DRIVER FOR CLIMATE ACTION

The overall trend in countries' climate ambitions is positive, indicating that energy transition plays a key role in accelerating climate action. Full implementation of the latest climate commitments would bring the world closer to achieving the Paris Agreement's goal of keeping the average global temperature rise below 1.5 degrees Celsius (°C). However, there is still a pressing need to raise the ambition of climate action and to accelerate the global energy transition to achieve net zero greenhouse gas emissions by 2050.

IRENA's *World energy transitions outlook* (WETO) 2022 underscores the urgency of accelerating the global energy transition towards cleaner and more sustainable options for energy generation (IRENA, 2022a). The emissions gap between countries' climate commitments – such as the NDCs and net-zero emission targets – and the efforts necessary to achieve the 1.5°C climate goal by 2050 is estimated to be 20 gigatonnes (Gt). Scaling up renewables and end-use electrification, together with accelerated energy efficiency measures, are essential to reduce emissions. Successful medium- and long-term energy transition plans and strategies should be supported by short-term interventions.

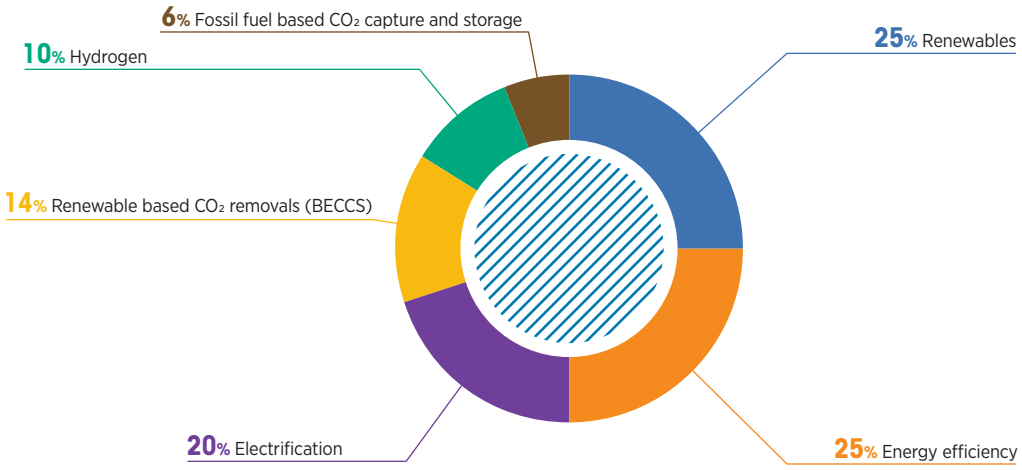
The pathway compatible with the 1.5°C climate goal requires a massive global transformation in the ways that energy is produced and in the patterns of energy consumption. Among the various solutions, the energy transition is the most feasible pathway to halve emissions in the medium term, by 2030 (IPCC, 2022). Integrating climate commitments and plans with energy transition policies is essential for countries to implement more ambitious climate action.

WETO 2022 presents six technological avenues to achieve climate targets. These are: 1) significant increases in generation and direct uses of renewables; 2) substantial improvements in energy efficiency; 3) the electrification of end-use sectors; 4) green hydrogen and its derivatives; 5) bioenergy coupled with carbon capture and storage; and 6) last-mile use of carbon capture and storage.

Pursuing these technological avenues at a rapid pace would contribute to significant emission reductions towards the goal of achieving a net zero carbon world by mid-century. By 2050, annual abatement of 36.9 Gt of CO_2 is achievable, compared to a reference case based on planned targets and policies[2] (Figure 2).

[2] *The Planned Energy Scenario (PES) was used as the primary reference case in IRENA's WETO 2021, building on current energy plans of governments and other planned policies and targets, including NDCs. Note that the PES does not consider the NDCs submitted around the time of the Glasgow climate conference in 2021 (IRENA, 2022).*

Figure 2 **Reducing emissions by 2050 through six technological avenues**



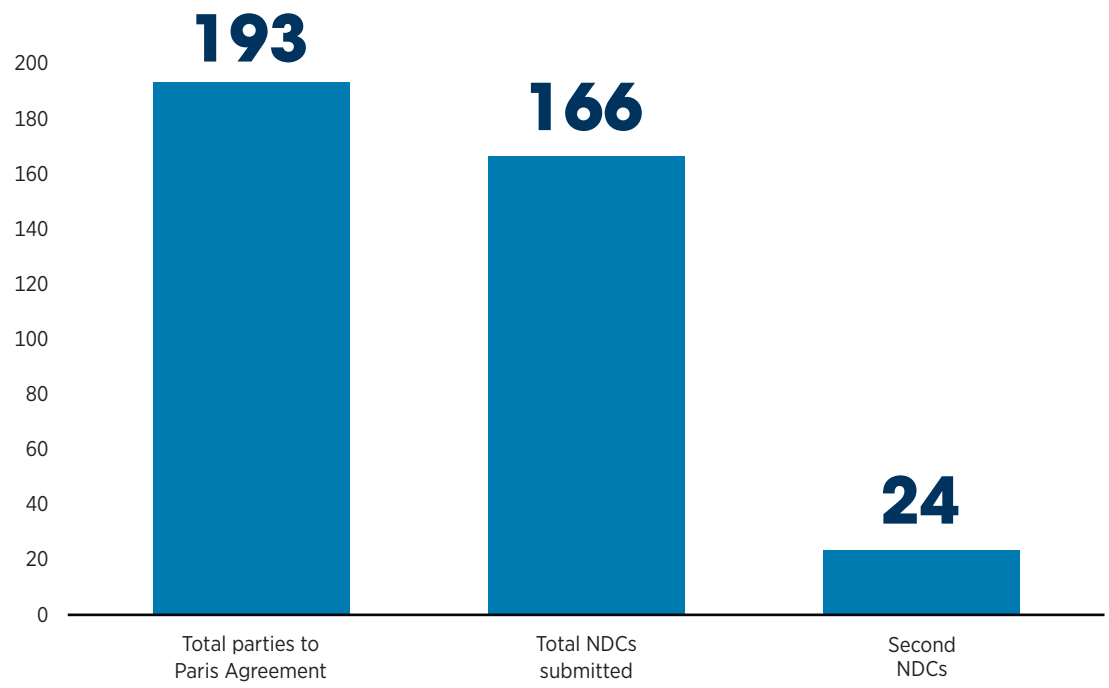
Source: IRENA, 2022.

Consistent with the recommendations made in WETO 2022, IRENA offers dedicated support to its Members that are also Parties to the Paris Agreement, tailoring its assistance to countries' needs and priorities for support. This engagement includes support in enhancing the ambitions of countries' commitments to climate change mitigation and adaptation, as well as support for the implementation of Members' climate action commitments.

Parties to the Paris Agreement have been increasingly enhancing their climate pledges and implementing actions towards reducing greenhouse gas emissions. Recognising the urgency of action, Parties agreed at the 26th Conference of the Parties to the UNFCCC (COP 26) to revisit and strengthen the level of emission reduction targets for 2030, as stipulated in the Glasgow Climate Pact. The current round of NDCs, updated prior to the 27th Conference of the Parties to the UNFCCC (COP 27), held in November 2022, defines the progression beyond the previous pledges.


CloudVisual © Shutterstock

Figure 3 **NDC submissions to the UNFCCC as of September 2022**



IRENA's recent analysis of the NDCs, released in November 2022, indicates that as of October 2022, 183 Parties had included renewable energy components in their NDCs; within these, 143 Parties provided quantified renewable energy targets. Further, 82 countries had set targets for renewable power in both their national policies and NDCs, while 67 countries had set these targets only in national plans and 26 only in NDCs. A total of 21 countries had not made any commitments specific to renewable power[3] (IRENA, 2022b).

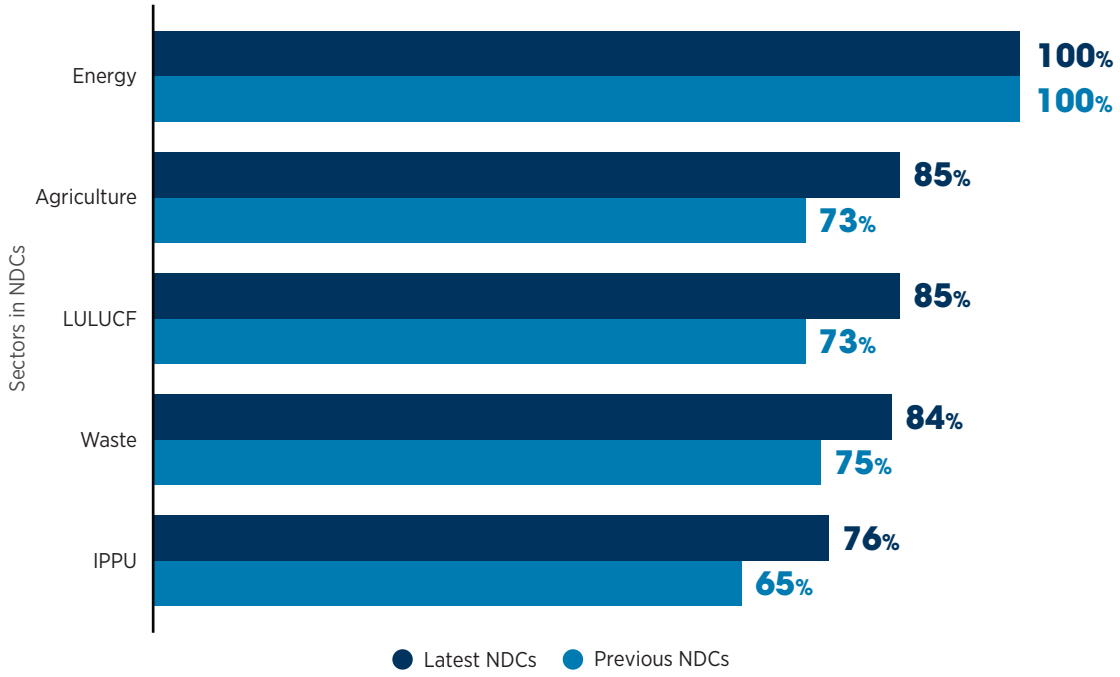
The *NDC Synthesis Report*, released by the UNFCCC Secretariat in 2022, provides an overview of cumulative climate commitments on the Parties' NDCs (UNFCCC, 2022). The report notes that if all NDCs are implemented as pledged, total greenhouse gas emissions in 2030 would be within the range of 50.7 Gt to 52.2 Gt of CO_2 equivalent (CO_2eq). Full implementation of the latest NDCs, including all conditional commitments, indicates 10.6% higher than the level of emissions in 2010.

To achieve the Paris Agreement's goal of limiting the rise in the global average temperature to 1.5°C, emissions would need to be reduced by around 45% from the 2010 level in the medium term (by 2030).

Accelerating renewables-based energy transition is fundamental to achieving climate neutrality, as renewables are central mitigation measure as well as instrument to facilitate adaptation. For the new or updated NDCs communicated since the previous NDC submissions, 91% of the NDCs indicated renewable energy generation is the most frequent mitigation option. The latest analysis by the UNFCCC Secretariat indicates that all of the submitted NDCs highlight the energy sector as a priority area for reducing emissions (Figure 3).

[3] *NDC target analysis is based on NDC data as of 17 October 2022.*

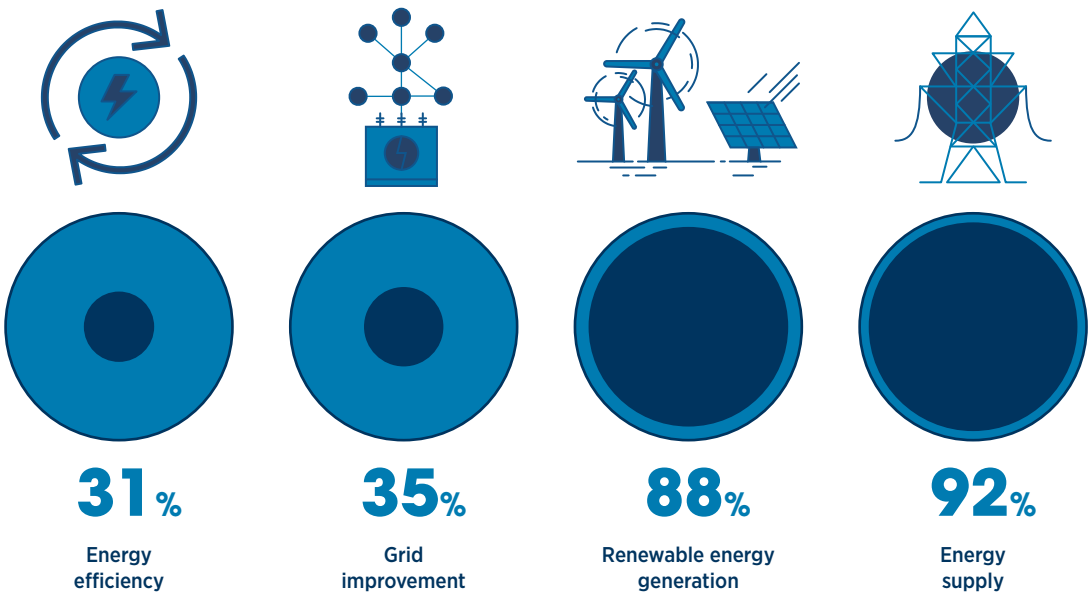
Figure 4 **Sector coverage in the updated NDCs**



LULUCF: Land use, land-use change, and forestry.
IPPU: Industrial Processes and Product Use.

The NDCs of Parties most frequently mention the use of domestic mitigation measures related to renewable energy (UNFCCC, 2021).

Figure 5 **Energy in updated NDCs submitted to the UNFCCC**



IRENA'S CLIMATE ACTION SUPPORT FOR NDCs AND LONG-TERM STRATEGIES

IRENA's membership continues to express growing interest in working with the Agency to receive targeted assistance for climate change mitigation and adaptation action to enhance and implement their NDCs and develop long-term strategies. As of November 2022, IRENA's support was provided to 83 countries via 164 work packages tailored to the needs and priorities of Members that are Parties to the Paris Agreement. This support currently covers all global regions, with the Agency providing assistance to countries across Africa, Asia and the Pacific, Europe, and Latin America and the Caribbean (Figure 6).

83
COUNTRIES

2 billion
PEOPLE

4 billion
TONNES OF CO_2eq

164
WORK PACKAGES


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Figure 6 **IRENA's engagement with Parties to the Paris Agreement**

40 **Input to NDC already provided**

18 **Implementation of support**

7 **Work plan development**

18 **Scoping**

Europe — 5

Belarus
North Macedonia

Albania
Bosnia and Herzegovina
Türkiye

2 | 3

Asia and the Pacific — 27

Bhutan
Fiji
Jordan
Kyrgyz Republic
Lebanon
Myanmar
Nepal
Palau
Papua New Guinea
Tonga
United Arab Emirates

Indonesia
Iraq
Lao PDR
Mongolia
Solomon Islands

Pakistan

Afghanistan
Cambodia
Cook Islands
Kazakhstan
Kiribati
Micronesia (Federated States of)
Niue
Samoa
Tuvalu
Uzbekistan

11 | 5 | 1 | 10

Latin America and the Caribbean — 22

Antigua and Barbuda
Belize
Cuba
Dominican Republic
Ecuador
El Salvador
Grenada
Nicaragua
Paraguay
Saint Kitts and Nevis
Uruguay

Bahamas
Colombia
Dominica
Saint Lucia
Saint Vincent and the Grenadines

Trinidad and Tobago

Argentina
Barbados
Guyana
Panama
Perú

11 | 5 | 1 | 5

Africa — 29

Benin
Burkina Faso
Eswatini
Gabon
The Gambia
Liberia
Mali
Mauritius
Mozambique
Niger
Nigeria
Seychelles
South Africa
Uganda
Zambia
Zimbabwe

Botswana
Cameroon
Comoros
São Tomé and Príncipe
Sudan

Chad
Egypt
Morocco
Rwanda
Senegal

Ethiopia
Ghana
Lesotho

16 | 5 | 5 | 3

Disclaimer: This map is provided for illustration purposes only.
Boundaries and names shown on this map do not imply any official endorsement or acceptance by IRENA.

IRENA engages closely with Member countries through its work packages, which are determined in response to requests for support. The various work packages reflect Members' support needs in order to ensure country ownership of the process of developing and implementing the NDCs and long-term strategies. IRENA builds on the feedback it receives from countries to consider its priority support portfolios in line with its knowledge and expertise.

Table 2 shows the categories of IRENA's main support portfolio at the country level. Its work packages offer data, technical analysis and assistance for providing inputs to NDC enhancement and implementation. The Agency also offers technical assistance for formulating and updating the renewable energy targets of Member countries.

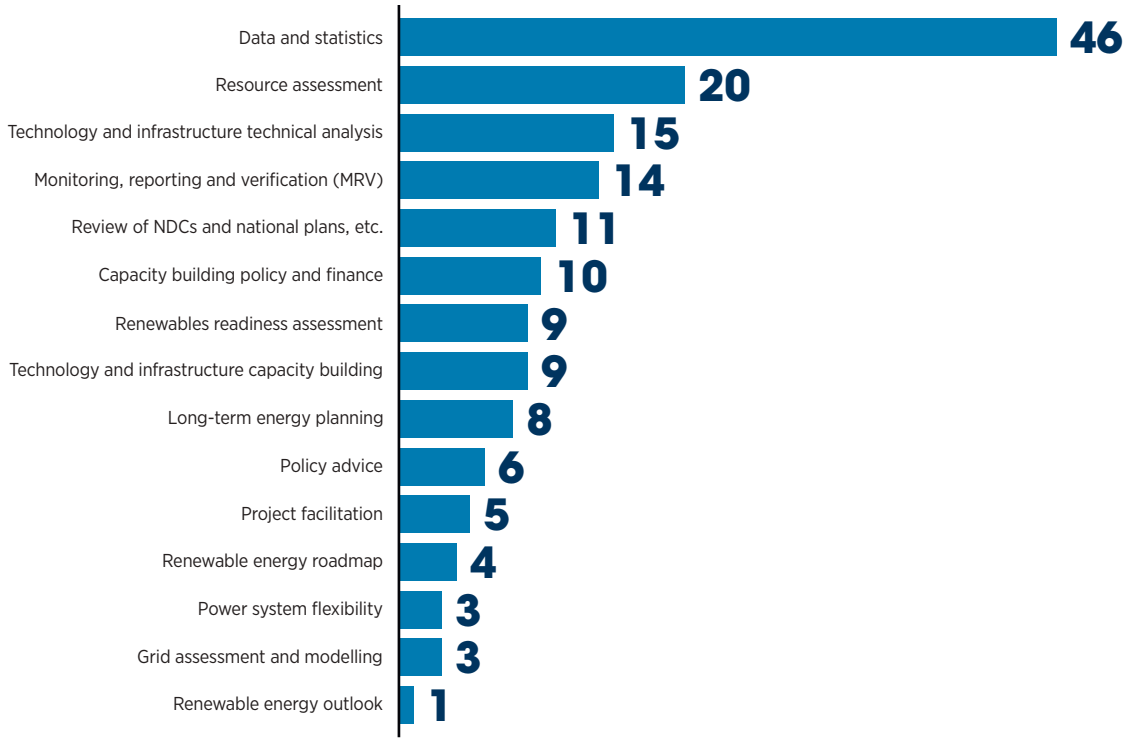
Table 2 **IRENA's climate action support**

Category	Description
Data and statistics	Providing energy data through IRENA's repository of statistics for energy balances, renewable energy capacity and generation, and energy finance and costs.
Monitoring, reporting and verification (MRV)	Technical assistance and capacity building on energy data collection, analysis, recording and reporting. The support can also cover MRV support on greenhouse gas emission reduction through energy transition.
Resource assessment	Assisting countries in assessing their renewable energy potential and building their capacities to undertake this analysis. This includes site assessment, suitability assessment, zoning assessment and use of the SolarCity Simulator, a web application to evaluate the prospects for electricity generation using rooftop solar photovoltaic (PV) installations.
Policy and finance advice	Undertaking technical analysis of the current policies and financial landscape for energy transition. The support can also offer analysis of the existing barriers to renewables deployment and provide policy-relevant recommendations to support mobilising investments in energy transition, leading to climate action.
Renewables readiness assessment	Undertaking comprehensive assessment of the conditions for renewable energy deployment to support decision makers in countries to expand ambitions for renewables deployment.
Long-term energy planning	Enhancing long-term renewable energy planning and developing the capacity of countries to undertake their energy planning and modelling.
Power system flexibility	Analysing the flexibility in power systems to identify cost-effective and sound solutions for integrating variable renewable energy. These include demand-side flexibility, energy storage, and sector coupling options, such as electric vehicles, power-to-heat and power-to-hydrogen.
Renewable energy roadmap (REmap)	Assessing the potential of renewable energy in the power, cooling and heating, and transport sectors. This support also covers analysis on possible technology avenues and assessment of other metrics including technology options, costs, financing and potential externalities, including emissions, air pollution and various economic indicators.

Category	Description
Project facilitation services	Facilitating the development of project pipelines aligned with the priorities of governments in collaboration with the financial sector, the private sector and project developers, and assisting in the bankability assessment and financial access of projects. The Climate Investment Platform and IRENA's regional Investment Forums are also leveraged to support countries' access to project finance.
Technology and infrastructure technical analysis	Assessment for the cost effectiveness of mitigation options for the energy sector to support country to priorities mitigation options to serve as an input for the NDC.
Technology and infrastructure capacity building	Technical capacity building programme on renewable energy technology to facilitate NDC implementation, with a particular focus on performance, cost, and planning requirement to implement renewable energy solutions.
Grid assessment and modelling	High-level assessment of the grid hosting capacity and distribution to accommodate Variable Renewable Energy (VRE) integration and build countries' capacity on grid assessment studies and to establish a working model of the electricity system through simulation software training.

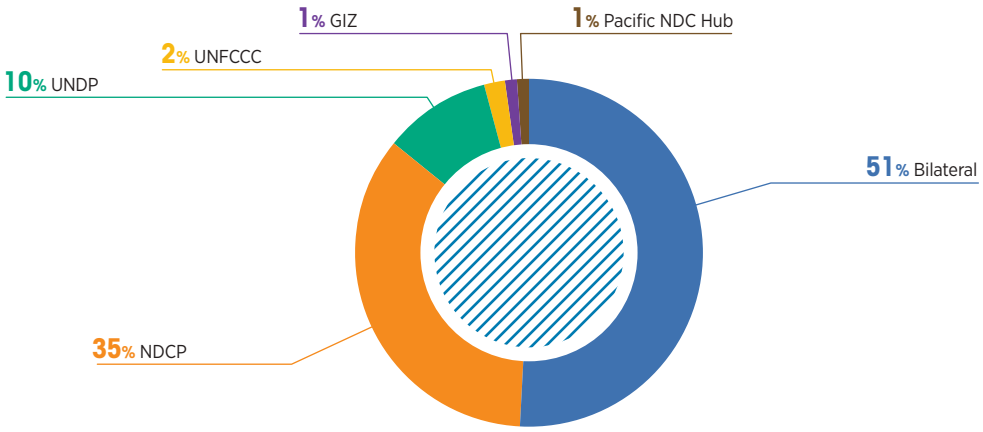
Within the wide coverage of IRENA's work packages, support on data and statistics is the most frequent assistance provided to Member countries. This is followed by support on resource assessment and technology and infrastructure technical analysis, review of NDCs and national policies and plans, and MRV (Figure 6).

Figure 7 **Distribution of IRENA's work packages**



IRENA's direct engagement with its Members, in collaboration with other key development agencies and institutions, fulfils opportunities to support climate change mitigation and adaptation action in countries. In addition to bilateral requests, IRENA has been the intermediary of many country support requests through its partner institutions, including the NDC Partnership (NDCP), the Regional Pacific NDC Hub, the UNFCCC and UNDP (Figure 7). IRENA's partnership also includes the European Union's Technical Assistance Facility (EU TAF) for Sustainable Energy to deliver assistance to countries in Sub-Saharan Africa and Latin America and the Caribbean.

Figure 8 **Distribution of support request sources to IRENA (%)**



IRENA is strengthening a robust process to facilitate efficient country engagement in developing, managing and implementing the support requested by its Members on climate action through energy transition. IRENA is committed to supporting its membership in achieving net-zero greenhouse gas emissions through this transition.

Parties to the Paris Agreement are invited to formulate and communicate their long-term strategies, the development of which requires the adoption of a whole-of-government approach. To this end, a growing number of countries are communicating their plans to synergise the United Nations Sustainable Development Goals (SDGs), NDCs and national plans to ensure effective implementation of a balanced and clear long-term vision to achieve a low-carbon, resilient economy by 2050. IRENA is available, upon request, to support its Members in their efforts to align their long-term plans to energy transition strategies and other plans.


Belinda Pretorius © Shutterstock

Of 53 submissions as of September 2022 (UNFCCC 2022), 47 IRENA Member countries and 4 states in accession have communicated long-term strategies. While 40% state that subsequent NDC revisions and enhanced ambitions will be guided by the strategies, around half did not mention how this relates to NDCs. With regard to energy sector, all strategies noted plans to increase renewable energy in domestic electricity systems. Among the submitted long-term strategies, 45% communicated clean power generation targets, which include renewable energy-based power. While 32% referred to a 100% clean power generation target indicating renewable energy plays a critical role to achieve the long term temperature goal and Sustainable Development Goal (SDG) 7 targets.[4] Furthermore, to implement adaptation efforts, 49% discussed the role of energy sectors in establishing synergies across mitigation and adaptation (Figure 9). As the recent LT-LEDS Synthesis Report suggested, capacity building is crucial to operationalise the measures and actions committed in long-term strategies.

IRENA is working to provide its Members with technical analysis to strengthen their long-term strategies towards energy transition and carbon neutrality under the Paris Agreement. For example, the Ministry of Energy of the Republic of Kazakhstan requested IRENA's support in reviewing the country's Low-carbon Economic Development Strategy. This support includes expert recommendations to further identify and highlight the alignment between renewable energy targets in the NDC and long-term strategies. IRENA supported the country to develop these by providing inputs such as data and analysis, and reviews of long-term strategies.

In addition, the Agency is collaborating closely with the Ministry of Environment and Tourism of Mongolia to support the development of long-term strategies., ensuring alignment with the country's mid-term NDC implementation objectives. IRENA contributes to evaluating the long-term emission pathway through the analysis of climate change mitigation options in the energy sector.

Beyond these countries, IRENA looks forward to supporting its membership through its expertise to establish long term plans powered by renewables.

Figure 9 **Energy Targets communicated in the LT-LEDS**

[4] *UNFCCC (2022), Long-term low-emission development strategies: Synthesis Report https://unfccc.int/lt-leds-synthesis-report*

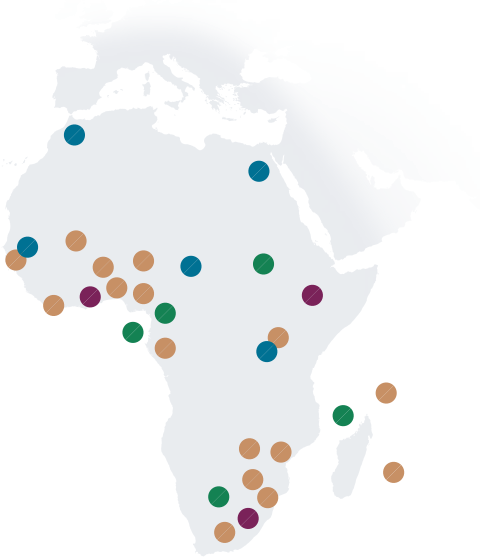
IRENA'S IMPACT TO DATE

AFRICA

29 COUNTRIES, 46 ACTIVITIES

Ongoing expansion of African economies is leading to rising energy demand together with a growing need to improve the sustainability and resilience of energy systems. Despite the region's substantial renewable energy potential, Africa accounts for only 3% of the global installed renewable electricity generation capacity (IRENA, 2022c). Hence, considerable room remains to expand clean energy deployment in the region. Africa needs to apply innovative technologies and solutions to facilitate acceleration of the energy transition and to expand the mobilisation of investment in climate change mitigation and adaptation.

Existing NDC support in the region aims to mitigate and adapt to climate change while meeting the SDGs. IRENA is assisting countries through a variety of work packages for NDC implementation, NDC enhancement and review of long-term strategies (Figure 10).



Total number of activities 46

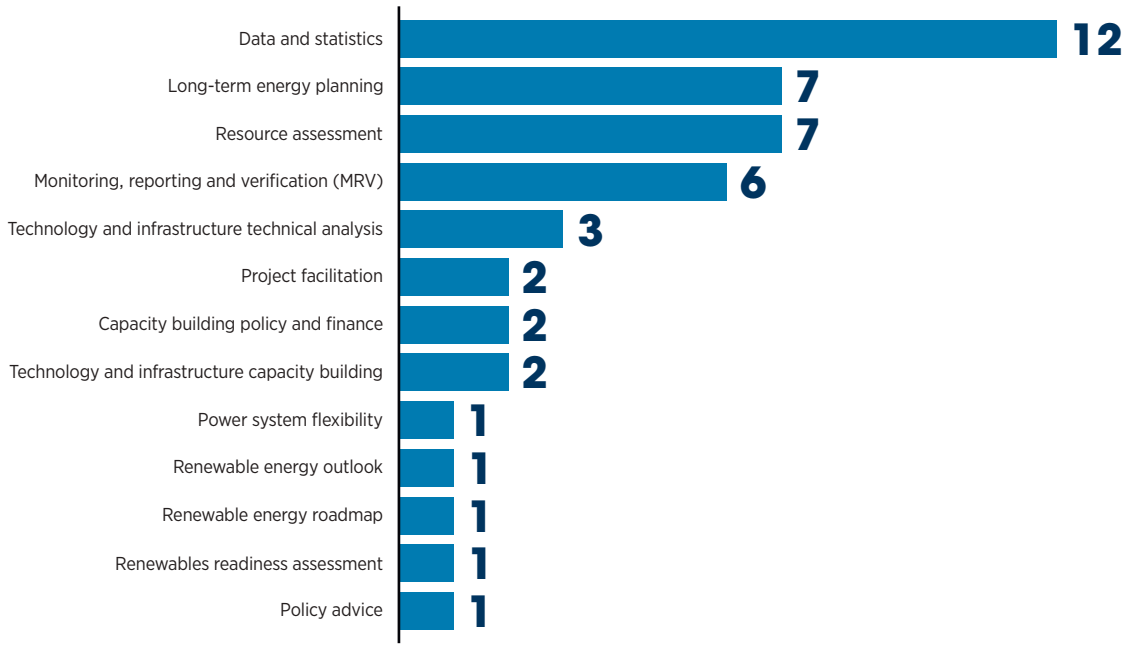
Enhancement activities	Implementation activities	Enhancement and implementation activities
17	27	2

Africa 29

Benin	Botswana	Chad	Ethiopia
Burkina Faso	Cameroon	Egypt	Ghana
Eswatini	Comoros	Morocco	Lesotho
Gabon	São Tomé and Príncipe	Rwanda	
The Gambia	Sudan	Senegal	
Liberia			
Mali			
Mauritius			
Mozambique			
Niger			
Nigeria			
Seychelles			
South Africa			
Uganda			
Zambia			
Zimbabwe			
16	5	5	3

● Input to NDC already provided ● Implementation of support ● Work plan development ● Scoping

Figure 10 **Distribution of IRENA work packages in Africa**



Status of IRENA support

In Africa, areas of support from IRENA cover strategic, result-oriented partnerships with stakeholders and development partners, leading to concrete outcomes and impact on the ground. The most common work programmes in the region cover data and statistics, long-term energy planning, climate innovation and technology capacity building, MRV and resource assessment.

- In **Benin**, capacity building support was undertaken to ensure a robust quantification study of greenhouse gas emissions related to the energy component of the NDC.
- In **Burkina Faso**, building on the Global Atlas for Renewable Energy, a suitability assessment was undertaken to increase the capacity and expertise to evaluate potential renewable energy deployment to accelerate the energy transition.
- In **Eswatini**, IRENA provided technical assessment for solar PV training for beneficiaries of a regional hospital refurbishment project. The support enabled development needs through the assessment of local capacities as well as capacity building for solar PV deployment and maintenance to operationalise hospital facilities.
- In **Gabon**, IRENA provided capacity building support on long-term energy planning through a combination of virtual training on the use of software and workshops tailored for the country to extend the energy component of the NDC.
- **The Gambia's** long-term Climate-Neutral Development Strategy 2050 used IRENA's estimate of electricity generation capacity, including solar and wind, enabling plans to implement 13 solar projects with an electricity generation capacity of 250 megawatts (MW). The target aligns with eight mitigation measures on electricity demand that IRENA identified to inform NDC development and implementation in the country.

- In **Mozambique**, IRENA supported data and financial analysis to assess the suitability of conditions for developing and deploying renewable energy. The analysis and recommendations will guide the country's integration of renewables and support the NDC implementation process.

- In **Niger**, IRENA supported the development of the MRV system, including mini-greenhouse gas inventories and projections to inform the energy targets in the NDC.

- Support to **São Tomé and Príncipe** includes training for scenario modelling and long-term planning to assist technicians in implementing the NDC targets. Furthermore, IRENA is supporting the assessment of renewable energy for primary healthcare, expanding renewables in the cross-sector environment.

- In **Seychelles**, IRENA undertook activities to build the country's capacity to assess climate investment and financial flows in the energy sector, focusing the sector's investment and financial flows, and the assessment process to strengthen the capacity of the relevant ministries to track financial flows for climate action projects. It also helped integrate climate finance into national budgeting.

- In **Sudan**, IRENA provided technical assistance to build the capacity and technical assistance for designing electricity auctions, aligned with its framework that classifies design elements according to auction demand, including product, technology and volume auctions.

- In **Zambia**, IRENA supported the capacity building of data providers and established data sharing platforms for improving quality assurance.

In Focus **South Africa**

South Africa submitted its updated first NDC on 27 September 2021. The Climate Action Tracker observed that the NDC update represents progression beyond the country's previous NDC submission, especially on South Africa's climate ambition for 2030.

IRENA provided technical analysis for the NDC update to assess the cost-effective technology options for using renewable energy to accelerate the planning process for climate action. The technical study provided climate policy makers with key knowledge to identify, quantify and select the short- and mid-term NDC targets. South Africa used this analysis to develop its long-term sector plans for the development of renewable energy mitigation measures, considering the domestic renewable energy potential and energy demand.

IRENA supported the initial modelling of net-zero pathways for South Africa and enabled the undertaking of a detailed study for the South African Presidential Climate Commission, a multi-stakeholder group established to advise the NDC update.

"We are very grateful for the support and advice provided by IRENA in the use of their FlexTool in the technical analysis below" (UCT, 2021).

(Technical analysis to support the update of mitigation target ranges in South Africa's first NDC, April 2021)

In Focus **Uganda**

Uganda submitted its updated NDC on 12 September 2022. The revised NDC indicates a series of priority adaptation actions for the energy sector, one of which aims to promote a total of 4 200 MW of renewable electricity generation capacity by 2030. The NDC update shows increased ambition in the emission reduction target from 22% to 24.7% of business as usual, as compared to the first NDC communication.

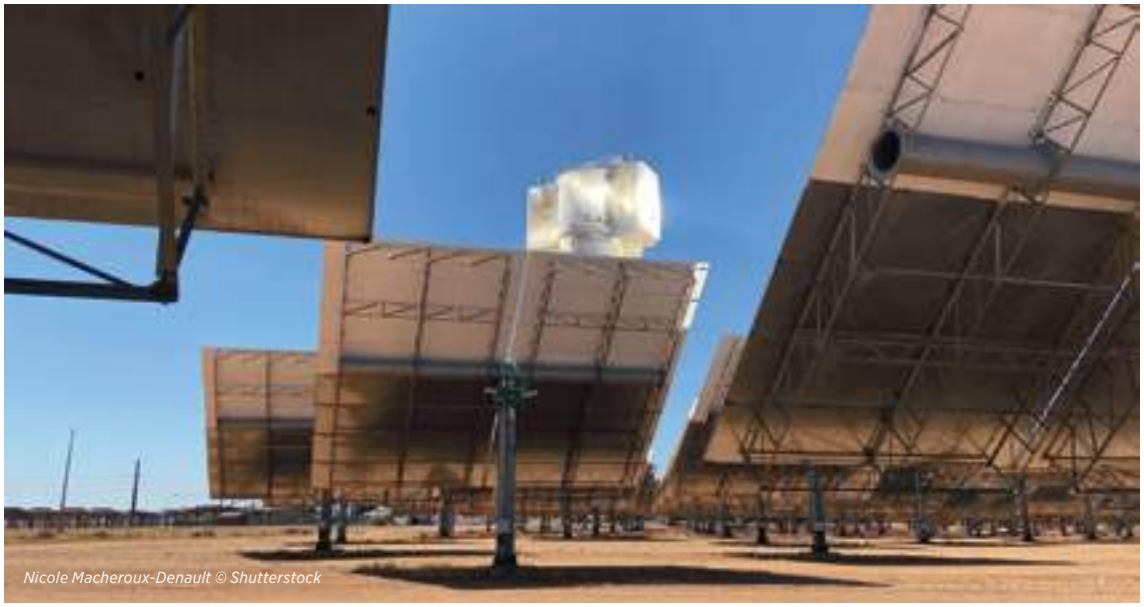
The progress in Uganda's NDC update reflects IRENA's support for data and statistics. This included assistance in data gathering and collation to refine the country's emission reduction targets for the sub-sectors of energy, agriculture, waste and transport and to define the adaptation target. IRENA contributed peer review to help refine energy-related targets in the NDC revision process. The process was undertaken in an open and transparent manner to identify key areas to facilitate the deployment of renewables in the country, strengthening the development of the NDC.

"On behalf of the Ministry of Water and Environment, I wish to take this opportunity to thank all the partners and stakeholders involved in the NDC update process for their technical and financial support. These include ... [the] International Renewable Energy Agency (IRENA)..."
(Republic of Uganda, 2022)

(Uganda's updated NDC, 12 September 2022)

In Focus **Nigeria**

Nigeria, Africa's largest economy, has experienced economic growth as well as increased energy demand. IRENA worked with the country to develop its second NDC with a focus on two main aspects. First, IRENA analysed the country's energy balance for the year 2018 to provide an estimation for policy monitoring and modelling work and to use this as a basis to identify opportunities. Second, the Agency provided guidance and tools to raise the country's capacity for monitoring and modelling.



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ASIA AND THE PACIFIC
27 COUNTRIES, 47 ACTIVITIES

The Asia and the Pacific region is characterised by strong economic growth and diverse climates and terrain, with a total population of around 4.5 billion people. The region includes the largest energy economies in the world, as well as small island developing states (SIDS), least developed countries (LDCs) and landlocked developing countries (LLDCs). Asia and the Pacific accounts for the largest share of global carbon emissions from the power sector and represents more than half of the world's energy consumption, 85% of which comes from fossil fuels.

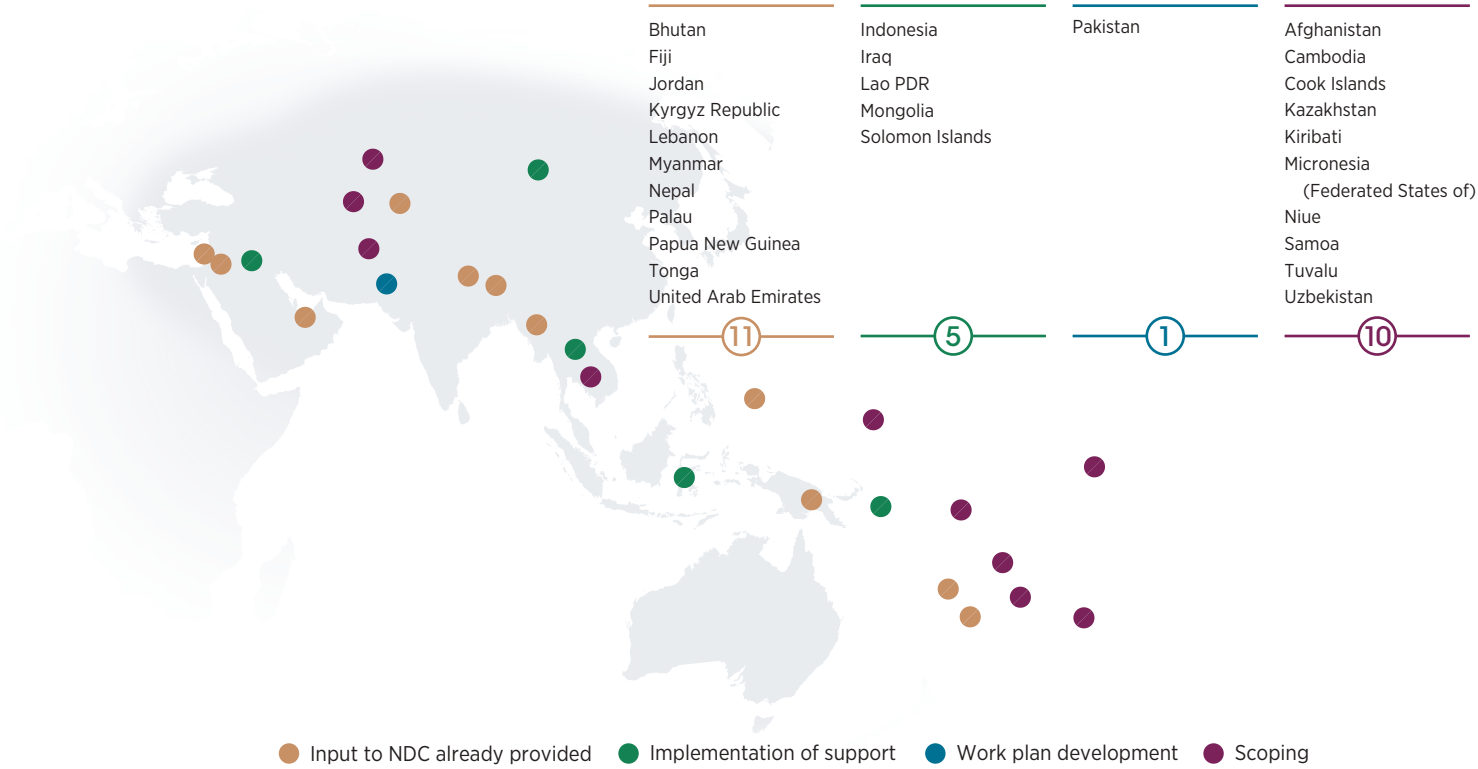
The region also faces energy challenges. One-tenth of the regional population does not have access to electricity, and a large population continues to rely on traditional use of biomass for heating and cooking. Energy demand is rising due to rapid industrialisation and urbanisation. However, considerable opportunities exist to prevent the lock-in of high-emitting energy technologies in the long term. Building on its large renewable energy potential, the region has added significant expertise and manufacturing related to renewables.

Total number of activities 47

Enhancement activities	Implementation activities	Enhancement and implementation activities
7	39	1

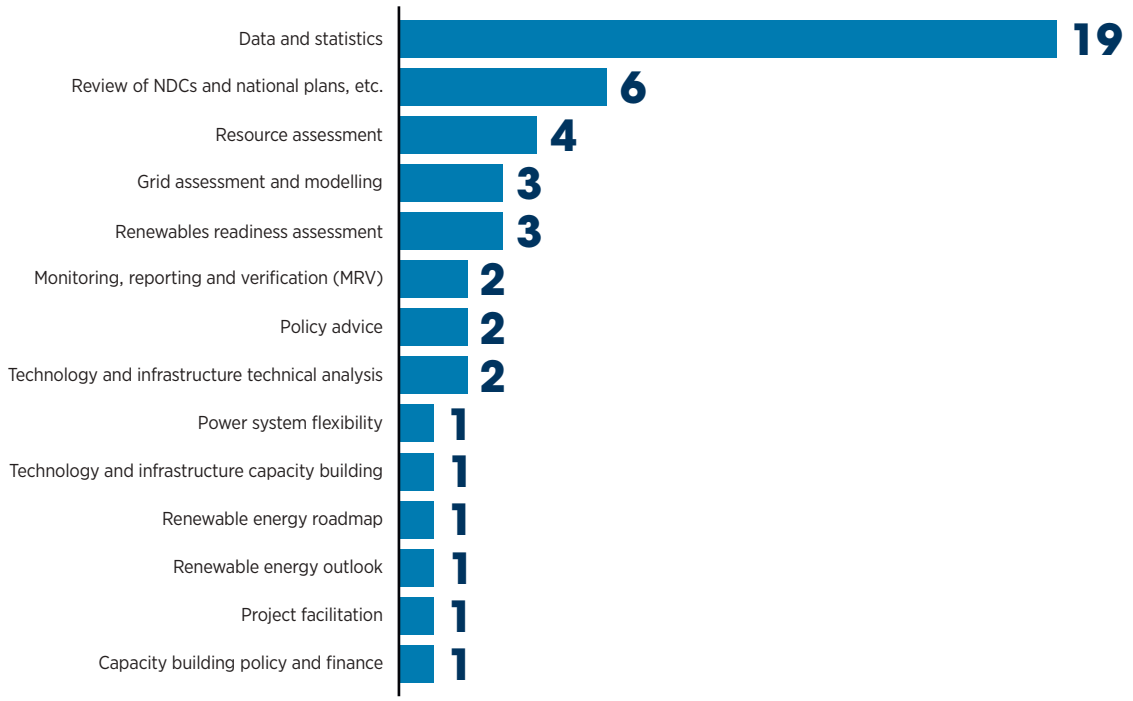
Asia and the Pacific 27

Bhutan	Indonesia	Pakistan	Afghanistan
Fiji	Iraq		Cambodia
Jordan	Lao PDR		Cook Islands
Kyrgyz Republic	Mongolia		Kazakhstan
Lebanon	Solomon Islands		Kiribati
Myanmar			Micronesia (Federated States of)
Nepal			Niue
Palau			Samoa
Papua New Guinea			Tuvalu
Tonga			Uzbekistan
United Arab Emirates			
11	5	1	10



Input to NDC already provided · Implementation of support · Work plan development · Scoping

Figure 11 **Distribution of IRENA work packages in Asia and the Pacific**



Concrete sets of climate actions based on energy transition are required to achieve the shift to a net zero future. IRENA is determined to actively engage with its Members in the Asia and the Pacific region to reinforce actions related to climate change mitigation and adaptation and to support the co-benefits of sustainable development (Figure 10).

Status of IRENA support

IRENA provides various sets of work packages for its Members in Asia and the Pacific, covering the assessment of energy data gaps, analysis of energy balances, and capacity building in data collection, recording, analysis and refinement. In addition, IRENA provides support on climate technology and infrastructure development. The energy data support also covers support on MRV to assist countries in tracking progress towards their renewable energy targets, mostly in the power sector.

Several countries have specifically requested IRENA's support on renewable energy data management and MRV. These countries include Fiji, Palau, the Solomon Islands and Uzbekistan. IRENA work packages also cover support to update and strengthen renewable energy targets in countries' NDCs, national policies and long-term strategies. For example, IRENA is supporting Kazakhstan to help the country identify options to raise the ambition of its strategy.

- **Iraq** completed an energy transition workshop to strengthen the enabling environment for increasing its renewable energy ambition. IRENA facilitated the gathering of stakeholders to discuss regional and global best practices in NDC target setting, as well as consideration of long-term energy planning.

- In **Mongolia**, capacity building sessions targeting the integration of renewable energy in the district strategic cooling and heating plan were held to plan the deployment of renewables at the city and municipal levels, with the aim of reducing energy consumption in the buildings sector.

- In **Palau**, IRENA is supporting training in the implementation and analysis of an MRV template consistent with the international standard, to develop a robust method of energy-related data collection as well as transparency in the country's greenhouse gas emission projections.

- IRENA supported **Papua New Guinea** by developing an integrated data management system to collect and record energy data in the country, contributing to transparency and accuracy.

- IRENA is supporting the **Solomon Islands** through readiness assessment studies of the energy sector based on country-led stakeholder consultations. The aim is to help create the enabling conditions necessary to scale up and accelerate the integration of renewables. IRENA is also providing assessment on the status and prospects of renewable energy deployment and analysing the options to improve the flexibility of the power system.

In Focus **Indonesia**

IRENA contributed to the G20 presidency's initiative by supporting a study on *Stocktaking of Economic, Social and Environmental Impacts of Sustainable Recovery*, which includes impact analysis of the country's NDC implementation. The study aims to highlight Indonesia's COVID-19 recovery efforts as an opportunity to advance climate change mitigation and adaptation while also considering adverse climate-related impacts, maladaptation and SDG co-benefits related to the environment and health.

In Focus **Republic of Lebanon**

IRENA has supported Lebanon through the development of a Renewable Energy Outlook. This work integrates two of the Agency's service lines: renewables readiness assessment (RRA), which is aligned with country priorities and ensured through country-led stakeholder consultations, and the renewable energy roadmap (REmap), which assesses the unexplored potential of renewables and other quantitative factors, such as financing needs, costs and associated environmental externalities such as air pollution.

Building on the recommendations in the Renewable Energy Outlook, IRENA assisted Lebanon in grid assessment and modelling analysis and contributed a capacity building workshop on the implementation of national climate action plans. The conducted studies also support implementation of Lebanon's ambitious target to increase the share of renewable electricity generation to 30% by 2030, contributing to the development of a country-led, economy-wide 2030 strategy consistent with the NDC, aligning short-, medium- and long-term plans.

In Focus **Republic**

The Kyrgyz Republic has set a general direction to develop its clean energy sector and energy efficiency, based on the concept of a green economy. IRENA undertook a renewables readiness assessment (RRA) to assist the country in exploring its renewable resource potential from wind and solar. The RRA assesses the conditions suitable for the deployment of renewables in the country and the actions required to meet those conditions. The output of the RRA also informed the country's NDC revision process, contributing to enhanced ambition in the renewable energy targets and in scaled-up climate action through energy transition. The resource assessment support, such as suitability maps and zoning for wind and solar PV, identified potential sites for deploying utility-scale renewable power plants.

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EUROPE
5 COUNTRIES, 12 ACTIVITIES

Member States of the European Union, through the EU's Fit for 55 plan, have committed to a binding target to achieve climate neutrality by 2050 and to cut greenhouse gas emissions by at least 55% by 2030. Non-EU countries in the region, especially in Southeast Europe, are also moving towards a more sustainable energy future by considering options to deploy renewables in power generation and other end-use sectors.

Moreover, through pledges in policies and plans such as NDCs, six Western Balkan countries have expressed ambitions to reach climate neutrality through reductions in greenhouse gas emissions. Croatia, as a member of the EU, has adopted the necessary regulations and strategies to implement climate change mitigation activities, and the five other countries in the sub-region are in the process of adopting similar measures (Knez, Štrbac and Podbregar, 2022).

In light of the new geopolitical and energy market realities in 2022, the EU is facing pressing needs to accelerate its transition to clean energy sources and to phase out its dependence on fossil fuels in the long term, as established in the REPowerEU plan.

IRENA is providing a diverse set of work packages for its Members in Europe, covering NDC revision and implementation support (Figure 11). Through workshops and capacity building training, the Agency provides assistance in developing and improving countries' technical, financial, regulatory and institutional frameworks for renewables. The Agency is also assisting countries to ensure alignment between their NDC targets and national energy and climate plans (NECPs).

Total number of activities 12

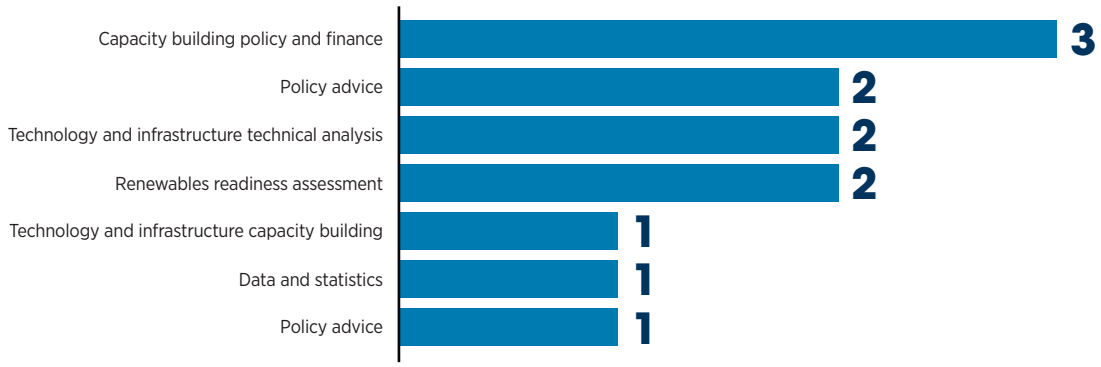
Enhancement activities	Implementation activities
2	10

Europe 5

Belarus North Macedonia	Albania Bosnia and Herzegovina Türkiye
2	3

Input to NDC already provided · Implementation of support · Work plan development · Scoping

Figure 12 **Distribution of IRENA work packages in Europe**



Status of IRENA support

- IRENA provided **Albania** with support to enhance and implement its NDC. Activities were focused on policy advisory and capacity building for the design of renewable energy targets and on analysis of policies and measures in the cooling and heating sectors, while encouraging the maximisation of socio-economic benefits and financial instruments.

- In **Belarus**, IRENA supported a capacity building workshop on auction design, equipping stakeholders to design relevant legislation on the auction system and to contribute to the energy transition.

- In **Bosnia and Herzegovina**, IRENA provided technical assistance to design enhanced climate change mitigation and adaptation measures in climate action policies and plans, building on renewable energy technologies. This activity also covered implementation support. In addition, IRENA assessed the potential of mitigation and the costs and co-benefits of adaptation, helping to confirm the options for renewable energy mitigation measures covered in the updated NDC. It will also ensure the NDC's consistency with renewable energy targets in the NECP, climate neutrality targets in the Sofia Declaration on the Western Balkans' Green Agenda, and the European Green Deal. In addition, IRENA is supporting Bosnia and Herzegovina with a renewables readiness assessment (RRA).

- IRENA is supporting **Türkiye** through the use of the SolarCity Simulator in the Sahinbey area. The simulator is designed to support sub-national authorities in the assessment of different policy and financial incentives, such as capital subsidies, for the rooftop solar PV market.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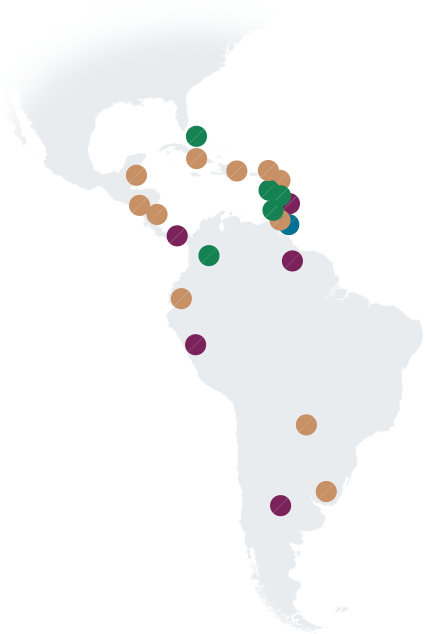
LATIN AMERICA AND THE CARIBBEAN
22 COUNTRIES, 59 ACTIVITIES

In Latin America, renewable energy contributes more than a quarter of the region's primary energy supply – twice the global average. Latin America hosts some of the world's most dynamic renewable energy markets. The power sectors of many countries depend greatly on hydropower, which is used to complement variable renewable energy sources and is key for leveraging all renewables in the region. Countries are diversifying their energy systems and creating enabling policy and regulatory environments to increase the share of renewable energy.

IRENA provides diverse work packages to support countries in the region, with the aim of integrating renewable energy plans and targets into their NDCs and long-term strategies, as well as ensuring alignment between the implementation of these climate action plans and project execution (Figure 12). IRENA further strives to support the region alongside regional climate summits to foster best practices through contextualisation of the WETO 2022 report.

IRENA has been strongly engaged with countries in Latin America and the Caribbean to assist them in revising their renewable energy targets and enhancing the ambition in their NDCs to accelerate implementation efforts. The various work packages being implemented cover technical assistance in defining renewable energy targets as well as climate technology and infrastructure sectoral analysis.



Total number of activities 59

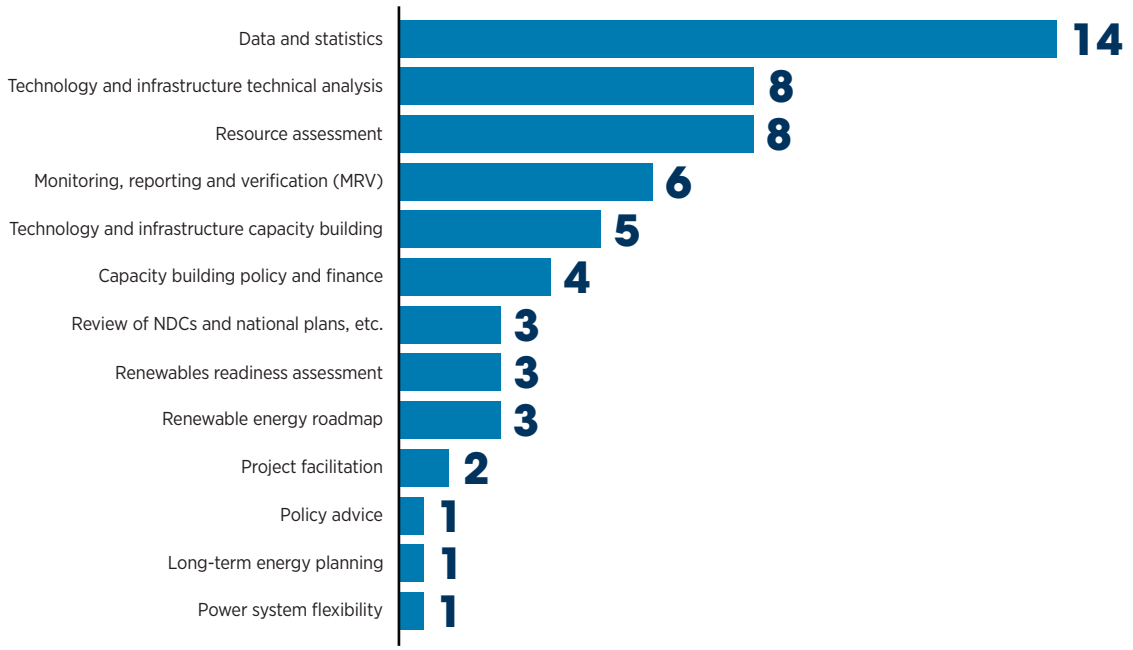
Enhancement activities	Implementation activities	Enhancement and implementation activities
18	39	2

Latin America and the Caribbean 22

Antigua and Barbuda	Bahamas	Trinidad and Tobago	Argentina
Belize	Colombia		Barbados
Cuba	Dominica		Guyana
Dominican Republic	Saint Lucia		Panama
Ecuador	Saint Vincent and the Grenadines		Perú
El Salvador			
Grenada			
Nicaragua			
Paraguay			
Saint Kitts and Nevis			
Uruguay			
11	5	1	5

Input to NDC already provided · Implementation of support · Work plan development · Scoping

Figure 13 **Distribution of IRENA work packages in Latin America and the Caribbean**



Status of IRENA support

- In **Antigua and Barbuda**, IRENA is assisting with NDC implementation by analysing a technology plan and climate change mitigation impacts. Additional efforts are being undertaken as part of the Sustainable Low-emission Island Mobility project, in collaboration with the United Nations Environment Programme through the Global Programme to Support Countries with the Shift to Electric Mobility, and with support from the Global Environment Facility. This support aims to analyse the early stages of transport sector decarbonisation by scaling up electric mobility aligned with the country's priorities, as elaborated in its updated NDC.

- In the **Bahamas**, IRENA will deliver a virtual training programme for youth focused on the key national priorities of renewable energy and NDC enhancement. This support will enhance participants' understanding of renewable energy technology as a feasible option for climate mitigation and adaptation, thereby increasing national capacity and technology transfer.

- IRENA supported **Belize** in specifying its NDC energy targets in line with on-the-ground data and international guidelines, and in proposing key progress indicators. In addition, IRENA's REmap work package supports the development of a baseline energy scenario and energy transition pathways for the country. IRENA is also providing insights into Belize's strategies for long-term decarbonisation.

- In **Colombia**, IRENA, as part of its REmap analysis, undertook a technical assessment to identify areas suitable for grid interconnection and for off-grid solar and wind projects.

- In **Cuba**, IRENA supported raising the ambition of climate action by reviewing energy components in the country's NDC.

- In the **Dominican Republic**, IRENA supported consultations with local and sub-regional stakeholders to build capacity on renewable energy technologies, with a focus on developing a climate-resilient energy investment portfolio for power and end-use applications as part of the national climate plan.

- IRENA has provided **Ecuador** with a range of activities for NDC implementation, including automating the calculation of emission factors to support an MRV system for the national grid. IRENA completed its support for a long-term scenario for energy and climate target setting and the development of local capacity for long-term planning. In addition, IRENA assisted Ecuador in securing key project finance for the implementation of NDC action by helping to develop a concept note on biodigesters.

- IRENA supported **Saint Kitts and Nevis** in the implementation of an MRV system in the country's NDC revision process. The aim is to strengthen the country's capacity to monitor and evaluate greenhouse gas emissions through the development of a robust and accurate inventory system.

In Focus **Republic of El Salvador**

IRENA provided support for El Salvador, assisting the country's NDC revision process. The support covers technology and infrastructure technical analysis, energy data, MRV, and the REmap and RRA processes. Specifically, IRENA supported the development of an energy perspective for 2030. REmap activities assessed the penetration of energy efficiency and renewable energy, linked with REmap's goal in Central America to support the analysis of energy-related emission reduction targets by sector.

Through its support for technology and infrastructure technical analysis, IRENA provided analysis on climate change mitigation in the agro-industry sub-sector. This analysis revealed a significant role and potential to deploy climate change mitigation measures for the power and thermal requirements of industry. It also confirmed the country's capability, financial feasibility and availability of solar technologies for climate change mitigation and adaptation.

The work package was an output of the partnership between IRENA and the European Commission and was implemented with support from the EU Technical Assistance Facility for Sustainable Energy. IRENA is also providing support related to the Global Atlas, which offers site assessment for onshore wind and solar projects. In addition, IRENA is developing a capacity building programme related to green hydrogen.

OUTLOOK

As the leading inter-governmental Agency on renewables, IRENA has continued to maintain climate action support as an integral element of its engagement with Member countries. Building on its broad membership, IRENA is determined to collaborate closely with the Parties to the Paris Agreement – as well as with development partners – to implement and enhance countries' climate ambitions through NDCs and long-term strategies, in addition to supporting efforts to accelerate the energy transition towards net zero emissions.

The implementation of climate commitments in NDCs and long-term strategies is essential for achieving the global climate goals of the Paris Agreement. IRENA will continue to engage with its Members to support the necessary climate change mitigation as well as adaptation actions, in line with countries' priorities as pledged in their NDCs. IRENA's various work packages, based on the Agency's wide-ranging expertise, will facilitate the enhancement of energy data and planning, policy development, project development and financing.

Most of the Parties to the Paris Agreement intend to continue enhancing their climate ambitions via their NDCs; however, so far only a relatively small number of Parties have communicated their LT-LEDS to the UNFCCC Secretariat. There is growing interest among Parties to seek IRENA's support to identify economy-wide low-emission pathways through energy transition to realise net-zero emissions by around mid-century.

Mobilising investment is required to materialise the level of climate action pledged in countries' NDCs. IRENA will continue to engage with partners and financiers in project facilitation and development. This engagement includes:

- channelling financing for a renewable energy project pipeline to facilitate the implementation of ambitious NDCs, with the aim of achieving the Paris Agreement goals and the co-benefits of the UN Sustainable Development Goals;
- facilitating matchmaking between financiers and project developers for renewable energy projects that are near-ready for financing, in line with countries' NDC priorities; and
- mobilising climate finance from international financial mechanisms and institutions, including both public and private sources, such as development financial mechanisms; global, regional and local banks; multilateral development banks; and the private sector.

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ANNEX

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AFGHANISTAN

Membership since

19 August 2016 **LDC / LLDC**

Population

39 835 428 (2021)[1]

GDP per capita

USD 516.75 (2020)[2]

TPES[3]

Total: 187 519 TJ (2019)
(Renewable: 36 518 TJ)

Energy-related emissions relative to global

8.27 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Behavioural change and opportunities for provision and development of alternative and renewable energy sources for 25% of the rural population above existing levels (15%)

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp (17% area)
  1.6-1.8 MWh/kWp/yr (28% area)
  1.8-1.9 MWh/kWp (37% area)
  1.9-2.0 MWh/kWp/yr (17% area)
- **Wind:** 260 W/m² (65% area)
  260-420 W/m² (18% area)
  420-560 W/m² (5% area)
- **Biomass:** 0.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

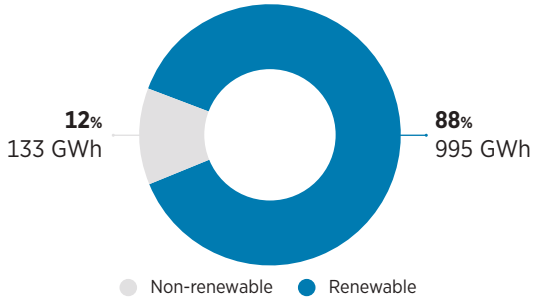
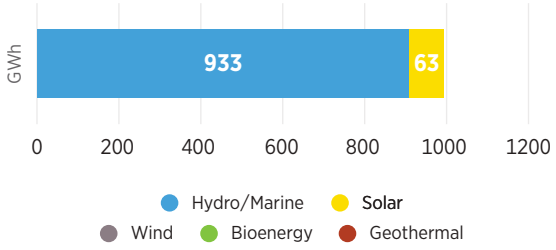


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Afghanistan

Support in implementation

Support is currently paused due to the political situation in the country

Work package:	Source:

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2016), IRENA Statistical Profile*

ALBANIA

Membership since

13 August 2010

Population

2 811 666 (2021)[1]

GDP per capita

USD 6 494.39 (2021)[2]

TPES[3]

Total: 91 851 TJ (2019)
(Renewable: 39 638 TJ)

Energy-related emissions relative to global

4.18 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, 42% renewables in gross final energy consumption

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (30% area)
  1.4–1.8 MWh/kWp/yr (69% area)
- **Wind:** 260 W/m² (57% area)
  260-420 W/m² (23% area)
  420-560 W/m² (10% area)
- **Biomass:** 5.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

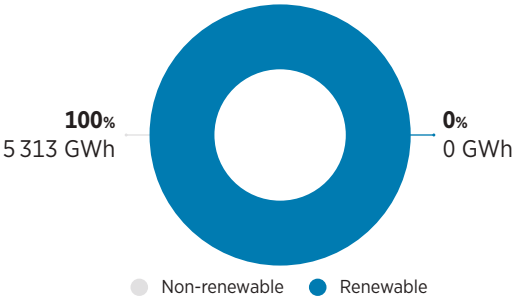
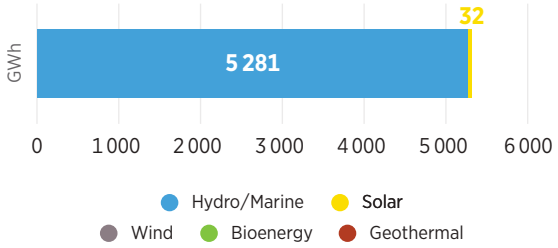


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Albania

Support completed

1	Comprehensive evaluations of the conditions for renewable energy deployment to identify a set of actions to scale up renewable energy and enhance greenhouse gas mitigation	
	Work package: Renewables readiness assessment	**Source:** NDC Partnership
2	A workshop to provide assistance and capacity building for the design of renewable energy targets and policy frameworks to help define and achieve NDC targets	
	Work package: Capacity building on policy and finance	**Source:** NDC Partnership

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

ANTIGUA AND BARBUDA

Membership since

10 October 2010 **SIDS**

Population

98 728 (2021)[1]

GDP per capita

USD 14 900.8 (2021)[2]

TPES[3]

Total: 7 233 TJ (2019)
(Renewable: 59 TJ)

Energy-related emissions relative to global

0.52 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first updated NDC[5]

100 MW of renewable generation capacity available to the grid (2030); 86% renewable generation from local resources in the electricity sector (2030); 20 MW of wind energy generation; and other targets

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (100% area)
- **Wind:** <260 W/m² (73% area)
  260-420 W/m² (28% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

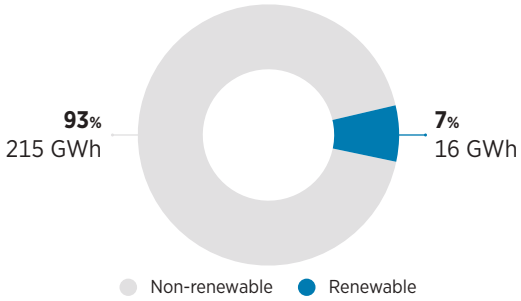
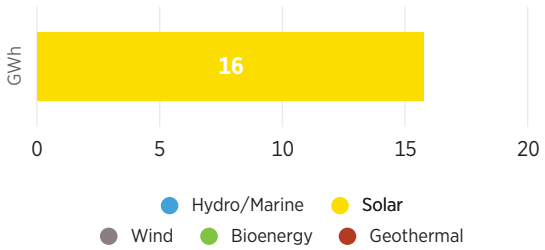


Figure 2 **Renewable electricity generation (GWh)**



Acknowledgement of IRENA support

"Special thanks to our implementing partners International Renewable Energy Agency (IRENA)"; also clearly mentions IRENA's Small Island Developing States (SIDS) Lighthouses Initiative as a method of NDC preparation, and cites REmap work.

(Antigua and Barbuda, first NDC [updated submission], 2 September 2021)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

IRENA climate action engagement in Antigua and Barbuda

	Support in implementation	
1	Development of a rooftop solar PV city simulator for North Antigua	
	Work package: Resource assessment	**Source:** Government of Antigua and Barbuda
2	Technical report with references to relevant existing published work that supports the assessment of technical needs of relevant sectors to achieve a just transition of the workforce to greener occupations and more widescale adoption of electric mobility	
	Work package: Technology and infrastructure technical analysis	**Source:** NDC Partnership
3	Technology plan and mitigation analysis to evaluate the early stages of transport sector decarbonisation with electric mobility. The analysis will look at the techno-economic feasibility of electrifying high-use-factor fleets, with a focus on public bus transport applications	
	Work package: Technology and infrastructure technical analysis	**Source:** NDC Partnership

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ARGENTINA

Membership since

15 June 2013

Population

45 808 747 (2021)[1]

GDP per capita

USD 10 729.23 (2021)[2]

TPES[3]

Total: 3 286 655 TJ (2019)
(Renewable: 325 545 TJ)

Energy-related emissions relative to global

188.24 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Does not indicate quantifiable renewable energy targets

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (46% area)
  1.6-1.8 MWh/kWp/yr (39% area)
  >2.0 MWh/kWp/yr (9% area)
- **Wind:** <260 W/m² (55% area)
  260-420 W/m² (17% area)
  260-420 W/m² (17% area)
  420-560 W/m² (15% area)
  >1 060 W/m² (15% area)
- **Biomass:** 3.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

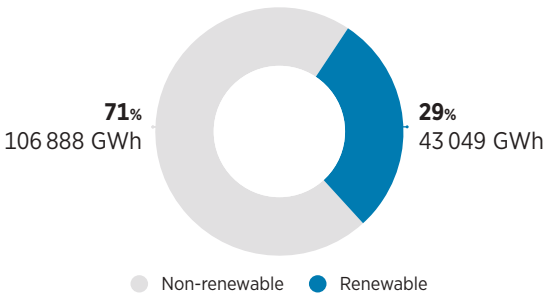
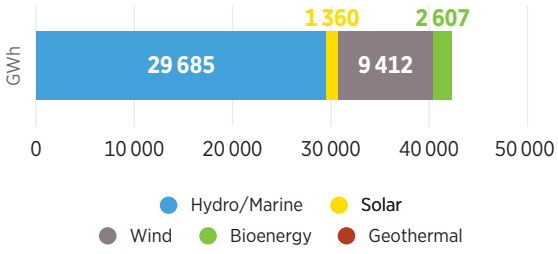


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Argentina

Support in implementation		
	Support is currently under discussion	
1	**Work package:** Renewables readiness assessment	**Source:** Government of Argentina

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

BAHAMAS

Membership since

3 May 2014 **SIDS**

Population

396 914 (2021)[1]

GDP per capita

USD 28 239.37 (2021)[2]

TPES[3]

Total: 36 534 TJ (2019)
(Renewable: 323 TJ)

Energy-related emissions relative to global

2.84 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Minimum of 30% renewables in the energy mix by 2030

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (39% area)
  1.6-1.8 MWh/kWp/yr (63% area)
- **Wind:** <260 W/m² (80% area)
  260-420 W/m² (20% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

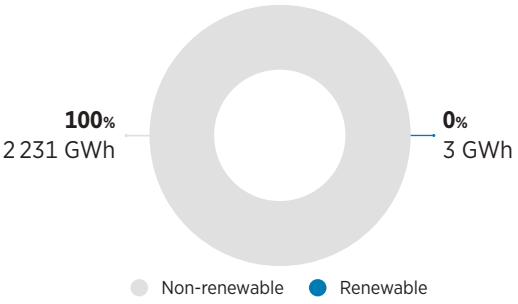
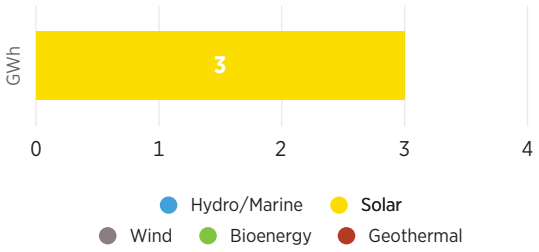


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Bahamas

Support in implementation

1	Support for two technical sessions as part of the virtual training programme for youth, with a focus on two of the identified key national priorities: renewable energy and NDC enhancement. The sessions will focus on renewable energy technologies, innovation and specific energy topics relevant to NDC implementation. The sessions will enhance participants' understanding of renewable energy technology and costs as well as mitigation and adaptation options, thereby facilitating capacity building and technology transfer

Work package:	Source:
Technology and infrastructure technical analysis	Government of Bahamas

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2016), IRENA Statistical Profile*

BARBADOS

Membership since

25 September 2014 **SIDS**

Population

287 708 (2021)[1]

GDP per capita

USD 17 033.94 (2021)[2]

TPES[3]

Total: 15 960 TJ (2019)
(Renewable: 713 TJ)

Energy-related emissions relative to global

1.23 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first updated NDC[5]

Conditional (by 2030):
95% renewables in the electricity mix

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (80% area)
  1.8-1.9 MWh/kWp/yr (19% area)
- **Wind:** <260 W/m² (71% area)
  260-420 W/m² (28% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

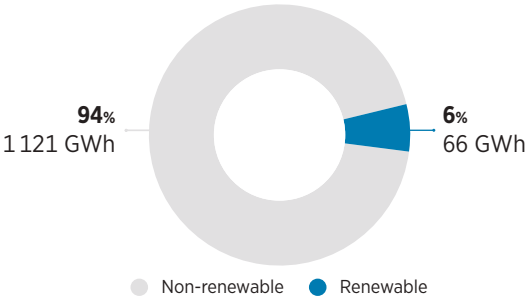
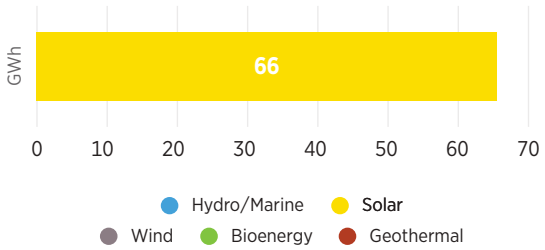


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Barbados

Support in implementation		
1	Support is currently under discussion	
	Work package:	**Source:** Government of Barbados
2	Support is currently under discussion.	
	Work package: Support is currently under discussion	**Source:** Government of Barbados

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

BELARUS

Membership since

27 February 2011

Population

9 340 314 (2021)[1]

GDP per capita

USD 7 303.69 (2021)[2]

TPES[3]

Total: 1 080 894 TJ (2018)
(Renewable: 66 321 TJ)

Energy-related emissions relative to global

57.22 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Does not include quantified renewable energy targets

Resource potential[6]

- **Solar PV:** <1.2 MWh/kWp (100% area)
- **Wind:** 260 W/m² (97% area)
  260-420 W/m² (5% area)
- **Biomass:** 5.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

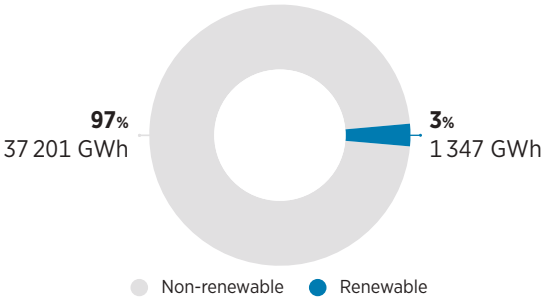
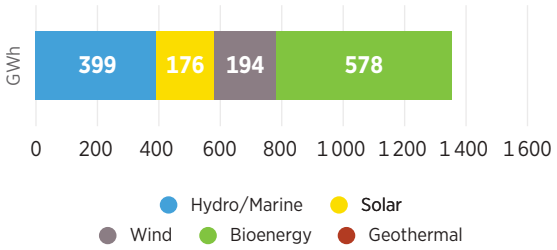


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Belarus

Support in implementation

1	Assessment of cost effective mitigation options for the power sector focusing on renewable energy technologies	
	Work package: Technology and infrastructure technical analysis	**Source:** UNDP
2	Building capacity in renewable energy technologies and related infrastructure, with a focus on NDC implementation	
	Work package: Technology and infrastructure capacity building	**Source:** UNDP
3	Capacity building workshop on auction design, a key recommendation from the renewables readiness assessment report	
	Work package: Capacity building on policy and finance	**Source:** Government of Belarus

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

BELIZE

Membership since

27 January 2013 **SIDS**

Population

404 915 (2021)[1]

GDP per capita

USD 4 420.49 (2021)[2]

TPES[3]

Total: 17 962 TJ (2019)
(Renewable: 7 202 TJ)

Energy-related emissions relative to global

0.73 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional:
Reduce emissions by
2 514 Gg of CO_2 via hydropower
518 Gg of CO_2 via solar PV and
947 Gg of CO_2 via bagasse

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (78% area)
  1.6-1.8 W/m² MWh/kWp/yr (18% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 5.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

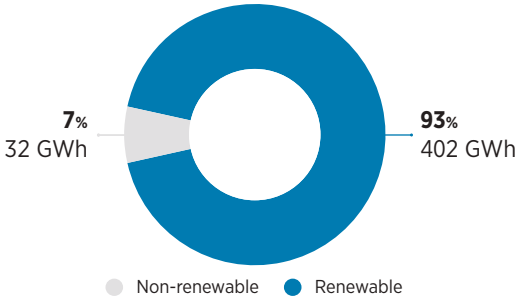
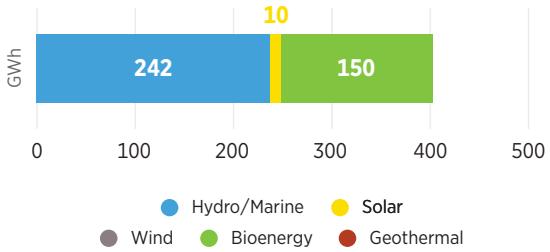


Figure 2 **Renewable electricity generation (GWh)**



Acknowledgement of IRENA support

"The updated NDC was supported by IRENA…"

(Belize's first [updated] NDC submission, 1 September 2021)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

IRENA climate action engagement in Belize

Support completed

1	Technical inputs from REmap to determine the potential to scale up the use of renewable energy, focusing on renewable technologies and on heating, cooling and transport technology options	
	Work package: Renewable energy roadmap	**Source:** UNFCCC
2	Review and analysis of existing mechanisms and frameworks for the collection and management of all data relevant to development of an MRV system, including identifying the key public and private sector stakeholders necessary for its design, development and sustainability	
	Work package: Data and statistics	**Source:** NDC Partnership
3	Recommendations on the policy, legal and institutional frameworks necessary for the development and implementation of the energy sector MRV system, as well as the supporting co-ordination mechanisms, based on international best practices	
	Work package: Capacity building on policy and finance	**Source:** NDC Partnership
4	Design of an MRV system to support tracking of greenhouse gas emissions, the impact of mitigation and adaptation actions, and climate finance flows that collectively contribute to the pursuit of communicated NDC targets	
	Work package: Monitoring, reporting and verification (MRV)	**Source:** NDC Partnership

Ronald Plett © Shutterstock

BENIN

Membership since

21 November 2012 **LDC**

Population

12 451 031 (2021)[1]

GDP per capita

USD 1 428.45 (2021)[2]

TPES[3]

Total: 219 872 TJ (2019)
(Renewable: 120 640 TJ)

Energy-related emissions relative to global

7.95 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first updated NDC[5]

By 2030, install 843 MW of renewable capacity in the energy mix

Resource Potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (22% area)
  1.4-1.6 MWh/kWp/yr (70% area)
  1.6-1.8 MWh/kWp/yr (9% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 2.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

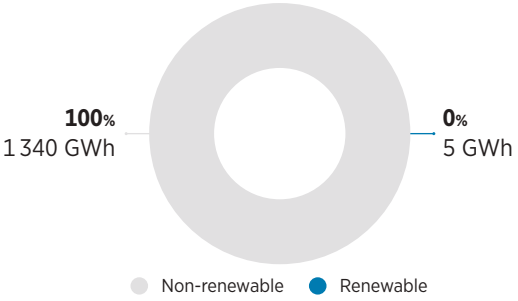
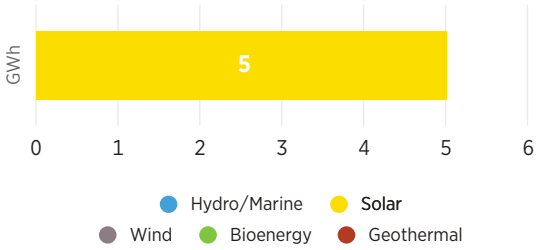


Figure 2 **Renewable electricity generation (GWh)**



IRENA Climate Action Engagement in Benin

Support completed

1	Capacity building support on a quantification study of greenhouse gas emissions from the NDC projects by sector	
	Work Package: Data and statistics	**Partner:** NDC Source

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

BHUTAN

Membership since

1 June 2016 **LDC / LLDC**

Population

779 900 (2021)[1]

GDP per capita

USD 3 000.78 (2020)[2]

TPES[3]

Total: 67 513 TJ (2019)
(Renewable: 80 505 TJ)

Energy-related emissions relative to global

0.7 $MtCO_2eq$ (2019)[4]

Renewable energy targets in second NDC[5]

Medium-term targets (2020-2028):
71.11 MW of utility-scale solar and wind energy; alternative renewable energy project to install roof-mounted solar PV on 300 rural households to enable access to clean energy and displace fuelwood consumption

Resource potential[6]

- **Solar PV:** 1.2-1.6 MWh/kWp/yr (50% area)
- **Wind:** 260 W/m² (99% area)
  420-560 W/m² (5% area)
- **Biomass:** 3.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

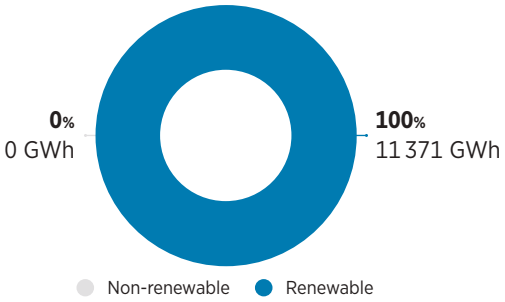
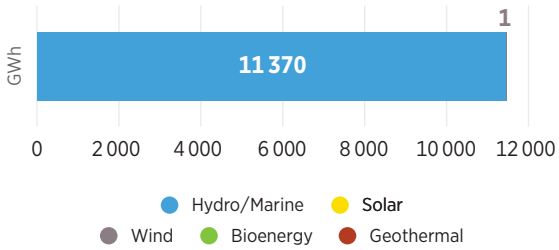


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Bhutan

Support completed

1	Comprehensive evaluations of the conditions for renewable energy deployment to identify a set of actions to scale up renewable energy and enhance greenhouse gas mitigation	
	Work package: Renewables readiness assessment	**Source:** Government of Bhutan

Acknowledgement of IRENA support

"The renewables readiness assessment (RRA) has been developed in co-operation with the International Renewable Energy Agency with a view to complement the country's efforts in enabling the wider penetration of various renewable energy technologies..."

(Bhutan's second NDC, 25 June 2021)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

BOSNIA AND HERZEGOVINA

Membership since

12 January 2011

Population

3 263 459 (2021)[1]

GDP per capita

USD 6 916.44 (2021)[2]

TPES[3]

Total: 297 639 TJ (2019)
(Renewable: 64 869 TJ)

Energy-related emissions relative to global

21.97 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional (by 2030):
70 MW of biomass co-generation plants
120 MW of mini-hydropower plants
175 MW of wind farms and
4 MW of solar PV modules

Resource potential[6]

- **Solar PV:** <1.2 MWh/kWp (20% area)
  1.2-1.4 MWh/kWp (65% area)
  1.4-1.6 MWh/kWp (15% area)
- **Wind:** 260 W/m² (69% area), 260-420 W/m² (17% area), 420-560 W/m² (10% area)
- **Biomass:** 5.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

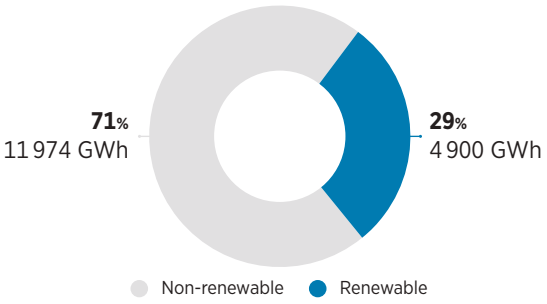
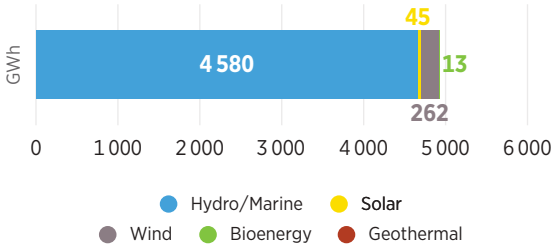


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Bosnia and Herzegovina

	Support in implementation	
1	RRA report including a chapter on bankability, combined with provisional notes that will serve the finalisation of the National Energy and Climate Plan (NECP)	
	Work package: Renewables readiness assessment	**Source:** Government of Bosnia and Herzegovina
2	Capacity building workshops on the socio-economic benefits of the energy transition, design of policy and measures in the heating and cooling sectors, and financing instruments for renewable energy	
	Work package: Capacity building on policy and finance	**Source:** Government of Bosnia and Herzegovina
3	Technical report with recommendations and actions for revising and aligning the NDC and NECP mitigation options	
	Work package: Technology and infrastructure technical analysis	**Source:** Government of Bosnia and Herzegovina

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

BOTSWANA

Membership since

23 June 2016 **LLDC**

Population

2 397 240 (2021)[1]

GDP per capita

USD 7 347.55 (2021)[2]

TPES[3]

Total: 97 847 TJ (2019)
(Renewable: 6 423 TJ)

Energy-related emissions relative to global

7.5 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2023, 100 MW of solar PV

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (10% area)
  1.8-1.9 MWh/kWp/yr (78% area)
  1.9-2.0 MWh/kWp/yr (18% area)
- **Wind:** 260 W/m² (97% area),
  260-420 W/m² (5% area)
- **Biomass:** 2.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

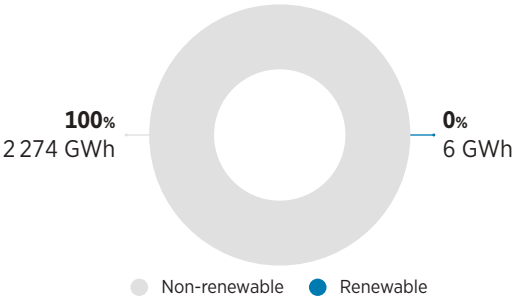
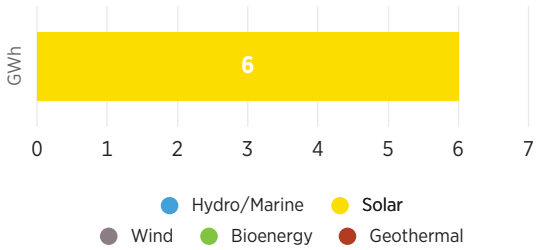


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Botswana

Support in implementation		
	Greenhouse gas reporting and energy statistics	
1	**Work package:** Data and statistics	**Source:** Government of Botswana

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2016), IRENA Statistical Profile*

BURKINA FASO

Membership since

25 July 2013 **LDC / LLDC**

Population

21 497 097 (2021)[1]

GDP per capita

USD 918.15 (2021)[2]

TPES[3]

Total: 198 887 TJ (2019)
(Renewable: 133 278 TJ)

Energy-related emissions relative to global

5.89 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, 36% renewable energy in total installed capacity, corresponding to 318 MW of renewable installed capacity, including 100 MW of small hydropower, 205 MW of solar and 13 MW of bioenergy

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (22% area)
  1.6-1.8 MWh/kWp/yr (78% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 1.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

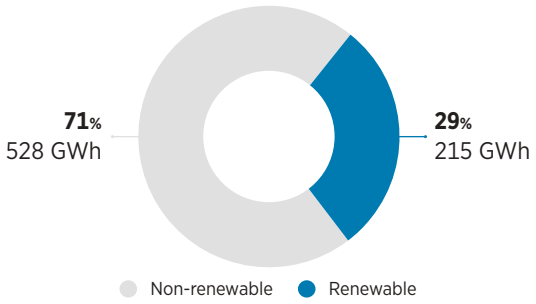
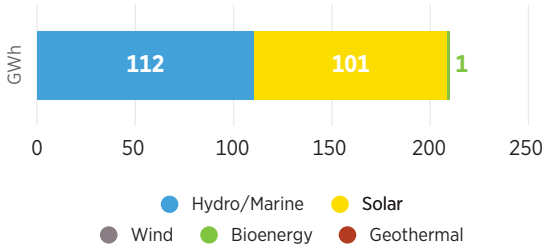


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Burkina Faso

Support completed

	Suitability assessment based on the Global Atlas for Renewable Energy	
1	**Work package:** Resource assessment	**Source:** Government of Burkina Faso

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

CAMBODIA

State in accession LDC

Population

16 946 446 (2021)[1]

GDP per capita

USD 1 590.96 (2021)[2]

TPES[3]

Total: 338 478 TJ (2019)
(Renewable: 167 460 TJ)

Energy-related emissions relative to global

13.88 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

25% renewables in the energy mix
(solar, wind, hydropower, biomass) by 2030

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp (16% area)
  1.4-1.6 MWh/kWp (83% area)
- **Wind:** 260 W/m² (98% area)
  260-420 W/m² (3% area)
- **Biomass:** 5.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

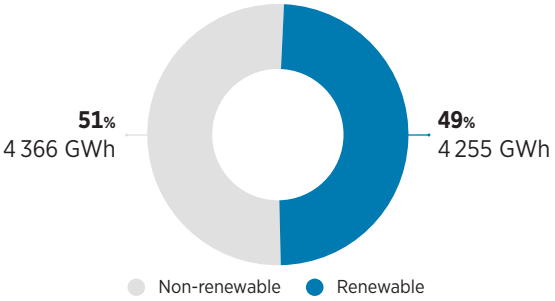
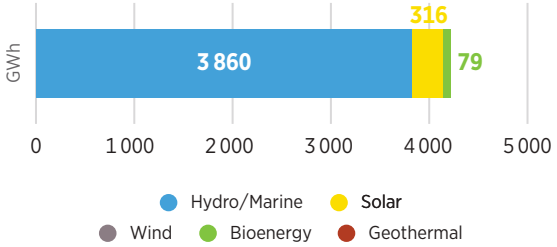


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Cambodia

Support in Implementation

Support is currently under discussion

1	**Work package:**	**Source:** NDC Partnership

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile*

CAMEROON

Membership since

20 August 2011

Population

27 224 262 (2021)[1]

GDP per capita

USD 1 661.7 (2021)[2]

TPES[3]

Total: 407 648 TJ (2019)
(Renewable: 308 796 TJ)

Energy-related emissions relative to global

13.7 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

25% renewables in the electricity mix by 2035

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp (23% area)
  1.4-1.6 MWh/kWp (36% area)
  1.6-1.8 MWh/kWp (37% area)
- **Wind:** 260 W/m² (98% area)
  260-420 W/m² (2% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

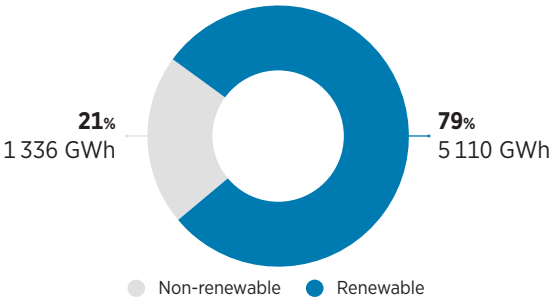
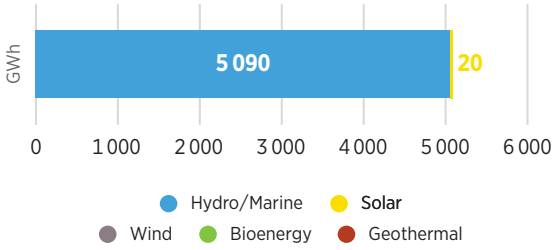


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Cameroon

Support completed

1	Assessment of technology options for power sector mitigation measures; capacity building for renewables, including dissemination of up-to-date technical information and know-how on renewables; capacity building on long-term energy planning	
	Work package: Technology and infrastructure capacity building	**Source:** NDC Partnership

Support in implementation

1	Capacity building workshops	
	Work package: Long-term energy planning	**Source:** NDC Partnership

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

CHAD

Membership since

24 May 2018 **LDC / LLDC**

Population

16 914 985 (2020)[1]

GDP per capita

USD 696.42 (2021)[2]

TPES[3]

Total: 94 886 TJ (2019)
(Renewable: 74 939 TJ)

Energy-related emissions relative to global

4.66 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Does not include quantified renewable energy targets

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp (56% area)
  1.8-1.9 MWh/kWp/yr (20% area)
  1.9-2.0 MWh/kWp/yr (22% area)
  >2.0 MWh/kWp (5% area)
- **Wind:** 260 W/m² (44% area)
  260-420 W/m² (30% area)
  420-560 W/m² (21% area)
  560-670 W/m² (7% area)
  670-820 W/m² (5% area)
  >1 060 W/m² (2% area)
- **Biomass:** 0.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

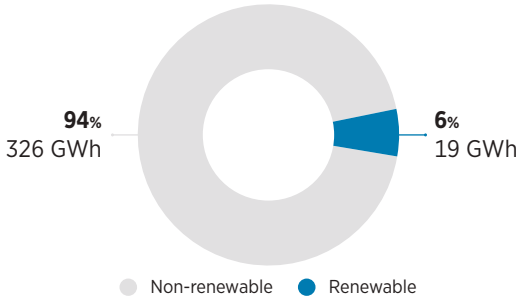
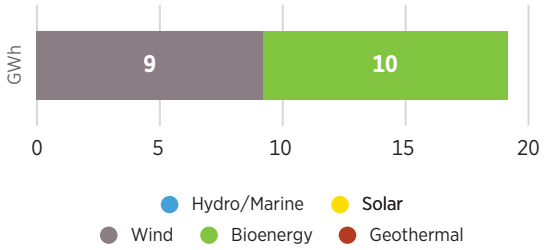


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Chad

Support in implementation

1	Comprehensive evaluations of the conditions for renewable energy deployment to identify a set of actions to scale up renewable energy and enhance greenhouse gas mitigation	
	Work package: Renewables readiness assessment	**Source:** Government of Chad

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

COLOMBIA

Membership since

7 February 2015

Population

51 265 841 (2021)[1]

GDP per capita

USD 6 131.23 (2021)[2]

TPES[3]

Total: 2 025 965 TJ (2019)
(Renewable: 348 625 TJ)

Energy-related emissions relative to global

92.07 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Does not include quantifiable renewable energy targets

Resource potential[6]

- **Solar PV:** <1.2 MWh/kWp/yr (10% area)
  1.2-1.4 MWh/kWp/yr (45% area)
  1.4-1.6 MWh/kWp/yr (45% area)
- **Wind:** 260 W/m² (96% area)
  260-420 W/m² (3% area)
- **Biomass:** 9.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

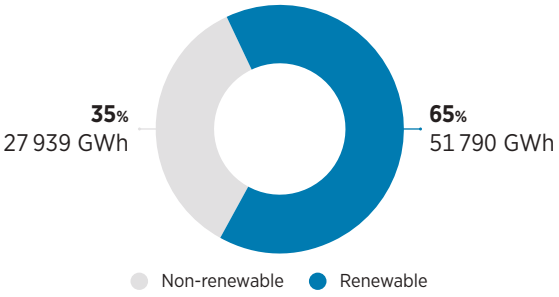
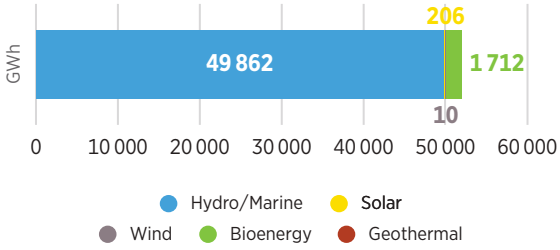


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Colombia

Support in implementation

1	Support on IRENA's suitability assessment to enable finding highly suitable areas for grid-connected and off-grid solar and wind project planning	
	Work package: Resource assessment	**Source:** Government of Colombia

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile*

COMOROS

Membership since

8 November 2015 **SIDS**

Population

888 456 (2021)[1]

GDP per capita

USD 1 494.7 (2021)[2]

TPES[3]

Total: 8 297 TJ (2019)
(Renewable: 3 835 TJ)

Energy-related emissions relative to global

0.32 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Increase renewable energy (by 2030), including 14 MW of solar and 14 MW of geothermal

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (30% area)
  1.6-1.8 MWh/kWp/yr (70% area)
- **Wind:** 260 W/m² (100% area),
- **Biomass:** 6.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

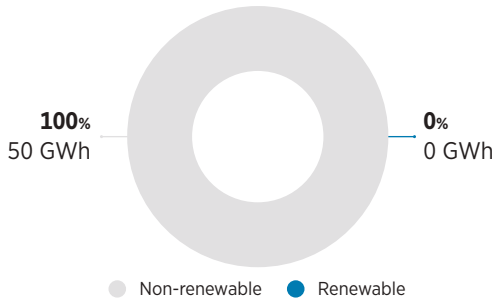
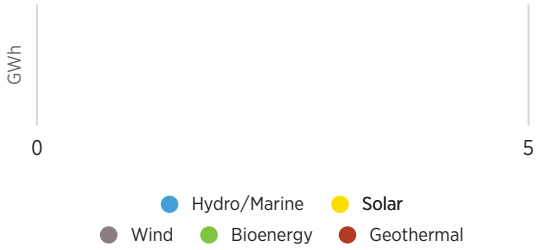


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Comoros

Support in implementation		
	SolarCity Simulator	
1	**Work package:** Resource assessment	**Source:** Government of Comoros

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

COOK ISLANDS

Non-membership **SIDS**

Population

17 000 (2021)[1]

GDP per capita

USD 16 700 (2016)[2]

TPES[3]

Total: 1 198 TJ (2019)
(Renewable: 49 TJ)

Energy-related emissions relative to global

0.09 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

100% renewable electricity by 2020

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (38% area)
  1.6-1.8 MWh/kWp/yr (75% area)
- **Wind:** 260 W/m² (35% area)
  260-420 W/m² (65% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

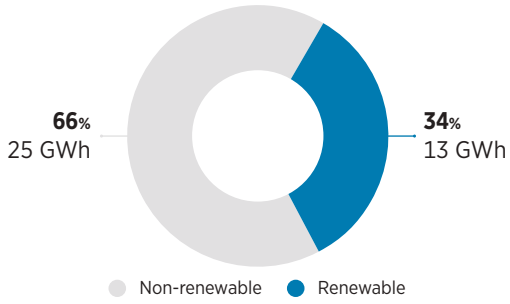
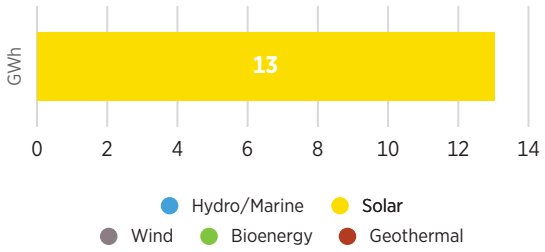


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Cook Islands

Support in implementation		
1	Socio-economic analysis	
	Work package: Data and statistics	**Source:** Government of Cook Islands

[1, 2, 3, 4, 5, 6] *World Bank national account data, World Bank Climate Change Knowledge Portal, IRENA Statistical Profile (2020), Climate Watch, Nationally Determined Contribution (2016), IRENA Statistical Profile (2020)*

CUBA

Membership since

29 April 2012 **SIDS**

Population

11 317 498 (2021)[1]

GDP per capita

USD 9 477.85 (2020)[2]

TPES[3]

Total: 367 086 TJ (2019)
(Renewable: 50 070 TJ)

Energy-related emissions relative to global

26.28 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, up to 24% renewable generation in the electricity matrix

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (21% area)
  1.6-1.8 MWh/kWp/yr (78% area)
- **Wind:** 260 W/m² (83% area)
  260-420 W/m² (18% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

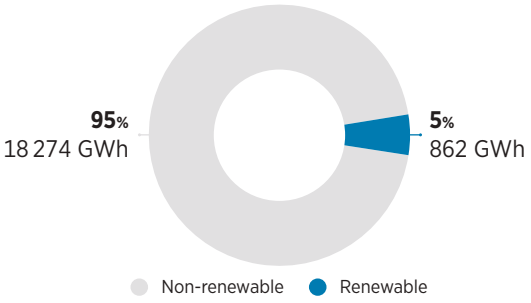
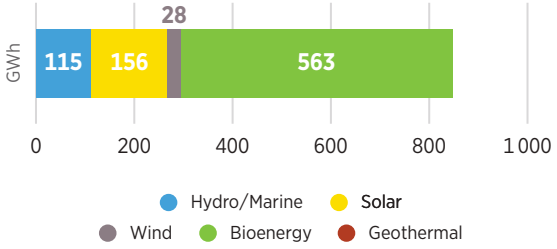


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Cuba

Support completed

1	Review and feedback on the energy component of the NDC	
	Work package: NDC review	**Source:** Government of Cuba

Support in discussion

1	Financing for efficient lights programme through IRENA's financing facilities, such as the Climate Investment Platform (CIP)	
	Work package: Project facilitation	**Source:** Government of Cuba

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile*

DOMINICA

Membership since

8 November 2020 **SIDS**

Population

72 172 (2021)[1]

GDP per capita

USD 7 559.97 (2021)[2]

TPES[3]

Total: 2 533 TJ (2019)
(Renewable: 140 TJ)

Energy-related emissions relative to global

0.17 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

100% renewable energy usage by 2030

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (15% area)
  1.4-1.6 MWh/kWp/yr (20% area)
  1.6-1.8 MWh/kWp/yr (65% area)
- **Wind:** <260 W/m² (60% area)
  260-420 W/m² (30% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

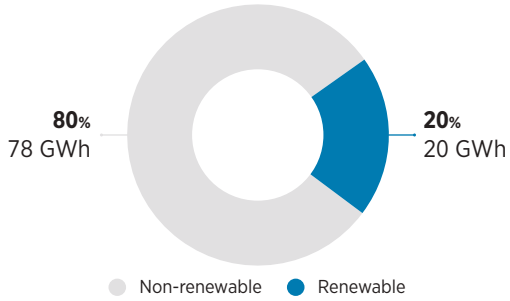
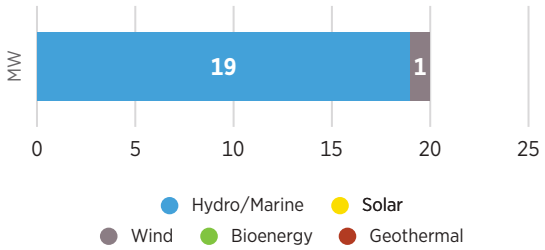


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Dominica

Support completed

1	Assessment of data gaps for the emission calculation, revision of the methodology for calculating emissions in the energy sector and facilitating intra/inter-institutional co-ordination to establish a functional, long-term system for the monitoring and verification of NDC implementation in the energy sector	
	Work package: Monitoring, reporting and verification (MRV)	**Source:** UNDP

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2022), IRENA Statistical Profile*

DOMINICAN REPUBLIC

Membership since

9 July 2010 **SIDS**

Population

10 953 714 (2021)[1]

GDP per capita

USD 8 603.79 (2021)[2]

TPES[3]

Total: 398 876 TJ (2019)
(Renewable: 32 367 TJ)

Energy-related emissions relative to global

25.76 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Installation of new wind farms, solar PV and small-scale biomass power generation, and increase in small hydroelectric plants

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (40% area)
  1.6-1.8 MWh/kWp/yr (57% area)
- **Wind:** 260 W/m² (90% area)
  260-420 W/m² (10% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

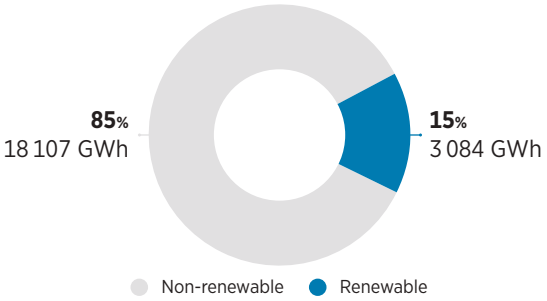
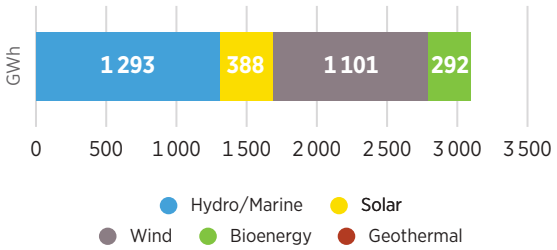


Figure 2 **Renewable electricity generation (GWh)**



Acknowledgement of IRENA support

"In the energy sector, the options were identified and evaluated with technical assistance from IRENA…"

(Dominican Republic first [updated] NDC submission, 29 December 2020)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile*

IRENA climate action engagement in Dominican Republic

Support completed

1	Technical inputs from the REmap study to scale up renewable energy technologies and heating, cooling and transport technology options	
	Work package: Renewable energy roadmap	**Source:** Government of the Dominican Republic

Support under implementation

1	Data gap analysis and development of local greenhouse gas emission factors for the energy sector **a.** Identify data gaps: comparison between current energy data flows and stakeholders vs. required/best practices **b.** Consolidation of data gaps into implementation solutions **c.** Implementation proposal for each data gap solution **d.** Design of a programme for the calculation of local emission factors for the energy sector, including capacity building with academia	
	Work package: Data and statistics	**Source:** NDC Partnership
2	MRV analysis and implementation support (MRV design and implementation plan) **a.** Quality review of current MRV across energy sub-sectors **b.** Identify requirements from MRV stakeholders (emission calculations, reporting structure, etc.) **c.** Design of modified/new MRV **d.** Implementation plan for MRV across energy sectors	
	Work package: Monitoring, reporting and verification (MRV)	**Source:** NDC Partnership
4	Training module focused on solar energy solutions in response to the Dominican Republic's need to further expand capacity to deploy climate resilient energy solutions and in alignment to the key technology as part of their updated NDC and NDC implementation	
	Work package: Technology and infrastructure capacity building	**Source:** NDC Partnership

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ECUADOR

Membership since

12 February 2011

Population

17 888 474 (2021)[1]

GDP per capita

USD 5 934.88 (2021)[2]

TPES[3]

Total: 624 757 TJ (2019)
(Renewable: 106 620 TJ)

Energy-related emissions relative to global

44.51 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional (by 2050):
Promote the use of geothermal and hydropower plants

Unconditional (by 2050):
Develop hydropower and non-conventional renewables (such as wind, solar and landfill gas) and power generation from landfill gas

Resource potential[6]

- **Solar PV:** < 1.2 MWh/kWp (36% area)
  1.2-1.4 MWh/kWp (47% area)
  1.4-1.6 MWh/kWp (11% area)
- **Wind:** 260 W/m² (97% area)
  260-420 W/m² (3% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

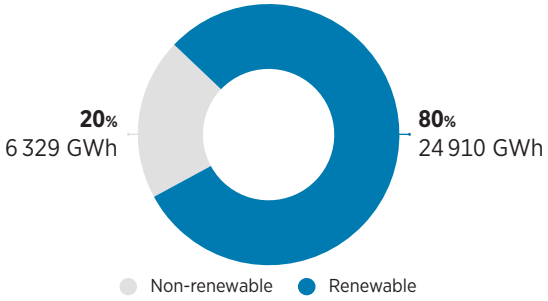
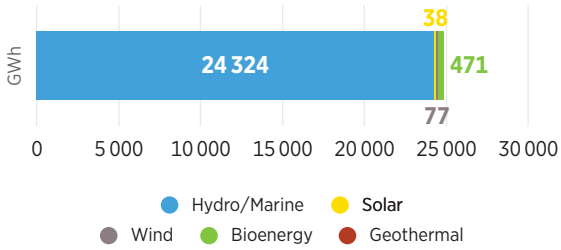


Figure 2 **Renewable electricity generation (GWh)**



[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2019), IRENA Statistical Profile*

IRENA climate action engagement in Ecuador

Support completed

1	Support the country in drafting a concept note to access Green Climate Fund finance for implementation of a national biodigester programme	
	Work package: Project facilitation	**Source:** NDC Partnership
2	Long-term energy planning capacity building through a mix of online software training and hands-on workshops to support the process of revising the energy component of the NDC; strengthen the country's capacities for energy planning and contribute to the preparation of roadmaps and long-term sector plans	
	Work package: Long-term energy planning	**Source:** NDC Partnership
3	Assess a total of seven solar PV and wind sites through the Global Atlas site appraisal service	
	Work package: Resource assessment	**Source:** Government of Ecuador

Support in implementation

1	Automatisation of calculations of the emission factors for the national grid to better predict emissions from energy generation	
	Work package: Data and statistics	**Source:** NDC Partnership
2	Support to enhance data, information and methods required to produce robust NDCs and NDC tracking in the energy and waste sectors. Analysis of data management and data availability in institutions related to MRV, as well as the tools, methodologies and technological equipment needed for the automatisation of processes that deliver reliable and accurate data for emission reductions	
	Work package: Monitoring, reporting and verification (MRV)	**Source:** NDC Partnership

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EGYPT

Membership since

11 July 2012

Major energy economies

Population

104 258 327 (2021)[1]

GDP per capita

USD 3 876.36 (2021)[2]

TPES[3]

Total: 4 103 955 TJ (2019)
(Renewable: 294 596 TJ)

Energy-related emissions relative to global

260.75 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Install additional renewable energy capacities to reach a 42% share in electricity by 2035

Resource potential[6]

- **Solar PV:** 1.8-1.9 MWh/kWp/yr (23% area)
  1.9-2.0 MWh/kWp/yr (65% area)
- **Wind:** 260-420 W/m² (57% area)
  420-560 W/m² (10% area)
- **Biomass:** 0.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

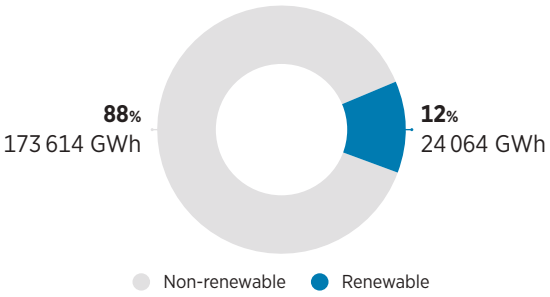
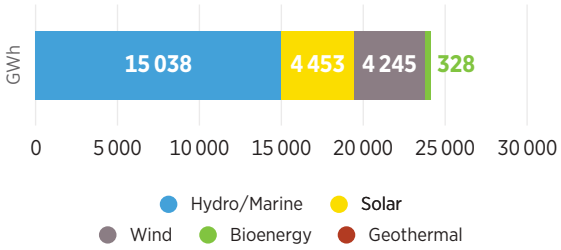


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Egypt

Support in implementation

	Develop an MRV system in line with international standards	
1	**Work package:** Monitoring, reporting and verification (MRV)	**Source:** Government of Egypt

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2022), IRENA Statistical Profile*

EL SALVADOR

Membership since

21 June 2017

Population

6 518 500 (2021)[1]

GDP per capita

USD 4 408.52 (2021)[2]

TPES[3]

Total: 194 296 TJ (2019)
(Renewable: 92 300 TJ)

Energy-related emissions relative to global

7.61 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Solar: renewable energy capacity by 50% compared to 2019, reaching 2 222 MW by 2030; generate between 86.1% and 85.7% of electricity from renewable sources by 2030

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (95% area)
- **Wind:** 260 W/m² (73% area)
  260-420 W/m² (15% area)
  420-560 W/m² (7% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

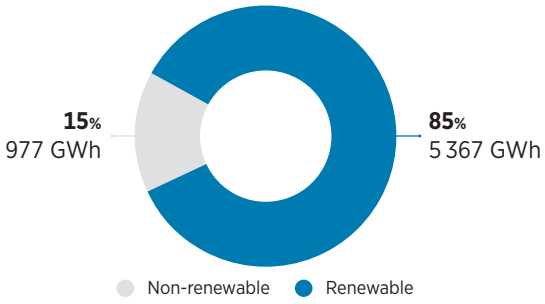
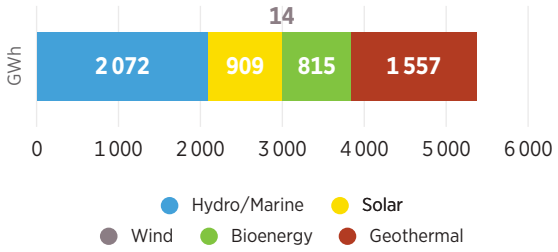


Figure 2 **Renewable electricity generation (GWh)**



[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2022), IRENA Statistical Profile*

IRENA climate action engagement in El Salvador

Support completed

1	Comprehensive evaluations of the conditions for renewable energy deployment to identify a set of actions to scale up renewable energy and enhance greenhouse gas mitigation	
	Work package: Renewables readiness assessment	**Source:** Government of El Salvador
2	Support the development of renewable energy technology plan and mitigation analysis in the agro-industrial sector of El Salvador	
	Work package: Technology and infrastructure technical analysis	**Source:** Government of El Salvador
3	Revision of national greenhouse gas targets' mitigation potential under the best information available. Includes reviewing inventories to ensure that the targets are reasonable and ambitious under the best available information derived from the latest inventories, country GDP, population growth, and national priorities, to inform more accurate mitigation targets under the NDC	
	Work package: Data and statistics	**Source:** Government of El Salvador
4	MRV analysis and implementation support, ensuring quality review of current MRV systems across energy sub-sectors; identifying requirements from MRV stakeholders (emission calculations, reporting structure, etc.), adjusting and creating new MRV systems, and developing an implementation plan for MRV across energy sectors	
	Work package: Monitoring, reporting and verification (MRV)	**Source:** Government of El Salvador
5	Guidance in NDC drafting through the identification of best practices and peer-to-peer support with other countries in the region; follow-up on the NDC drafting process, providing reviews and inputs to the energy component	
	Work package: NDC drafting support	**Source:** Government of El Salvador

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ESWATINI

Membership since

3 April 2011 **LLDC**

Population

1 172 369 (2021)[1]

GDP per capita

USD 4 214.86 (2021)[2]

TPES[3]

Total: 46 121 TJ (2019)
(Renewable: 31 017 TJ)

Energy-related emissions relative to global

1.05 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Double the share of renewables in the energy mix (from 16% to 32%) and reach 10% ethanol blending by 2030

Resource potential[6]

- **Solar PV:** 1.4-1.8 MWh/kWp/yr (68% area)
  1.6-1.8 MWh/kWp/yr (10% area)
- **Wind:** 260 W/m² (90% area)
  260-420 W/m² (10% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

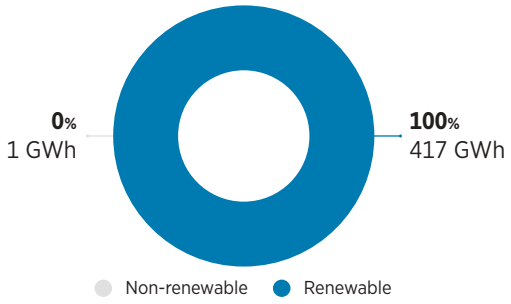
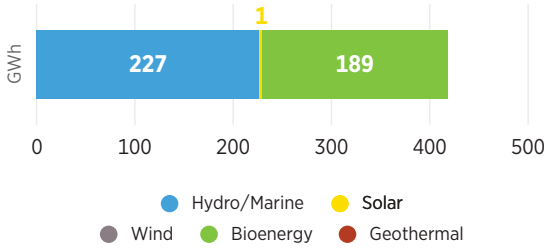


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Eswatini

Support completed

1	Technical power sector study to support the identification of cost-effective mitigation options for the energy sector to help country officials prioritise options that can serve as inputs to the NDC for the power and other relevant sectors	
	Work package: Long-term energy planning	**Source:** Government of Eswatini

Acknowledgement of IRENA support

"During the course of preparing the NDC, at various stages, contributions to the drafting thereof were made by IRENA…"

(Eswatini's first [updated] NDC submission, 9 October 2021)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

ETHIOPIA

Membership since

10 March 2012 **LDC / LLDC**

Population

117 876 226 (2021)[1]

GDP per capita

USD 943.97 (2021)[2]

TPES[3]

Total: 1 614 475 (2018)
(Renewable: 1 416 148 TJ)

Energy-related emissions relative to global

28.04 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, install 25 GW of power capacity, including 22 GW of hydropower, 2 GW of wind and 1 GW of geothermal

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (20% area)
  1.6-1.8 MWh/kWp (65% area)
  1.8-1.9 MWh/kWp/yr (18% area)
  1.9-2.0 MWh/kWp (2% area)
- **Wind:** 260 W/m² (89% area)
  260-420 W/m² (10% area)
  420-560 W/m² (2% area)
  670-820 W/m² (3% area)
- **Biomass:** 4.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

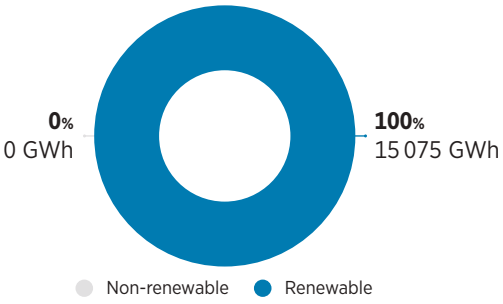
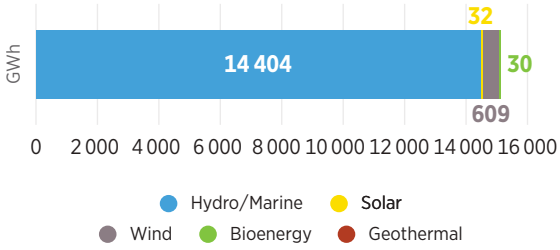


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Ethiopia

Support in implementation

1	Strengthening bioenergy data for monitoring SDGs and NDCs; energy surveys for NDC implementation roadmaps
	Work package: Data and statistics
	Source: Government of Ethiopia

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

FIJI

Membership since

2 December 2010 **SIDS**

Population

902 899 (2021)[1]

GDP per capita

USD 5 085.97 (2021)[2]

TPES[3]

Total: 26 126 TJ (2019)
(Renewable: 6 655 TJ)

Energy-related emissions relative to global

1.58 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional and unconditional (by 2030):
100% of electricity from renewables including: hydropower, geothermal, biomass, grid-connected solar and wind; 20% of energy sector CO_2 emissions under a business-as-usual scenario

Resource potential[6]

- **Solar PV:** <2.6 MWh/kWp/yr (22% area)
  1.2-1.4 MWh/kWp/yr (56% area)
  1.4-1.6 MWh/kWp/yr (17% area)
- **Wind:** 260 W/m² (60% area)
  260-420 W/m² (37% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

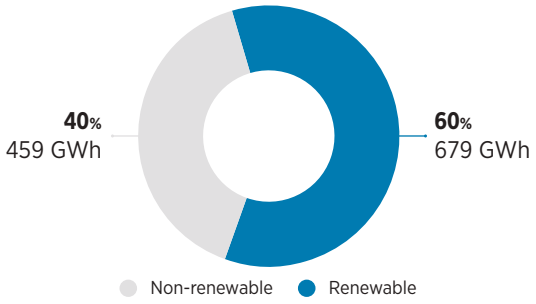
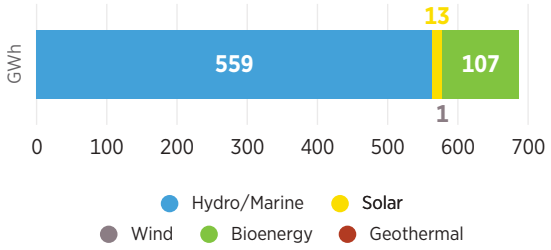


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Fiji

Support completed

	Activity on review of climate change bill	
1	**Work package:** Data and statistics	**Source:** Government of Fiji
	Identification of data gaps and review of methodology for energy statistics to support the MRV process	
2	**Work package:** Monitoring, reporting and verification (MRV)	**Source:** Government of Fiji

Support in implementation

	Socio-economic analysis	
1	**Work package:** Data and statistics	**Source:** Government of Fiji

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile (2020), Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile (2020)*

GABON

Membership since

11 June 2015

Population

2 278 829 (2021)[1]

GDP per capita

USD 8 016.99 (2021)[2]

TPES[3]

Total: 104 005 TJ (2019)
(Renewable: 59 350 TJ)

Energy-related emissions relative to global

10.2 $MtCO_2eq$ (2019)[4]

Renewable energy targets in second NDC[5]

Reach 80% electricity production from hydropower in 2020, with an additional 1 204 MW of hydropower by 2030

Resource potential[6]

- **Solar PV:** <1.2 MWh/kWp/yr (3% area)
  1.2-1.4 MWh/kWp/yr (93% area)
  1.4-1.6 MWh/kWp/yr (2% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 1.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

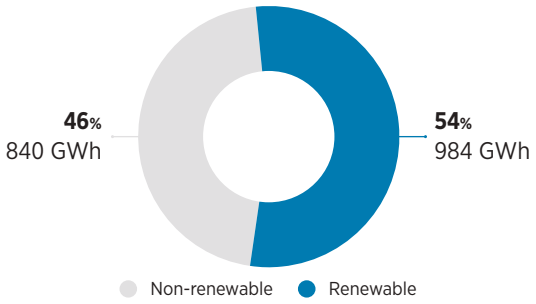
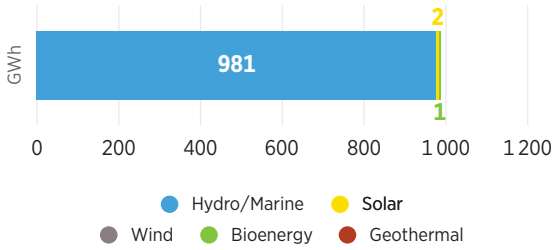


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Gabon

Support completed

1	Long-term energy planning capacity building through a mix of online software training and hands-on workshops to support the energy component of the NDC	
	Work package: Long-term energy planning	**Source:** NDC Partnership

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2022), IRENA Statistical Profile*

THE GAMBIA

Membership since

31 March 2011 **LDC**

Population

2 486 937 (2021)[1]

GDP per capita

USD 835.59 (2021)[2]

TPES[3]

Total: 15 485 TJ (2019)
(Renewable: 7 184 TJ)

Energy-related emissions relative to global

0.58 $MtCO_2eq$ (2019)[4]

Renewable energy targets in second NDC[5]

By 2030, achieve 38.9% renewable energy capacity, including 50 MW of solar PV and 20 MW of wind

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (100% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 1.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

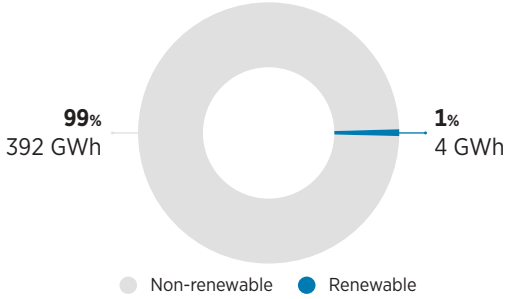
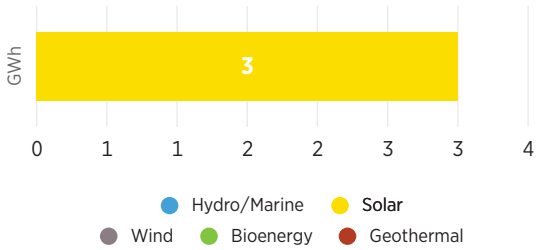


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in The Gambia

Support completed

1	Assessment for the cost effectiveness of mitigation options for the energy sector to support country to prioritise mitigation options supporting NDC for power and other relevant sectors	
	Work package: Technology and infrastructure technical analysis	**Source:** NDC Partnership

Acknowledgement of IRENA support

"The NDC2 revises and strengthens those mitigation measures and includes additional ones identified through the metabolic analysis and IRENA's work on the power sector. An additional eight mitigation measures were identified through the metabolic analysis, while IRENA defined eight for the power sector through the cost-effectiveness analysis of renewable energy mitigation options (five of which from the NDC1 were strengthened)."

(The Gambia's Second NDC, 12 September 2020)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

GHANA

Membership since

6 February 2014

Population

31 732 128 (2021)[1]

GDP per capita

USD 2 445.29 (2021)[2]

TPES[3]

Total: 443 974 TJ (2019)
(Renewable: 197 797 TJ)

Energy-related emissions relative to global

20.79 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Utility solar: 447.5 MW
distributed solar: 200 MW
standalone solar PV: 20 MW
solar street lighting: 25 MW
utility-scale wind: 325 MW
standalone wind systems: 2 MW
utility-scale biomass: 72 MW
utility-scale waste-to-energy: 50.1 MW
small hydropower plants: 150.03 MW
wave power: 50 MW
hybrid mini-grids by 2030: 12 MW

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (37% area)
  1.6-1.8 MWh/kWp/yr (63% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 4.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

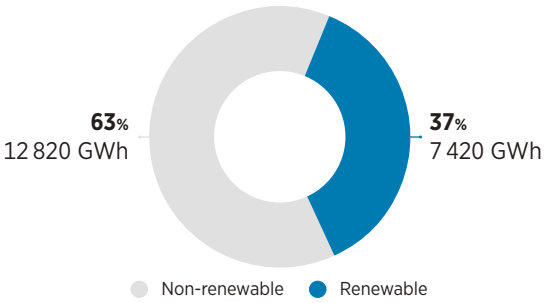
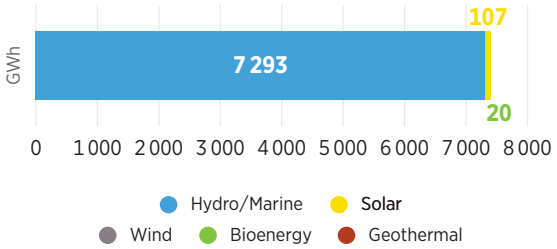


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Ghana

Support in implementation

1	Strengthening bioenergy data for monitoring SDGs and NDCs; energy surveys for NDC implementation roadmaps	
	Work package: Data and statistics	**Source:** Government of Ghana

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

GRENADA

Membership since

15 July 2011 **SIDS**

Population

113 015 (2021)[1]

GDP per capita

USD 9 928.62 (2021)[2]

TPES[3]

Total: 5 119 TJ (2019)
(Renewable: 378 TJ)

Energy-related emissions relative to global

0.33 $MtCO_2eq$ (2019)[4]

Renewable energy targets in second NDC[5]

Scale up geothermal electricity as assumed in the first NDC (15 MW); incorporate 15 MW of intermittent renewables for rapid energy transition

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (90% area)
- **Wind:** <260 W/m² (48% area)
  260-420 W/m² (45% area)
  420-560 W/m² (5% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

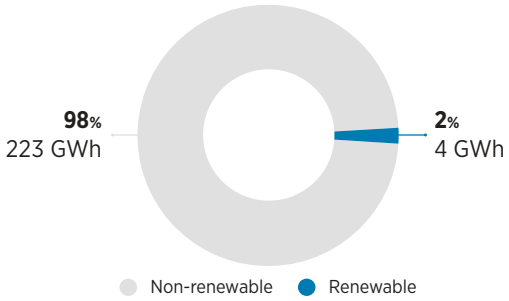
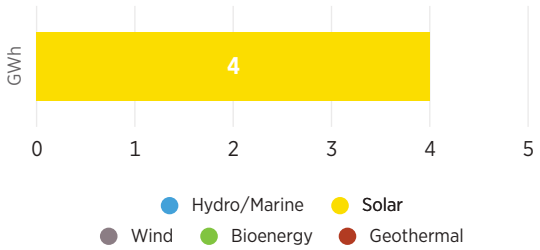


Figure 2 **Renewable electricity generation (GWh)**



Acknowledgement of IRENA support

"The Government of Grenada is appreciative of the support provided by … the International Renewable Energy Agency (IRENA)…"

(Grenada's second NDC, 30 November 2020)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile (2020), Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile (2020)*

IRENA climate action engagement in Grenada

Support completed

1	System analysis and maintenance and improvement of energy-related data collection and management for greenhouse gas emission reporting and tracking	
	Work package: Data and statistics	**Source:** NDC Partnership

Support in implementation

1	Assessment of potential mitigation measures in the power sector. Identification and spatial characterisation of mitigation options based on national circumstances	
	Work package: Technology and infrastructure technical analysis	**Source:** UNDP
2	Capacity building on energy management and energy auditing for various sectors, including residential, financial, hotel and government	
	Work package: Capacity building on policy and finance	**Source:** NDC Partnership

Kenrick Baksh © Shutterstock

GUYANA

Membership since

14 February 2014 **SIDS**

Population

790 329 (2021)[1]

GDP per capita

USD 9 374.80 (2021)[2]

TPES[3]

Total: 40 790 TJ (2019)
(Renewable: 3 534 TJ)

Energy-related emissions relative to global

2.77 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional (by 2025):
100% of electricity from renewables including 165 MW of hydropower

Unconditional:
26 MW of wind power

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (96% area)
  1.6-1.8 MWh/kWp/yr (5% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

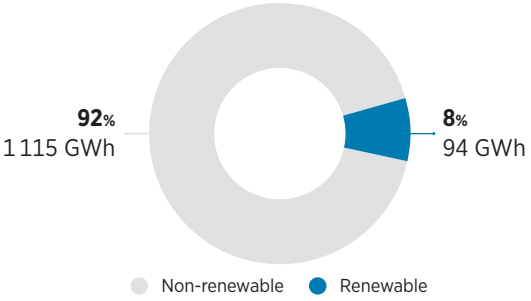
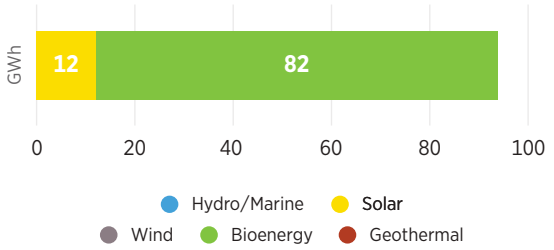


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Guyana

Support in implementation		
1	Support is currently under discussion	
	Work package:	**Source:** Government of Guyana
2	Support is currently under discussion	
	Work package:	**Source:** Government of Guyana

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile (2020), Climate Watch, Nationally Determined Contribution (2016), IRENA Statistical Profile (2020)*

INDONESIA

Membership since

7 September 2014

Population

276 361 788 (2021)[1]

GDP per capita

USD 4 291.81 (2021)[2]

TPES[3]

Total: 11 249 477 TJ (2019)
(Renewable: 2 315 352 TJ)

Energy-related emissions relative to global

650.47 $MtCO_2eq$ (2019)[4]

Renewable energy targets in revised first NDC[5]

New and renewable energy (geothermal, hydropower, solar PV, wind turbines, biomass and biofuels) of at least 23% in 2025 and at least 31% in 2050

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (60% area)
  1.4-1.6 MWh/kWp/yr (30% area)
  1.6-1.8 MWh/kWp/yr (9% area)
- **Wind:** 260 W/m² (98% area)
  260-420 W/m² (2% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

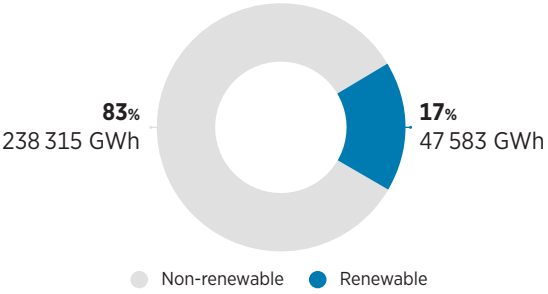
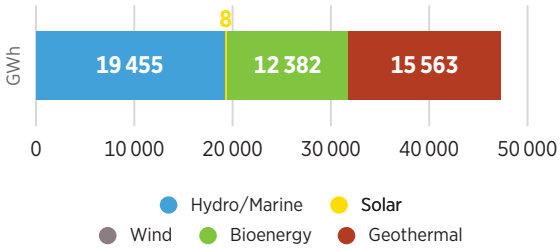


Figure 2 **Renewable electricity generation (GWh)**



[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2022), IRENA Statistical Profile*

IRENA climate action engagement in Indonesia

Support completed

1	At the G20 Investment Forum on Energy Transitions, facilitated support for business matchmaking with investors for nine projects; deep-dive workshops on addressing risks associated with project initiation, development and implementation towards creating strong enabling frameworks to finance the energy transition projects	
	Work package: Project facilitation	**Source:** Government of Indonesia

Support in implementation

1	Provision of input on the report *Stocktaking of Economic, Social and Environmental Impacts of Sustainable Recovery, including Impacts on NDC Implementation*. The study was mentioned in the G20 Chair's Summary Joint Environment and Climate Ministers' Meeting	
	Work package: Policy advice	**Source:** NDC Partnership
2	Support is currently under discussion	
	Work package:	**Source:** NDC Partnership

Akhmad Dody Firmansyah © Shutterstock

IRAQ

Membership since

30 December 2012

Population

41 179 351 (2021)[1]

GDP per capita

USD 5 048.39 (2021)[2]

TPES[3]

Total: 2 304 697 TJ (2018)
(Renewable: 23 978 TJ)

Energy-related emissions relative to global

290.51 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Increase renewables to 30% of the electricity supply by 2030

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (3% area)
  1.6-1.8 MWh/kWp/yr (85% area)
- **Wind:** <260 W/m² (20% area)
  260-420 W/m² (70% area)
  420-560 W/m (9% area)
- **Biomass:** 4.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

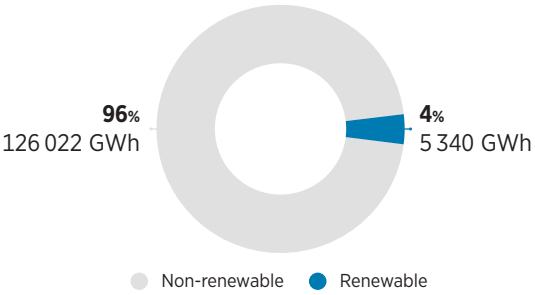
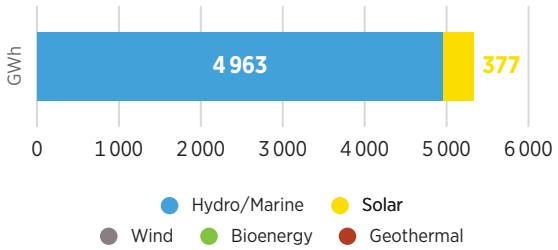


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Iraq

Support in implementation

1	High-level assessment of the grid hosting capacity and distribution to accommodate Variable Renewable Energy (VRE) integration and build countries' capacity on grid assessment studies and to establish a working model of the electricity system through simulation software training	
	Work package: Grid assessment and modelling	**Source:** UNDP

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

JORDAN

Membership since

2 August 2014

Population

10 269 022 (2021)[1]

GDP per capita

USD 4 405.84 (2021)[2]

TPES[3]

Total: 399 573 TJ (2019)
(Renewable: 15 266 TJ)

Energy-related emissions relative to global

23.61 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Increase renewable electricity generation from 20% in 2020 to 35% in 2030, and 9% energy efficiency distributed among residential, services and industry. Implementation through measures listed in the national strategy action plan; CSP of 100 MW and 300 MW

Resource potential[6]

- **Solar PV:** 1.8-1.9 MWh/kWp/yr (50% area)
  1.9-2.0 MWh/kWp (49% area)
- **Wind:** 260 W/m² (62% area)
  260-420 W/m² (37% area)
- **Biomass:** 0.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

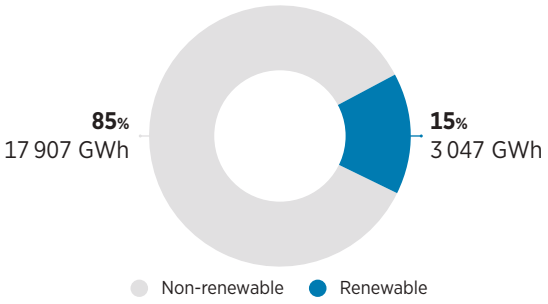
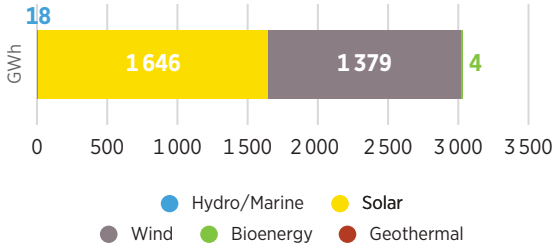


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Jordan

Support completed

1	Comprehensive evaluations of the conditions for renewable energy deployment to identify a set of actions to scale up renewables and enhance greenhouse gas mitigation	
	Work package: Renewables readiness assessment	**Source:** Government of Jordan

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

KAZAKHSTAN

Membership since

5 July 2013 **LLDC**

Population

19 002 586 (2021)[1]

GDP per capita

USD 10 041.49 (2021)[2]

TPES[3]

Total: 3 006 382 TJ (2019)
(Renewable: 48 168 TJ)

Energy-related emissions relative to global

235.3 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Does not indicate quantifiable renewable energy targets

Resource potential[6]

- **Solar PV:** <1.2 MWh/kWp/yr (10% area)
  1.2-1.4 MWh/kWp/yr (59% area)
  1.4-1.6 MWh/kWp/yr (30% area)
- **Wind:** 260 W/m² (18% area)
  260-420 W/m² (62% area)
  420-560 W/m² (17% area)
- **Biomass:** 1.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

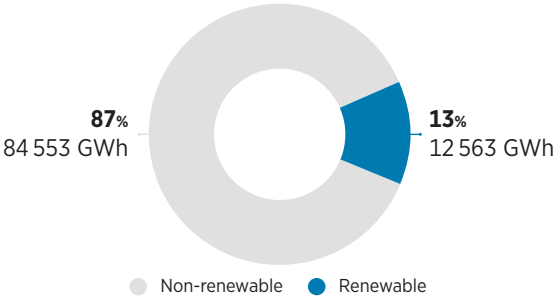
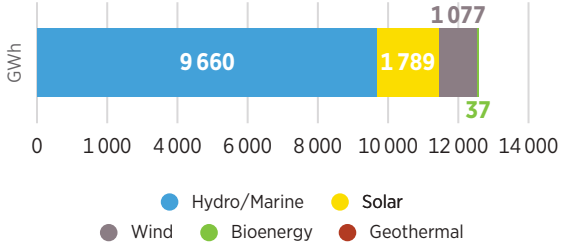


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Kazakhstan

Support in implementation

1	End user energy survey to improve and build comprehensive energy balances, annual energy reports and energy commodity accounts. The survey will focus on residential sector energy end use	
	Work package: Data and statistics	**Source:** Government of Kazakhstan

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2016), IRENA Statistical Profile*

KIRIBATI

Membership since

17 September 2014

Population

121 388 (2021)[1]

GDP per capita

USD 1 514.59 (2020)[2]

TPES[3]

Total: 1 582 TJ (2019)
(Renewable: 562 TJ)

Energy-related emissions relative to global

0.09 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Renewable energy targets (23%-100%) for individual islands by 2025

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (10% area)
  1.6-1.8 MWh/kWp/yr (75% area)
  1.8-1.9 (20% area)
- **Wind:** 260 W/m² (98% area)
  260-420 W/m² (100% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

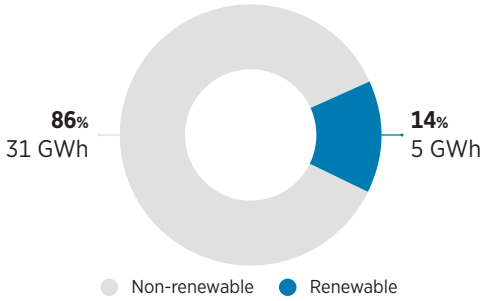
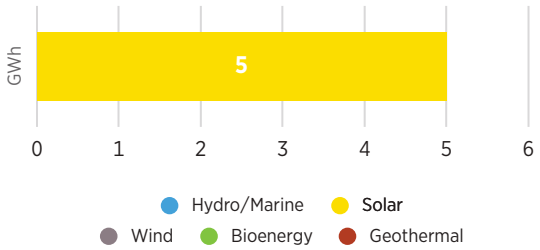


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Kiribati

Support in implementation

Socio-economic analysis

1	**Work package:** Data and statistics	**Source:** Government of Kiribati

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2016), IRENA Statistical Profile*

KYRGYZ REPUBLIC

Membership since

14 May 2021 **LLDC**

Population

6 694 200 (2021)[1]

GDP per capita

USD 1 276.24 (2021)[2]

TPES[3]

Total: 159 067 TJ (2019)
(Renewable: 50 406 TJ)

Energy-related emissions relative to global

9.71 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Does not include quantifiable renewable energy targets

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (37% area)
  1.4-1.6 MWh/kWp/yr (43% area)
  1.6-1.8 MWh/kWp/yr (10% area)
- **Wind:** 260 W/m² (72% area)
  260-420 W/m² (15% area)
  420-560 W/m² (% area)
- **Biomass:** 1.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

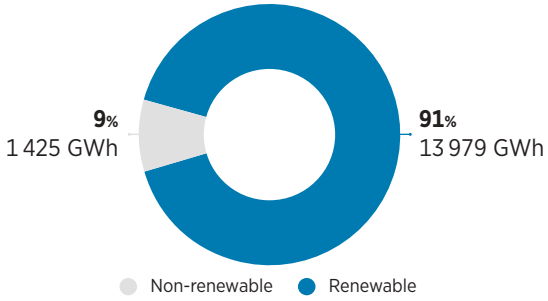
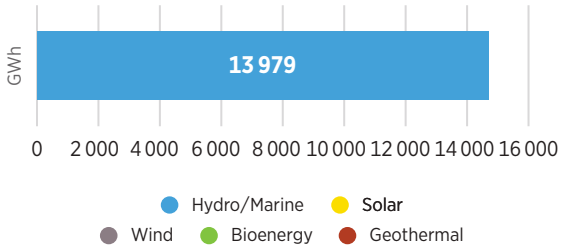


Figure 2 **Renewable electricity generation (GWh)**



Acknowledgement of IRENA support

"During the course of preparing the NDC, at various stages, contributions to the drafting thereof were made by IRENA."

(Kyrgyz Republic's first [updated] NDC submission, 9 October 2021)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

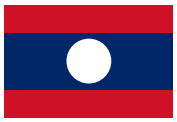
IRENA climate action engagement in Kyrgyz Republic

Support completed

IRENA's support on renewable energy assessment was used for the NDC update

	Comprehensive assessment of renewable energy sector background to identify a set of actions to scale up renewable energy in the context of the NDC	
1	**Work package:** NDC Note based on preliminary renewables readiness assessment (RRA) findings	**Source:** UNDP
	Suitability maps for solar PV and wind with promising zones for development	
2	**Work package:** Resource assessment	**Source:** UNDP
	As part of the RRA process, technical support on the design of renewable energy targets, presenting the design elements of targets together with the trade-offs of selecting one option over the other	
3	**Work package:** Capacity building on renewable energy target setting	**Source:** UNDP

elena moiseeva © Shutterstock



LAO PEOPLE'S DEMOCRATIC REPUBLIC

Non-membership **LDC**

Population

7 379 358 (2020)[1]

GDP per capita

USD 2 551.33 (2021)[2]

TPES[3]

Total: 285 325 TJ (2019)
(Renewable: 109 926 TJ)

Energy-related emissions relative to global

17.8 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional:
1 GW of solar and wind and 300 MW of biomass

Resource potential[6]

- **Solar PV:** 1.2-1.4 kWh/kWp/yr (57% area)
  1.4-1.6 kWh/kWp/yr (35% area)
- **Wind:** 260 W/m² (90% area)
  260-420 W/m² (9% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

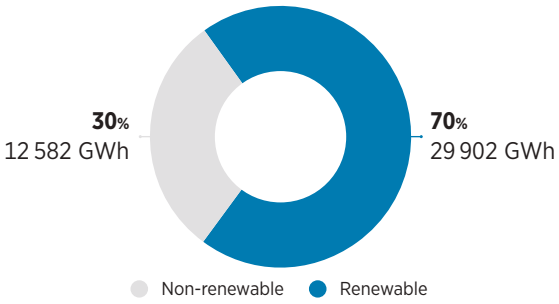
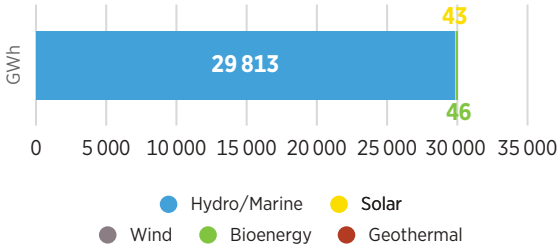


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Lao People's Democratic Republic

Support in Implementation

1 Technology capacity building programme providing technical information and best practices on solar PV mitigation measures specified in the country's NDC to facilitate NDC implementation, with a particular focus on performance, cost, and planning requirements of solar PV solutions

Work package:	**Source:**
Technology and infrastructure capacity building	NDC Partnership

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

LEBANON

Membership since

4 November 2017

Population

6 769 151 (2021)[1]

GDP per capita

USD 2 670.44 (2021)[2]

TPES[3]

Total: 350 442 TJ (2019)
(Renewable: 11 221 TJ)

Energy-related emissions relative to global

25.88 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Unconditional (by 2030):
generate 18% of electricity demand and 11% of heat demand (in the buildings sector) from renewable sources

Conditional (by 2030):
generate 30% of electricity demand and 16.5% of heat demand (in the buildings sector) from renewable sources

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (13% area)
  1.6-1.8 MWh/kWp/yr (62% area)
  1.8-1.9 MWh/kWp/yr (25% area)
- **Wind:** 260 W/m² (82% area)
  260-420 W/m² (13% area)
- **Biomass:** 0.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

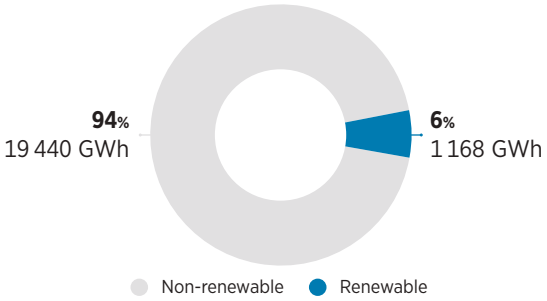
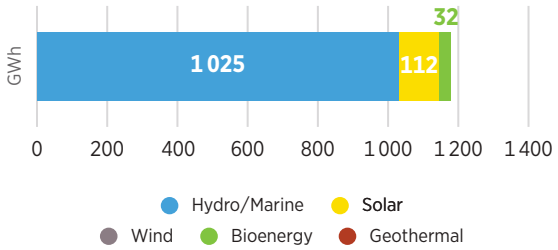


Figure 2 **Renewable electricity generation (GWh)**



Acknowledgement of IRENA support

"Lebanon commits to unconditionally generate 18% of the power demand (i.e. electricity demand) and 11% of its heat demand (in the building sector) from renewable energy sources in 2030, compared to a combined 15% in 2015. Conditionally, Lebanon commits to generate 30% of the power demand (i.e. electricity demand) and 16.5% of its heat demand (in the building sector) from renewable energy sources in 2030, compared to a combined 20% in 2015 (guided by the IRENA Renewable Energy Outlook: Lebanon)."

(Lebanon's first [updated] NDC submission, 16 March 2021)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

IRENA climate action engagement in Lebanon

Support completed

1	Combination of the two IRENA methodologies, RRA and REmap, to inform decision makers on the potential to scale up renewable energy ambitions	
	Work package: Renewable energy outlook	**Source:** Government of Lebanon

Support in implementation

1	High-level assessment of the grid's hosting capacity analysis and distribution to accommodate VRE integration and capacity building on improving the capacity of national stakeholders to perform grid assessment studies and to establish a working model of the electricity system through simulation software training	
	Work package: Grid assessment and modelling	**Source:** Government of Lebanon

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LESOTHO

Membership since

17 September 2014 **LDC / LLDC**

Population

2 159 067 (2021)[1]

GDP per capita

USD 1 166.46 (2021)[2]

TPES[3]

Total: 44 790 TJ (2019)
(Renewable: 18 121 TJ)

Energy-related emissions relative to global

0.77 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, additional renewable generation capacity of 200 MW

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (2% area)
  1.6-1.8 MWh/kWp (17% area)
  1.8-1.9 MWh/kWp/yr (78% area)
  1.9-2.0 MWh/kWp/yr (5% area)
- **Wind:** <260 W/m² (79% area)
  260-420 W/m² (13% area)
  420-560 W/m² (9% area)
  560-670 W/m² (2% area)
  820–1 060W/m² (2% area)
- **Biomass:** 4.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

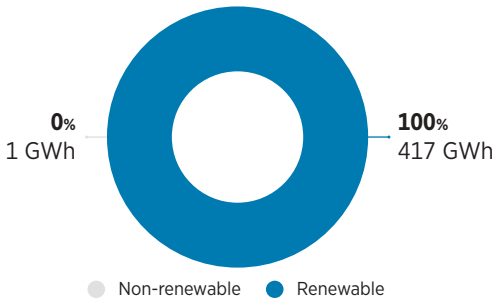
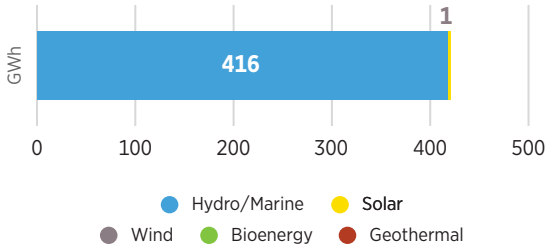


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Lesotho

Support in Implementation

1	Strengthening of bioenergy data for monitoring SDGs and NDCs; energy surveys for NDC implementation roadmaps	
	Work package: Data and statistics	**Source:** Government of Lesotho

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2018), IRENA Statistical Profile*

LIBERIA

State in accession LDC

Population

2 159 067 (2021)[1]

GDP per capita

USD 673.08 (2021)[2]

TPES[3]

Total: 100 939 TJ (2019)
(Renewable: 86 843 TJ)

Energy-related emissions relative to global

1.06 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, 95% renewable electricity capacity, corresponding to 1 011 MW, including,
503 MW of bioenergy,
456 MW of hydropower and
52 MW of solar PV

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (46% area)
  1.4-1.6 MWh/kWp/yr (55% area)
- **Wind:** 260 W/m2 (100% area)
- **Biomass:** 7.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

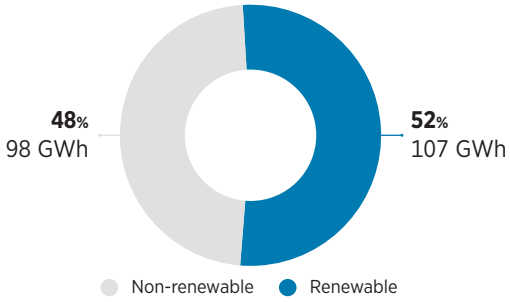
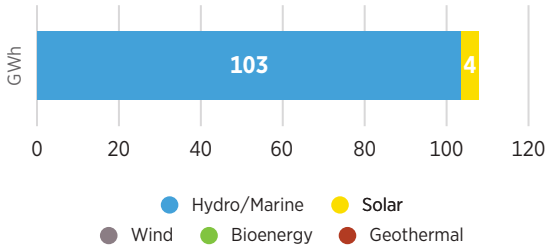


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Liberia

Support completed

Regional capacity building on planning and operation of power grids with higher shares of variable renewable energy

1	**Work package:** Climate innovation and technology capacity building	**Source:** NDC Partnership

Acknowledgement of IRENA support

"The robust process of the NDC revision would not have been possible without the support of the NDC Partnership… supported by: International Renewable Energy Agency…"

(Liberia first [updated] NDC submission, 4 August 2021)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

MALI

Membership since

18 November 2010 **LDC / LLDC**

Population

20 855 724 (2021)[1]

GDP per capita

USD 917.91 (2021)[2]

TPES[3]

Total: 211 639 TJ (2019)
(Renewable: 163 589 TJ)

Energy-related emissions relative to global

6.58 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, 58.3% renewables in total installed electricity capacity, representing 37.1% of the generation mix, including:
731 MW of medium and large hydropower
528 MW of solar
107 MW of small hydropower
30 MW of bioenergy
20 MW of wind

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (83% area)
  1.8-1.9 MWh/kWp (18% area)
- **Wind:** 260 W/m² (45% area)
  260-420 W/m² (50% area)
- **Biomass:** 0.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

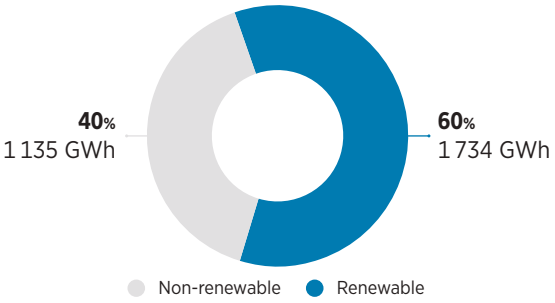
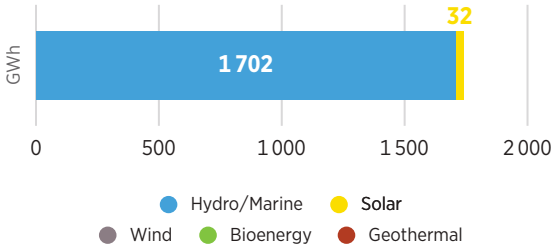


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Mali

Support completed

1	Support on site assessment	
	Work package: Resource assessment	**Source:** Government of Mali
2	Long-term energy planning capacity building through a mix of online software training and hands-on workshops to support the process of revising the energy component of the NDCs to strengthen capacities for energy planning and contribute to the preparation of roadmaps and long-term sectoral plans	
	Work package: Long-term energy planning	**Source:** NDC Partnership

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

MAURITIUS

Membership since

24 April 2011 **SIDS / LDC**

Population

1 266 060 (2021)[1]

GDP per capita

USD 8 812.11 (2021)[2]

TPES[3]

Total: 69 539 TJ (2019)
(Renewable: 9 781 TJ)

Energy-related emissions relative to global

4.23 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Does not include quantified renewable energy targets

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (17% area)
  1.6-1.8 MWh/kWp/yr (76% area)
- **Wind:** <260 W/m² (10% area)
  420-560 W/m² (80% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

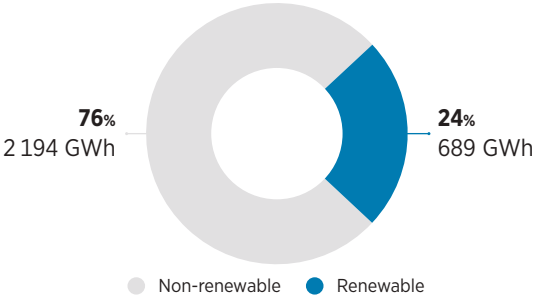
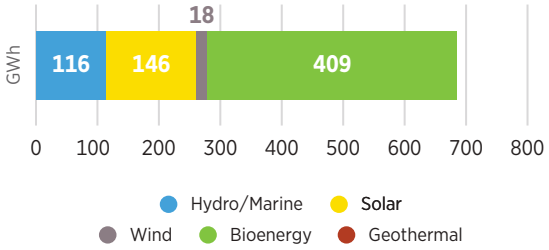


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Mauritius

Support completed

	SolarCity Simulator	
1	**Work package:** Resource assessment	**Source:** Government of Mauritius

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

FEDERATED STATES OF MICRONESIA

Membership since

23 November 2014

Population

116 255 (2021)[1]

GDP per capita

USD 3 476.65 (2021)[2]

TPES[3]

Total: 2 178 TJ (2019)
(Renewable: 40 TJ)

Energy-related emissions relative to global

0.18 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional (by 2030):
70% of total electricity generation from renewables

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (10% area)
  1.6-1.8 MWh/kWp/yr (90% area)
- **Wind:** 260 W/m² (98% area)
  260-420 W/m² (5% area)
- **Biomass:** 4.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

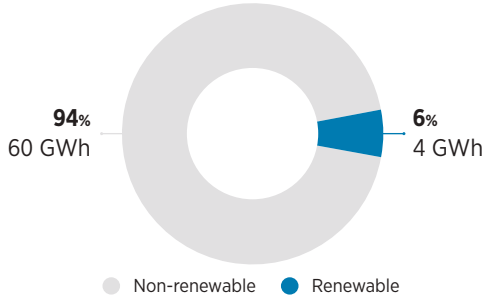
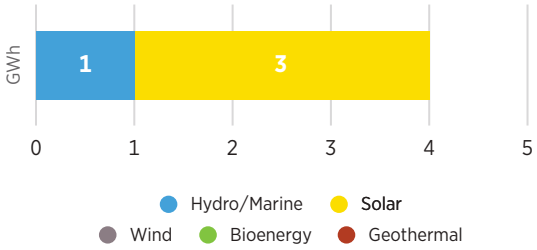


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in the Federated States of Micronesia

Support completed

	Socio-economic analysis	
1	**Work package:** Data and statistics	**Source:** Government of the Federated States of Micronesia

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2022), IRENA Statistical Profile*

MONGOLIAN PEOPLE'S REPUBLIC

Membership since

11 April 2010 **LLDC**

Population

3 329 282 (2021)[1]

GDP per capita

USD 4 534.92 (2021)[2]

TPES[3]

Total: 541 998 TJ (2019)
(Renewable: 8 429 TJ)

Energy-related emissions relative to global

24.33 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Use renewable energy sources, including hydro/wind/solar power plants, and heat pumps for heating utilities

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (16% area)
  1.6-1.8 MWh/kWp/yr (56% area)
  1.8-1.9 MWh/kWp/yr (25% area)
- **Wind:** <260 W/m² (40% area)
  260-420 W/m² (40% area)
  420-560 W/m² (18% area)
- **Biomass:** 0.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

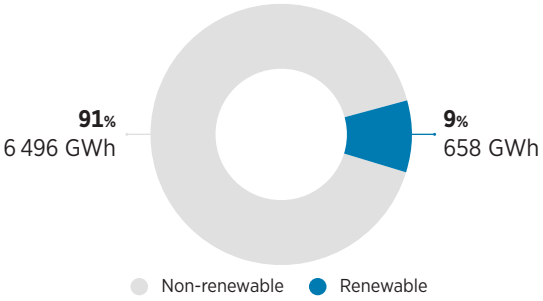
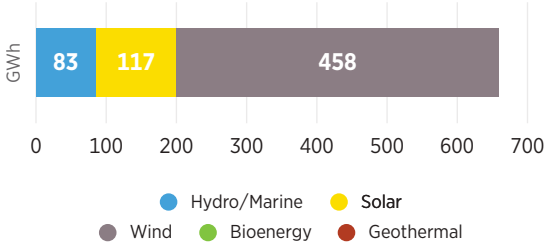


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Mongolia

Support in Implementation

	Policy advice on heating and cooling in the buildings sector	
1	**Work package:** Policy advice	**Source:** Government of Mongolia
	Technical assistance for the long-term low emission development strategy	
2	**Work package:** Development of long-term strategy	**Source:** Government of Mongolia

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile*

MOROCCO

Membership since

24 April 2015 **SIDS / LLDC**

Population

37 344 787 (2021)[1]

GDP per capita

USD 3 496.76 (2021)[2]

TPES[3]

Total: 941 084 TJ (2019)
(Renewable: 95 772 TJ)

Energy-related emissions relative to global

67.05 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

52% of installed electricity from renewable sources, including 20% from solar, 20% from wind and 12% from hydropower by 2030

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (17% area)
  1.6-1.8 MWh/kWp/yr (76% area)
- **Wind:** <260 W/m² (10% area)
  420-560 W/m² (80% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

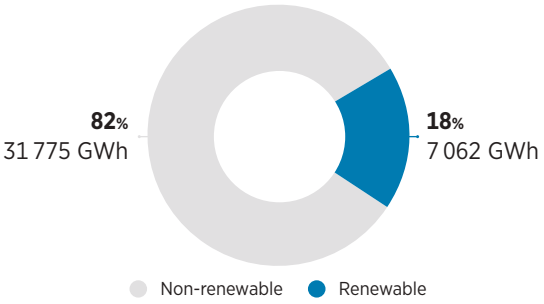
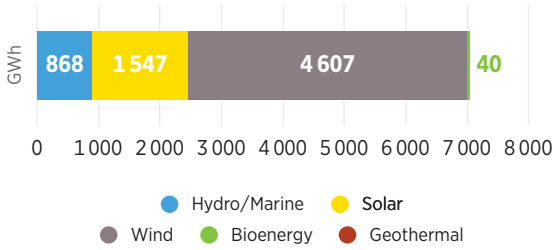


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Morocco

Support in Implementation

1	Assisting the government in strengthening national capacities by implementing a technical capacity building programme consisting of several workshops on renewable energy technologies and critical infrastructure for green hydrogen development as part of NDC implementation plans. The capacity building programme would provide national stakeholders with the technical understanding and know-how to design a robust NDC implementation strategy that places a premium on green hydrogen alongside renewable energy sources (and possibly others upon clarification with government officials)	
	Work package: Climate technology and infrastructure	**Source:** Government of Morocco
2	Support is currently under discussion	
	Work package:	**Source:**

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

MOZAMBIQUE

Membership since

28 April 2011 **LDC**

Population

32 163 045 (2021)[1]

GDP per capita

USD 500.44 (2021)[2]

TPES[3]

Total: 425 207 TJ (2019)
(Renewable: 325 365 TJ)

Energy-related emissions relative to global

10.81 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Above 50% renewables in total electricity production up to and during 2030, including: 3.5 GW of large hydropower, 200 MW of small and mini-hydropower, 150 MW of wind, 50 MW of solar and 50 MW of biomass

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (61% area)
  1.6-1.8 MWh/kWp/yr (39% area)
- **Wind:** <260 W/m² (97% area)
  260-420 W/m² (1% area)
- **Biomass:** 6.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

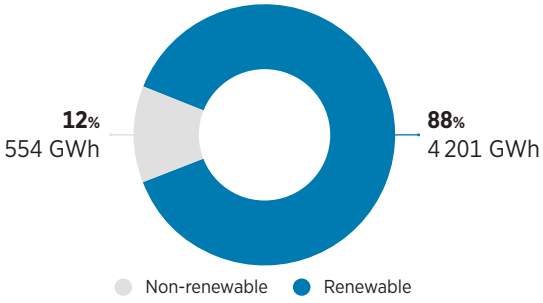
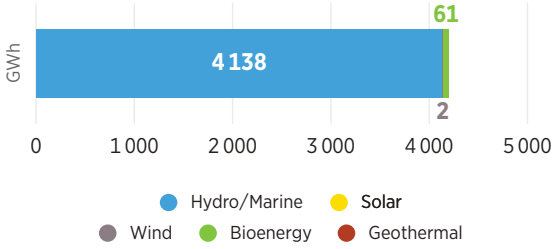


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Mozambique

Support completed

1	Activity to develop and implement a training capacity building package	
	Work package: Data and statistics	**Source:** NDC Partnership
2	Support for on-site assessment	
	Work package: Resource assessment	**Source:** Government of Mozambique

Support in implementation

1	A study on the renewable energy off-grid regulatory framework and business models and a capacity building workshop on best practices in legal frameworks for licencing or concession for mini/micro grids and different business models	
	Work package: Capacity building on policy and finance	**Source:** Government of Mozambique

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

MYANMAR

Non-member

Population

54 806 014 (2021)[1]

GDP per capita

USD 1 187.24 (2021)[2]

TPES[3]

Total: 977 042 TJ (2019)
(Renewable: 496 449 TJ)

Energy-related emissions relative to global

39.56 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional (by 2030):
new renewable energy target of 2 000 MW

Conditional (by 2030):
3 070 MW of renewables (solar and wind)

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (75% area)
- **Wind:** 260 W/m² (98% area)
  260-420 W/m² (5% area)
- **Biomass:** 4.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

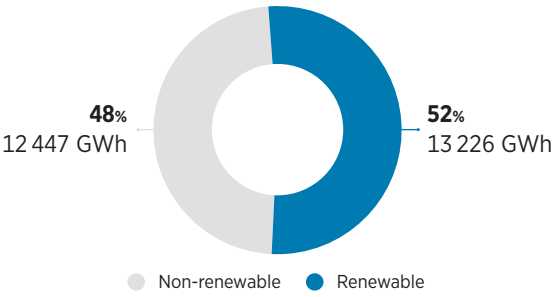
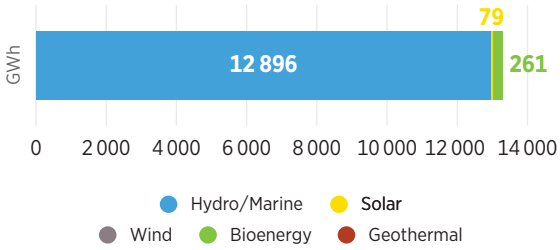


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Myanmar

Support completed

1	Review and provide comments on draft NDC on clean cooking, encouraging the use of improved cookstoves and renewable energy sources to reduce emissions. The first updated NDC (Annex VII: Adaptation projects supplementary information, p. 81) reflects potential socio-economic benefits through improved cookstoves and training in renewable energy technologies as means of adaptation	
	Work package: NDC review	**Source:** Government of Myanmar

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

NEPAL

Membership since

14 December 2017 **LDC / LLDC**

Population

29 674 920 (2021)[1]

GDP per capita

USD 1 222.88 (2021)[2]

TPES[3]

Total: 598 140 TJ (2019)
(Renewable: 463 117 TJ)

Energy-related emissions relative to global

13.7 $MtCO_2eq$ (2019)[4]

Renewable energy targets in second NDC[5]

Expand clean energy generation to around 15 000 MW, of which 5-10% will be generated from mini- and micro-hydro power, solar, wind and bioenergy. Of this, 5 000 MW is an unconditional target. Ensure that 15% of the total energy demand is supplied from clean sources

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (36% area)
  1.4-1.6 MWh/kWp/yr (41% area)
  1.6-1.8 MWh/kWp/yr (15% area)
- **Wind:** 260 W/m² (85% area)
  260-420 W/m² (10% area)
- **Biomass:** 5.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

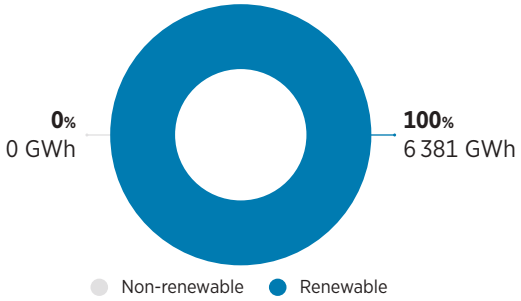
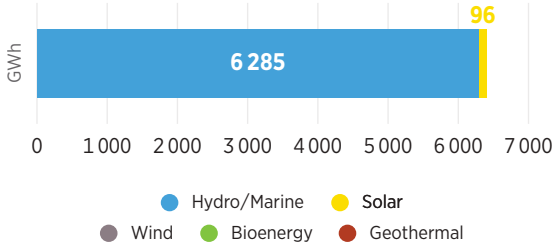


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Nepal

Support completed

1	Detailed review of the draft NDC identifying opportunities to increase ambition and provide actionable recommendations to include renewable energy technologies as mitigation options	
	Work package: NDC review	**Source:** Government of Nepal

Acknowledgement of IRENA support

"We would like to record our appreciation for the feedback from IRENA on draft NDC received at short notice..."

(Letter received from Government of Nepal, 18 December 2020)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile*

NICARAGUA

Membership since

23 October 2010

Population

6 702 379 (2021)[1]

GDP per capita

USD 2 090.75 (2021)[2]

TPES[3]

Total: 168 002 TJ (2019)
(Renewable: 97 029 TJ)

Energy-related emissions relative to global

5.36 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional (by 2030):
up to 65% renewable sources in the energy matrix

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (23% area)
  1.4-1.6 MWh/kWp/yr (55% area)
  1.6-1.8 MWh/kWp/yr (23% area)
- **Wind:** 260 W/m² (79% area),
  260-420 W/m² (13% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

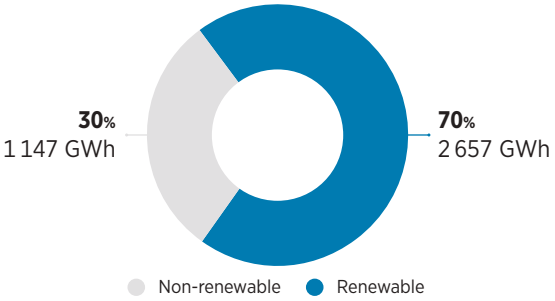
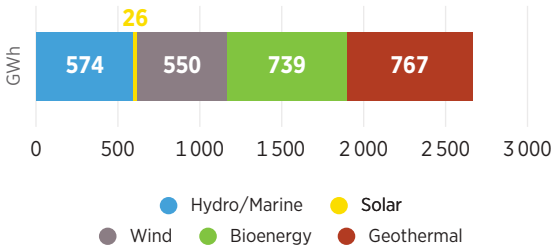


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Nicaragua

Support completed

1	Technical report with references to relevant existing published work to support the formulation of a strategy to continue expanding the energy matrix using renewable energy	
	Work package: Technology and infrastructure technical analysis	**Source:** NDC Partnership

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile*

NIGER

Membership since

16 December 2010 **LDC / LLDC**

Population

25 130 810 (2021)[1]

GDP per capita

USD 594.93 (2021)[2]

TPES[3]

Total: 104 953 TJ (2019)
(Renewable: 70 591 TJ)

Energy-related emissions relative to global

3.25 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, 28% renewable installed capacity and 57% renewable electricity generation, corresponding to 280 MW of renewables by 2030, including
130 MW of hydropower
150 MW of solar PV
100 MW off-grid

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (42% area)
  1.8-1.9 MWh/kWp/yr (38% area)
  1.9-2.0 MWh/kWp/yr (17% area)
- **Wind:** 260 W/m² (50% area),
  260-420 W/m² (43% area)
- **Biomass:** 0.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

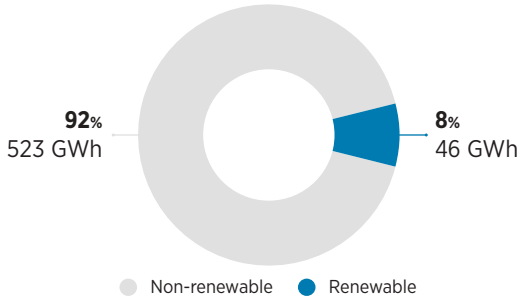
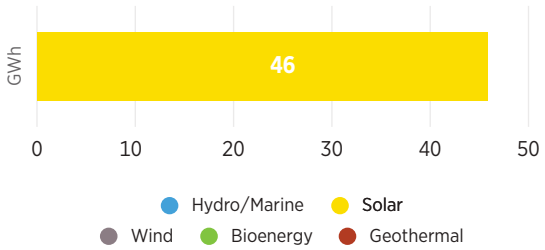


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Niger

Support completed

1	Long-term energy planning capacity building through a mix of online software training and hands-on workshops to support the process of revising the energy component of the NDC, strengthen capacities for energy planning and contribute to the preparation of roadmaps and long-term sectoral plans	
	Work package: Long-term energy planning	**Source:** NDC Partnership
2	Strengthening the monitoring mechanism for NDC implementation by establishing a sustainable monitoring system, training the stakeholders, defining the indicators, monitoring frequency, and good data collection, analysis and reporting. Development of mini greenhouse gas inventories and projections to inform new NDC targets	
	Work package: Monitoring, reporting and verification (MRV)	**Source:** NDC Partnership

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

NIGERIA

Membership since

30 September 2010

Population

211 400 704 (2021)[1]

GDP per capita

USD 2 085.03 (2021)[2]

TPES[3]

Total: 6 592 429 TJ (2018)
(Renewable: 4 954 442 TJ)

Energy-related emissions relative to global

186.31 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

43% installed renewable capacity in final electricity consumption, corresponding to 13 800 MW of renewables, including: 5 000 MW of solar PV; 4 700 MW of large hydropower, 1 200 MW of small hydropower, 1 100 MW of bioenergy, 1 000 MW of CSP and 800 MW of wind

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (37% area)
  1.6-1.8 MWh/kWp/yr (45% area)
- **Wind:** 260 W/m² (97% area)
  260-420 W/m² (2% area)
- **Biomass:** 2.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

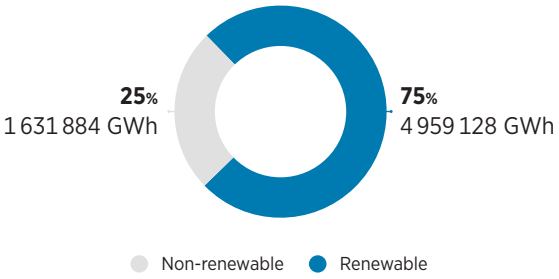
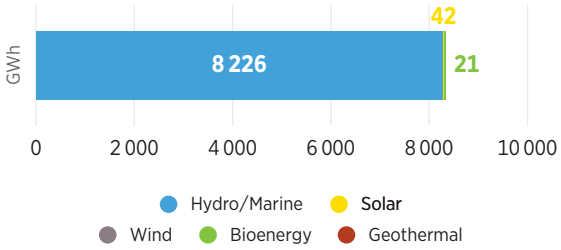


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Nigeria

Support in implementation

1	Enhance and establish an energy balance for Nigeria; establish a system to produce balances and MRV reporting for energy; capacity building on data collection and management	
	Work package: Data and statistics	**Source:** NDC Partnership
2	Development of four sector MRVs on agriculture, industry, transport, and oil and gas	
	Work package: Monitoring, reporting and verification (MRV)	**Source:** NDC Partnership

Acknowledgement of IRENA support

"Nigeria has, with support from … IRENA, in a coalition of development partners contributing through the NDC Partnership, carried out a significant enhancement program as part of the NDC update."

(Nigeria's first [updated] NDC submission, 30 July 2021)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile (2020), Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile (2020)*

NIUE

Non-member **SIDS**

Population

2 562 (2020)[1]

GDP per capita

USD 18 757 (2020)[2]

TPES[3]

Total: 108 TJ (2019)
(Renewable: 18 TJ)

Energy-related emissions relative to global

0.01 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional (by 2025):

Additional 42% (or higher) share of renewable energy

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (75% area)
- **Wind:** 260 W/m² (98% area)
  260-420 W/m² (5% area)
- **Biomass:** 4.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

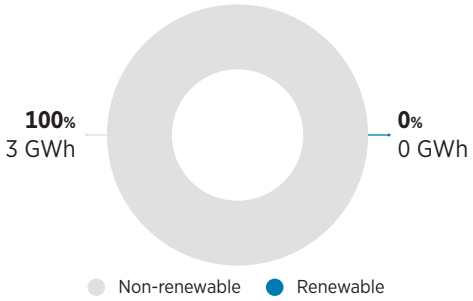
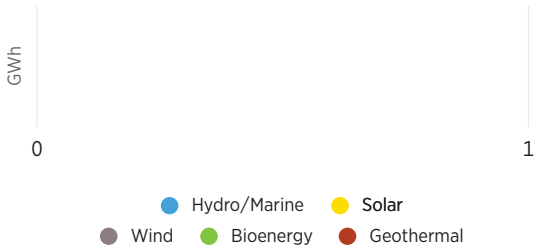


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Niue

Support in implementation

Socio-economic analysis

1	**Work package:** Data and statistics	**Source:** Government of Niue

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2016), IRENA Statistical Profile*

NORTH MACEDONIA

Membership since

29 December 2010 **LLDC**

Population

2 065 092 (2021)[1]

GDP per capita

USD 6 720.89 (2021)[2]

TPES[3]

Total: 121 132 TJ (2019)
(Renewable: 18 254 TJ)

Energy-related emissions relative to global

57 910 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

1 033 MW of hydropower
180 MW of solar
15 MW of biogas
15 MW of biogas combined heat and power plants and 15 MW of geothermal

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (65% area)
  1.4-1.6 MWh/kWp/yr (36% area)
- **Wind:** 260 W/m² (85% area)
  260-420 W/m² (10% area)
- **Biomass:** 5.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

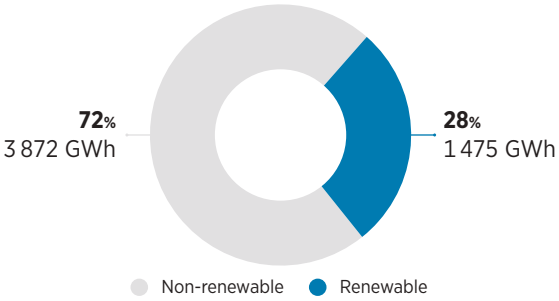
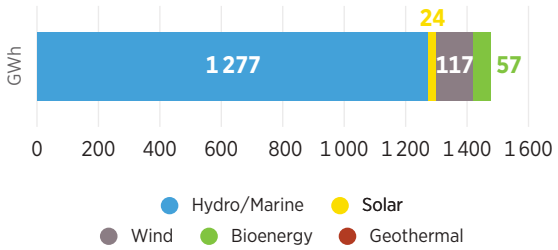


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in North Macedonia

Support completed

1	IRENA conducted the study *De-risking investments in North Macedonia: Renewable energy finance and policy focusing on power, heating and cooling*	
	Work package: Policy advice	**Source:** UNDP

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

PAKISTAN

Membership since

23 June 2016

Population

225 199 929 (2021)[1]

GDP per capita

USD 1 537.94 (2021)[2]

TPES[3]

Total: 3 870 742 TJ (2019)
(Renewable: 868 808 TJ)

Energy-related emissions relative to global

200.6 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, generate 60% of all energy from renewable sources, including hydropower

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (30% area)
  1.6-1.8 MWh/kWp/yr (39% area)
  1.8-1.9 MWh/kWp/yr (16% area)
  1.9-2.0 MWh/kWp/yr (10% area)
- **Wind:** 260 W/m² (77% area)
  260-420 W/m² (16% area)
  420-560 W/m² (5% area)
- **Biomass:** 0.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

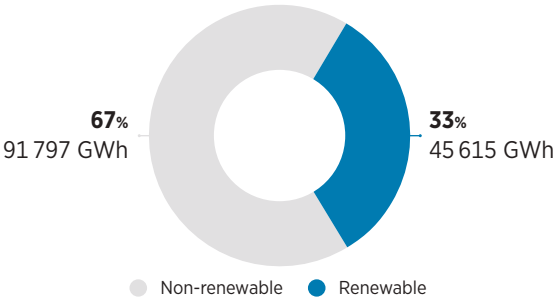
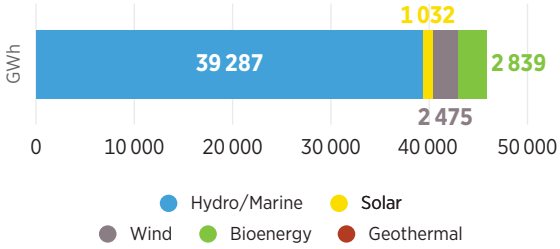


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Pakistan

Support in implementation

Support is currently under discussion

1	**Work package:**	**Source:** Government of Pakistan

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

PALAU

Membership since

27 December 2009 **SIDS**

Population

18 174 (2021)[1]

GDP per capita

USD 14 243.86 (2020)[2]

TPES[3]

Total: 3 049 TJ (2019)
(Renewable: 9 TJ)

Energy-related emissions relative to global

0.25 $MtCO_2eq$ (2019)[4]

ewable energy targets in first NDC[5]

15 MW of solar and 10 MW of hydropower

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (5% area)
  1.4-1.6 MWh/kWp/yr (98% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

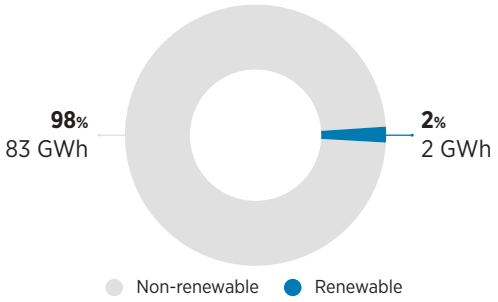
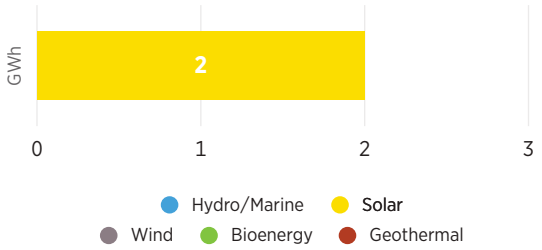


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Palau

Support completed

1	Support on the green hydrogen roadmap	
	Work package: Renewable energy roadmap	**Source:** Pacific NDC Hub

Support in implementation

1	Training on implementing and analysing the MRV template based on international guidelines; socio-economic analysis	
	Work package: Data and statistics	**Source:** Government of Palau
2	Training and the development of policies and environment to attract more public-private Sourceship for Palau Public Utilities Corporation (PPUC) to utilise appropriate ocean energy, ocean thermal energy conversion (OTEC) and green hydrogen	
	Work package: Capacity building on policy and finance	**Source:** Government of Palau

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2016), IRENA Statistical Profile*

PANAMA

Membership since

15 January 2012

Population

4 381 538 (2021)[1]

GDP per capita

USD 14 516.46 (2021)[2]

TPES[3]

Total: 217 733 TJ (2019)
(Renewable: 40 863 TJ)

Energy-related emissions relative to global

12.8 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Does not include quantifiable renewable energy targets

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (43% area)
  1.4-1.6 MWh/kWp/yr (52% area)
- **Wind:** 260 W/m² (86% area)
  260-420 W/m² (9% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

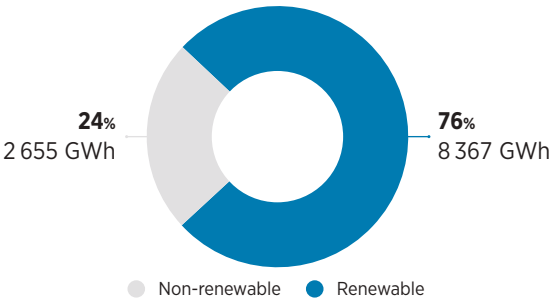
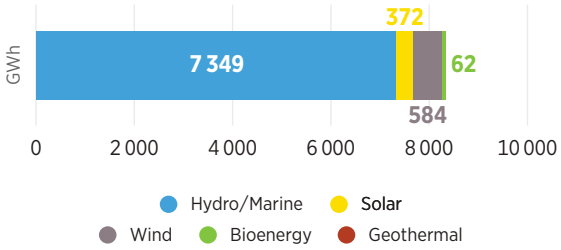


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Panama

Support in implementation		
1	Support is currently under discussion	
	Work package:	**Source:** Government of Panama
2	Support is currently under discussion	
	Work package:	**Source:** Government of Panama

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile*

PAPUA NEW GUINEA

State in accession **SIDS**

Population

9 119 005 (2021)[1]

GDP per capita

USD 2 916.36 (2021)[2]

TPES[3]

Total: 199 547 TJ (2019)
(Renewable: 89 512 TJ)

Energy-related emissions relative to global

12.8 $MtCO_2eq$ (2019)[4]

Renewable energy targets in second NDC[5]

Increase the installed capacity of on-grid renewable electricity generation to 78% by 2030

Resource potential[6]

- **Solar PV:** <1.2 MWh/kWp (16% area)
  1.2-1.4 MWh/kWp (62% area)
  1.4-1.6 MWh/kWp (22% area)
- **Wind:** 260 W/m² (89% area),
  260-420 W/m² (10% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

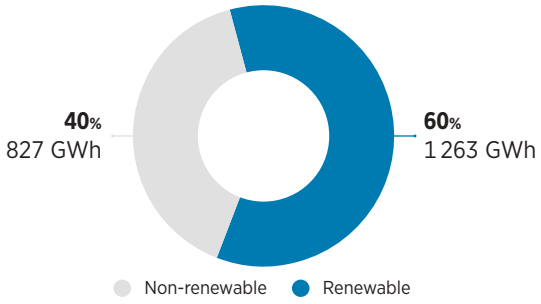
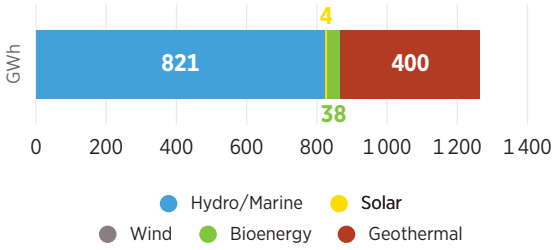


Figure 2 **Renewable electricity generation (GWh)**



Acknowledgement of IRENA support

"Special thanks also go to a number of development partners including IRENA for invaluable support."

(Papua New Guinea's first [updated] NDC submission, 16 December 2020)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile*

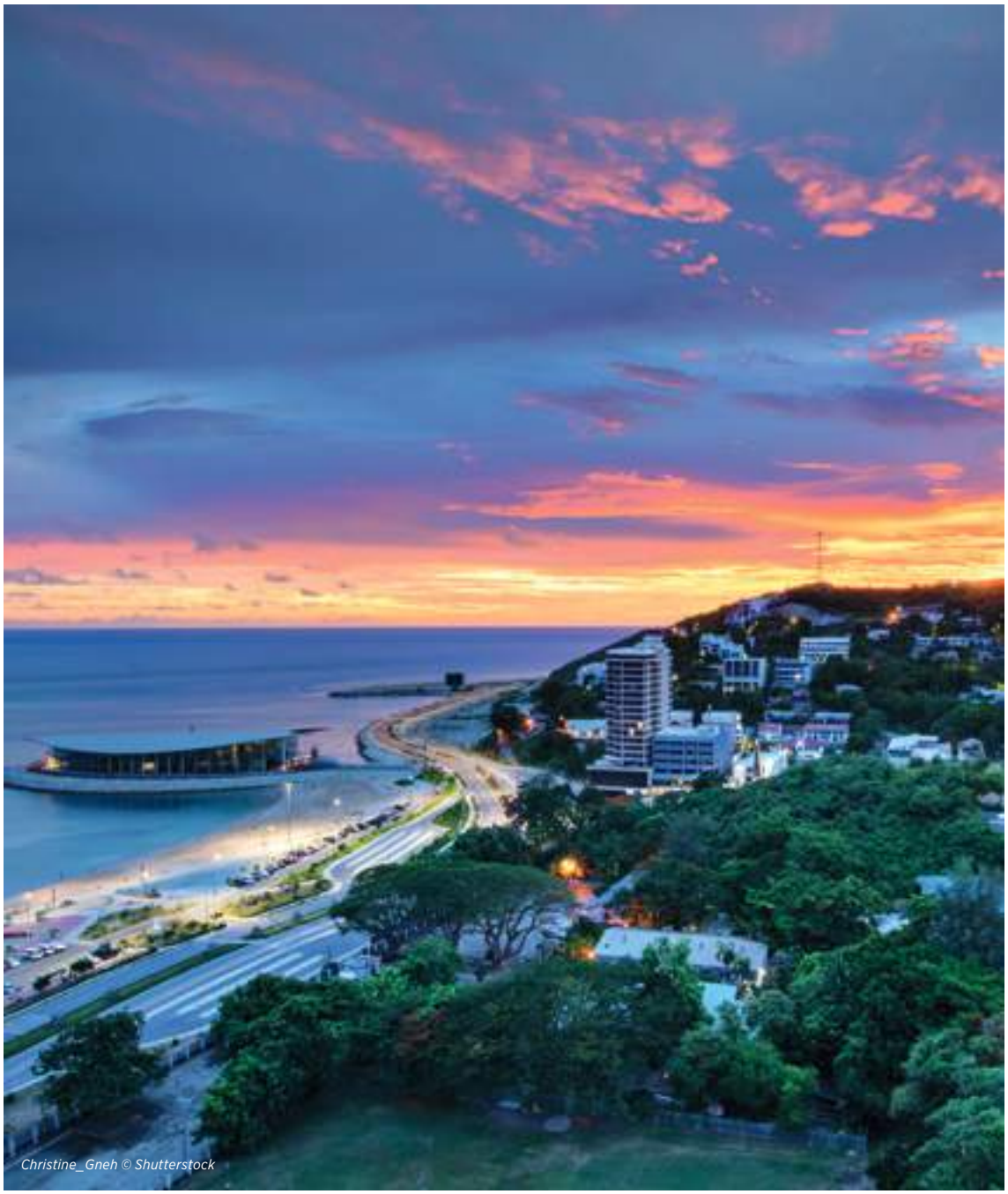
IRENA climate action engagement in Papua New Guinea

Support completed

1	Developing a system to collect reliable country-specific energy data and developing an integrated energy data management system with other sectors for planning and development of the Global Database of National GHG Inventory	
	Work package: Data and statistics	**Source:** NDC Partnership

Support in implementation

1	Socio-economic analysis	
	Work package: Data and statistics	**Source:** Government of Papua New Guinea



Christine_Gneh © Shutterstock

PARAGUAY

Membership since

2 March 2018 **LLDC**

Population

7 219 641 (2021)[1]

GDP per capita

USD 5 400.10 (2021)[2]

TPES[3]

Total: 293 059 TJ (2019)
(Renewable: 180 280 TJ)

Energy-related emissions relative to global

8.53 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Generate and promote alternative energy sources instead of hydropower in vulnerable communities

By 2030:
promote efficient stoves for vulnerable families in rural areas, especially those most dependent on biomass for cooking; promote distributed generation systems such as solar and wind in areas with limited access to energy sources; promote solar water heaters as a way to use solar thermal energy

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (100% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 5.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

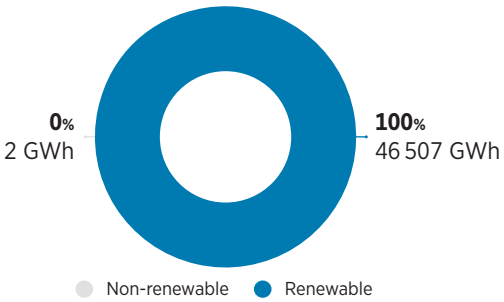
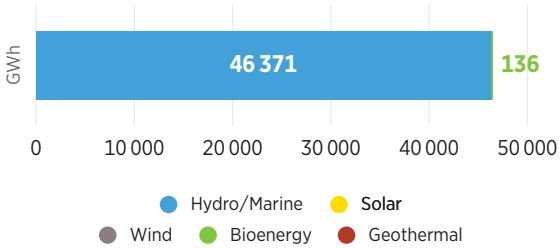


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Paraguay

Support completed

1	Comprehensive evaluation of the conditions for renewable energy deployment to identify a set of actions to scale up renewable energy and enhance greenhouse gas mitigation	
	Work package: Renewables readiness assessment	**Source:** Government of Paraguay

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

PERU

Membership since

21 November 2013

Population

33 359 416 (2021)[1]

GDP per capita

USD 6 692.25 (2021)[2]

TPES[3]

Total: 1 043 730 TJ (2019)
(Renewable: 231 698 TJ)

Energy-related emissions relative to global

57.06 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first updated NDC[5]

Does not include quantifiable renewable energy targets

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (43% area)
  1.4-1.6 MWh/kWp/yr (23% area)
  1.6-1.8 MWh/kWp/yr (10% area)
  < 2.0 MWh/kWp/yr (9% area)
- **Wind:** 260 W/m² (97% area)
  260-420 W/m² (2% area)
  670-820 W/m² (2% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

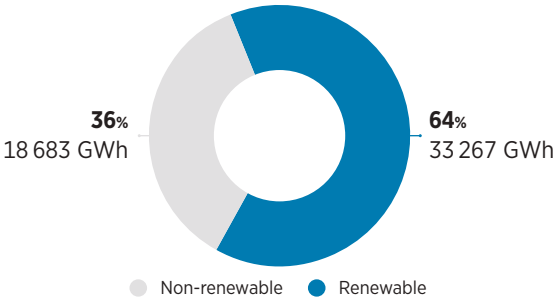
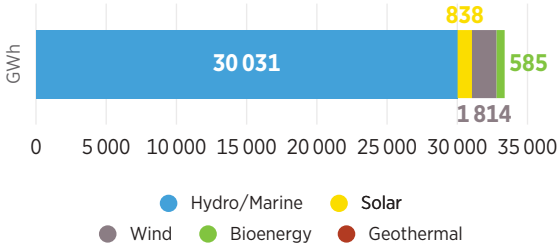


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Peru

Support in implementation

Support is currently under discussion

1	**Work package:**	**Source:** Government of Peru

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile*

RWANDA

Membership since

24 June 2012 **LDC / LLDC**

Population

13 276 517 (2021)[1]

GDP per capita

USD 833.83 (2021)[2]

TPES[3]

Total: 111 294 TJ (2019)
(Renewable: 87 021 TJ)

Energy-related emissions relative to global

1.19 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, 60% renewable energy in the electricity generation mix

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp (15% area)
  1.4-1.6 MWh/kWp (85% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

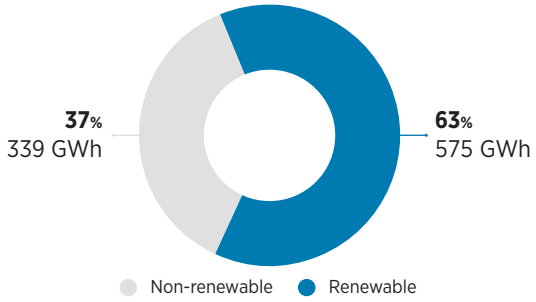
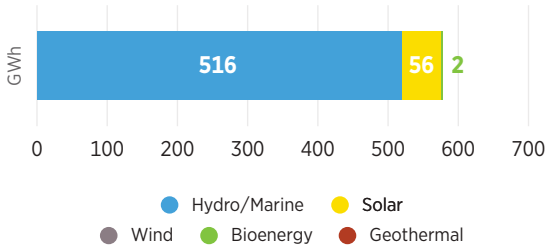


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Rwanda

Support in implementation

Developing a project pipeline to implement the NDC

1	**Work package:** Project facilitation	**Source:** NDC Partnership

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile (2020), Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile (2020)*

SAINT KITTS AND NEVIS

Membership since

20 June 2013 **SIDS**

Population

53 546 (2021)[1]

GDP per capita

USD 18 230.13 (2021)[2]

TPES[3]

Total: 3 572 TJ (2019)
(Renewable: 32 TJ)

Energy-related emissions relative to global

0.25 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional (by 2030):
35 MW of geothermal
7.6 MW of wind
1.9 MW of solar

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (100% area)
- **Wind:** 260 W/m² (63% area)
  260-420 W/m² (25% area)
  420-560 W/m² (15% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

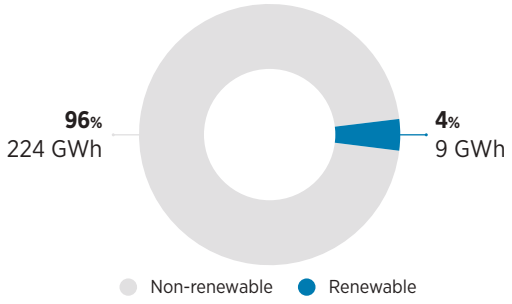
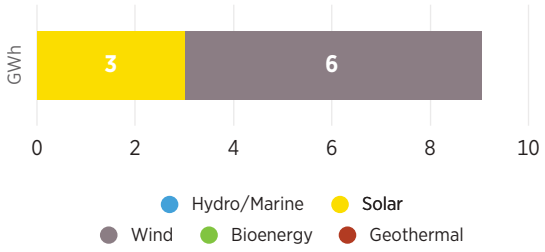


Figure 2 **Renewable electricity generation (GWh)**



[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

IRENA climate action engagement in Saint Kitts and Nevis

Support completed

1	Technical capacity building programme consisting of several workshops on geothermal technology to facilitate NDC implementation, with a particular focus on performance, cost, and planning requirements of geothermal solutions	
	Work package: Technology and infrastructure capacity building	**Source:** UNFCCC

Support in implementation

1	Implementation of the MRV system in the framework of the NDC revision	
	Work package: Monitoring, reporting and verification (MRV)	**Source:** UNFCCC
2	Assessment for the cost effectiveness of mitigation options for the energy sector to support country officials prioritising mitigation options as the input to the country's NDC on power and other relevant sectors	
	Work package: Technology and infrastructure technical analysis	**Source:** UNFCCC
3	SolarCity Simulator	
	Work package: Resource assessment	**Source:** Government of Saint Kitts and Nevis

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SAINT LUCIA

Membership since

31 March 2016 **SIDS**

Population

184 401 (2021)[1]

GDP per capita

USD 9 570.99 (2021)[2]

TPES[3]

Total: 8 020 TJ (2019)
(Renewable: 616 TJ)

Energy-related emissions relative to global

0.39 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional (by 2025 and 2030):
35%-50% of electricity from renewables through a mix of geothermal, wind and solar energy

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (16% area)
  1.6-1.8 MWh/kWp/yr (83% area)
- **Wind:** 260 W/m² (53% area)
  260-420 W/m² (40% area)
  420-560 W/m² (8% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

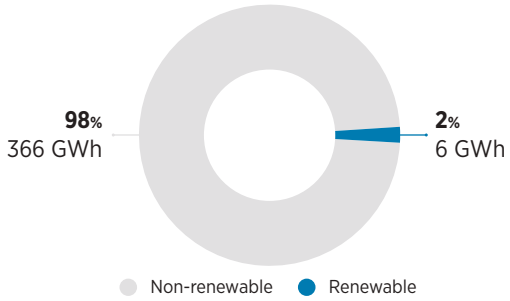
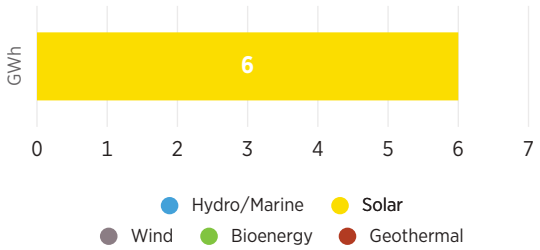


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Saint Lucia

Support in implementation

SolarCity Simulator

1	**Work package:** Resource assessment	**Source:** Government of Saint Lucia

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

SAINT VINCENT AND THE GRENADINES

Membership since

9 November 2012 **SIDS**

Population

111 269 (2021)[1]

GDP per capita

USD 7 996.61 (2021)[2]

TPES[3]

Total: 3 420 TJ (2019)
(Renewable: 161 TJ)

Energy-related emissions relative to global

0.26 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Unconditional:
15 MW of geothermal

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (5% area)
  1.4-1.6 MWh/kWp/yr (10% area)
  1.6-1.8 MWh/kWp/yr (90% area)
- **Wind:** <260 W/m² (32% area)
  260-420 W/m² (50% area)
  420-560 W/m² (17% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

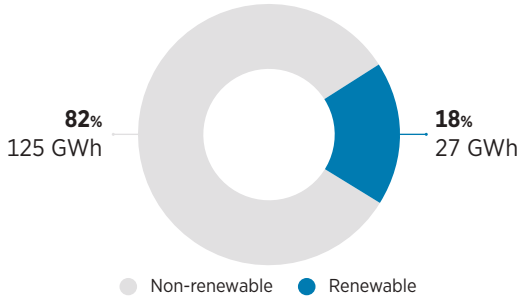
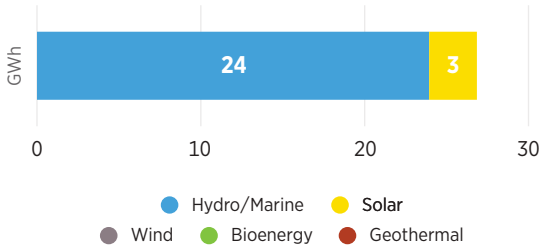


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Saint Vincent and the Grenadines

Support in implementation

	Review the data needed for NDC enhancement and energy-related target tracking and its availability	
1	**Work package:** Data and statistics	**Source:** UNDP

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2016), IRENA Statistical Profile*

SAMOA

Membership since

4 August 2010 **SIDS**

Population

200 144 (2021)[1]

GDP per capita

USD 3 939.11 (2021)[2]

TPES[3]

Total: 5 668 TJ (2019)
(Renewable: 1 703 TJ)

Energy-related emissions relative to global

0.3 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional (by 2025):
Reach 100 percent renewable electricity generation

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (75% area)
- **Wind:** 260 W/m² (98% area)
  260-420 W/m² (5% area)
- **Biomass:** 4.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

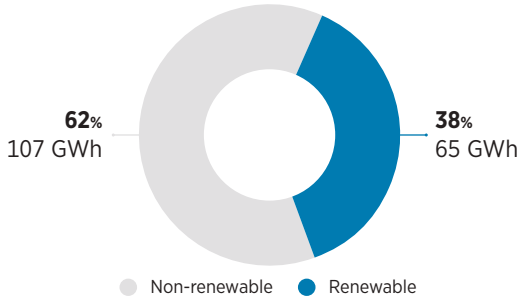
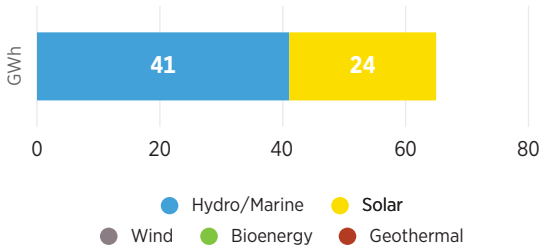


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Samoa

Support in implementation

1	Socio-economic analysis	
	Work package: Data and statistics	**Source:** Government of Samoa

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

SÃO TOMÉ AND PRÍNCIPE

Membership since

1 November 2014 **SIDS / LDC**

Population

223 364 (2021)[1]

GDP per capita

USD 2 449.33 (2021)[2]

TPES[3]

Total: 2 984 TJ (2019)
(Renewable: 1 061 TJ)

Energy-related emissions relative to global

0.15 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional (by 2030):
12 MW of solar and 14 MW of hydropower

Resource potential[6]

- **Solar PV:** <1.2 MWh/kWp/yr (10% area)
  1.2-1.4 MWh/kWp/yr (70% area)
  1.4-1.6 MWh/kWp/yr (20% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 1.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

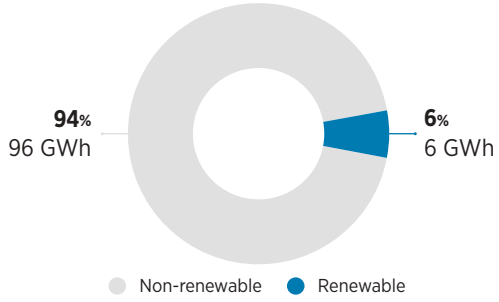
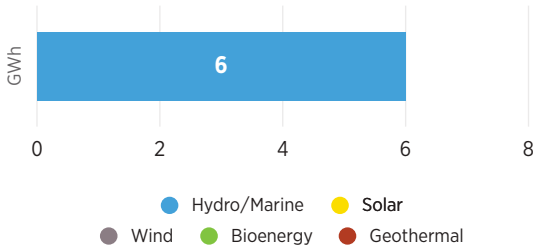


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in São Tomé and Príncipe

Support in implementation

1	Training for long-term planning and scenario modelling to enhance skills and increase the group of technicians to lead the process	
	Work package: Long-term energy planning	**Source:** UNDP
2	Assessment for the cost effectiveness of mitigation options for the energy sector to support country officials prioritising mitigation options which can serve as an input for the NDC implementation phase for power and other relevant sectors	
	Work package: Technology and infrastructure technical analysis	**Source:** UNDP
3	Assessment of renewable energy for primary healthcare	
	Work package: Others	**Source:** UNDP
4	SolarCity Simulator	
	Work package: Resource assessment	**Source:** UNDP

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

SENEGAL

Membership since

1 April 2012 **LDC**

Population

17 196 308 (2021)[1]

GDP per capita

USD 1 606.47 (2021)[2]

TPES[3]

Total: 208 740 TJ (2019)
(Renewable: 73 519 TJ)

Energy-related emissions relative to global

8.94 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, 23% renewables in the electricity generation mix, corresponding to 632 MW, including 257 MW of solar
225 MW of hydropower
150 MW of wind

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (10% area)
  1.6-1.8 MWh/kWp/yr (89% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 1.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

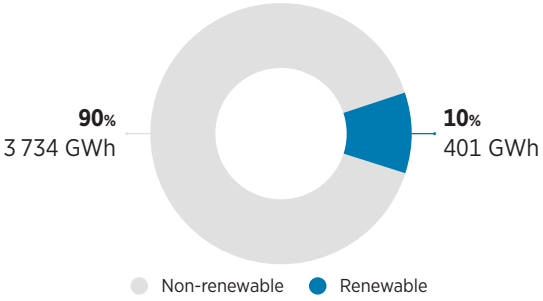
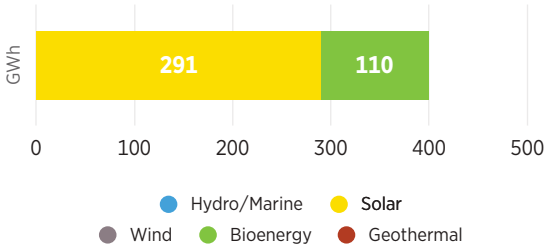


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Senegal

Support in implementation		
1	SolarCity Simulator	
	Work package: Resource assessment	**Source:** Government of Senegal

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile*

SEYCHELLES

Membership since

2 June 2011 **SIDS**

Population

99 202 (2021)[1]

GDP per capita

USD 13 306.73 (2021)[2]

TPES[3]

Total: 8 468 TJ (2019)
(Renewable: 264 TJ)

Energy-related emissions relative to global

0.61 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional (by 2030):
15.8 MW of solar

Unconditional (by 2030):
90 MW of solar

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (100% area)
- **Wind:** <260 W/m² (53% area)
  260-420 W/m² (46% area)
- **Biomass:** 6.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

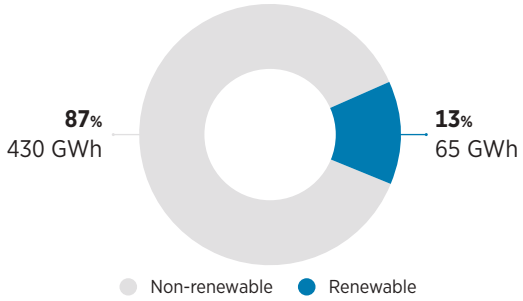
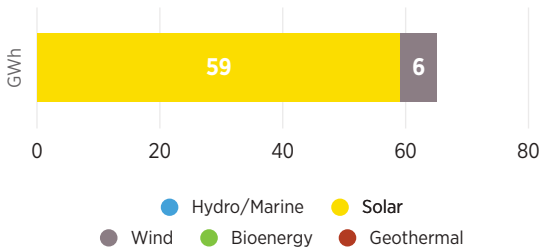


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Seychelles

Support completed

	SolarCity Simulator	
1	**Work package:** Resource assessment	**Source:** Government of Seychelles

Support in implementation

	Capacity building on climate investment and financial flows in the energy sector	
2	**Work package:** Project facilitation	**Source:** NDC Partnership

Acknowledgement of IRENA support

"The supporting partners assisting Seychelles technically and financially to raise our ambitions by updating mitigation and adaptation targets and broadening the scope of our NDCs to cover a greater part of the economy, are… IRENA…"

(Seychelles' first [updated] NDC submission, 30 July 2021)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

SOLOMON ISLANDS

Membership since

4 August 2013 **SIDS**

Population

703 995 (2021)[1]

GDP per capita

USD 2 336.96 (2021)[2]

TPES[3]

Total: 7 597 TJ (2019)
(Renewable: 3 323 TJ)

Energy-related emissions relative to global

0.36 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Unconditional (by 2030): 84 MW of hydropower and 1 250 MW of biodigesters

Conditional (by 2030): Reduce 15 316 Gg/CO_2eq via hydropower and 179 Gg/CO_2eq via solar

Resource potential[6]

- **Solar PV:** <1.2 MWh/kWp/yr (7% area)
  1.2-1.4 MWh/kWp/yr (78% area)
  1.4-1.6 MWh/kWp/yr (16% area)
- **Wind:** <260 W/m² (98% area)
  260-420 W/m² (5% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

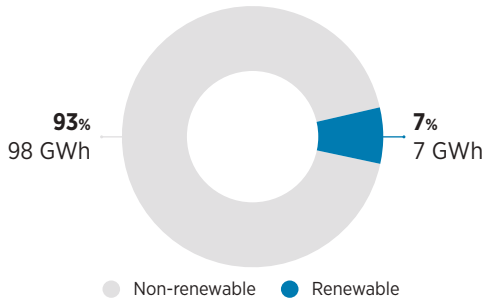
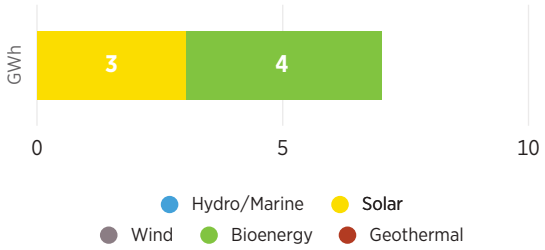


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Solomon Islands

Support in implementation

1	SolarCity Simulator	
	Work package: Resource assessment	**Source:** Government of Solomon Islands
2	High-level assessment of the grid hosting capacity and distribution to accommodate Variable Renewable Energy (VRE) integration and build countries' capacity on grid assessment studies and to establish a working model of the electricity system through simulation software training	
	Work package: Grid assessment and modelling	**Source:** Government of Solomon Islands
3	Readiness assessment of the energy sector	
	Work package: Renewables readiness assessment	**Source:** Government of Solomon Islands
4	Socio-economic analysis	
	Work package: Data and statistics	**Source:** Government of Solomon Islands

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

SOUTH AFRICA

Membership since

30 December 2010

Population

60 041 996 (2021)[1]

GDP per capita

USD 6 994.21 (2021)[2]

TPES[3]

Total: 5 979 803 TJ (2019)
(Renewable: 398 998 TJ)

Energy-related emissions relative to global

477.1 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, produce 39.7% of electricity from renewable sources, including:
17 742 MW of wind
8 288 MW of solar
4 600 MW of hydropower
600 MW of CSP

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (17% area)
  1.6-1.8 MWh/kWp/yr (25% area)
  1.6-1.8 MWh/kWp/yr (29% area)
  1.9-2.0 MWh/kWp/yr (27% area)
  1.9-2.0 MWh/kWp/yr (32% area)
- **Wind:** 260 W/m² (67% area)
  260-420 W/m² (18% area)
- **Biomass:** 4.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

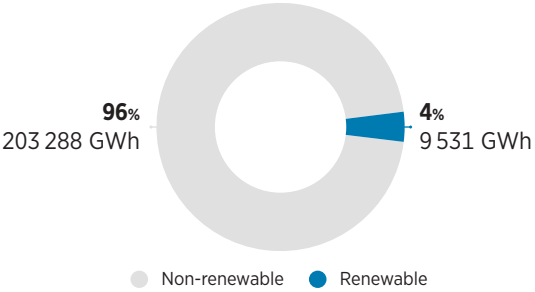
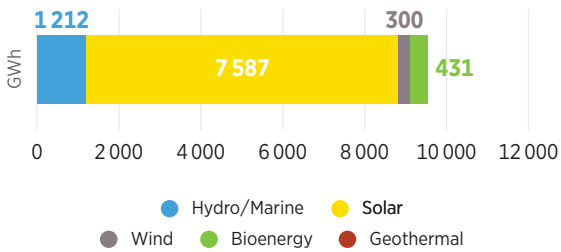


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in South Africa

Support completed

1	Technical inputs from the FlexTool programme to assess the adequacy and flexibility of a more ambitious power expansion plan	
	Work package: Power system flexibility	**Source:** Government of the Republic of South Africa

Support in implementation

1	Support with mini-grid regulations	
	Work package: Policy advice	**Source:** Government of the Republic of South Africa

Acknowledgement of IRENA support

"We are also very grateful to the support and advice provided by IRENA in the use of their FlexTool in the technical analysis."

(Technical analysis to support the update of South Africa's first NDC's mitigation target ranges, April 2021)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile (2020), Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile (2020)*

SUDAN

Membership since

18 June 2011 **LDC**

Population

44 909 351 (2021)[1]

GDP per capita

USD 764.34 (2021)[2]

TPES[3]

Total: 537 425 TJ (2019)
(Renewable: 249 303 TJ)

Energy-related emissions relative to global

24.12 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

2 140 MW of utility-scale grid-connected solar and wind power plants; 796 MW of mini-grids covering residential, agriculture and industrial; and 36 896 GWh of hydropower

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (36% area)
  1.8-1.9 MWh/kWp/yr (40% area)
  1.9-2.0 MWh/kWp/yr (23% area)
- **Wind:** 260 W/m² (48% area)
  260-420 W/m² (38% area)
  420-560 W/m² (10% area)
- **Biomass:** 0.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

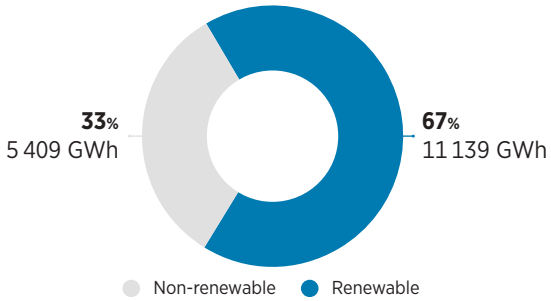
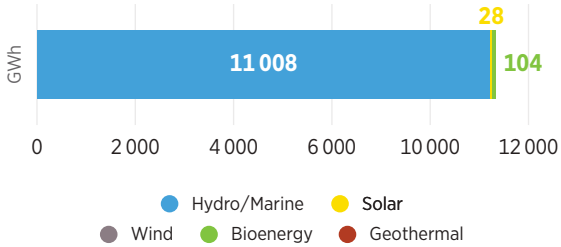


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Sudan

Support completed

1	Enhancement of ambition and other requirements for a good NDC specific to Sudan circumstances; much more work is required, particularly country and regional specific data. The capacity of sectoral institutions also needs to be built to generate the data and information required for NDC work	
	Work package: Data and statistics	**Source:** NDC Partnership
2	Capacity building support on the design of auctions following a framework that classifies design elements according to auction demand (*e.g.* product, technology and volume auctioned). Capacity building support on Open Solar Contracts to empower the government with the practice skills to use these contracts in the procurement of affordable solar power	
	Work package: Capacity building on policy and finance	**Source:** NDC Partnership

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

TONGA

Membership since

6 March 2010 **SIDS**

Population

106 759 (2020)[1]

GDP per capita

USD 4 624.82 (2020)[2]

TPES[3]

Total: 2 293 TJ (2019)
(Renewable: 54 TJ)

Energy-related emissions relative to global

0.16 $MtCO_2eq$ (2019)[4]

Renewable energy targets in the enhanced or second NDC[5]

By 2030, 13% (16 Gg) reduction in GHG emissions by 2030 compared to 2006 from the energy sector and 70% renewable electricity through solar, wind and battery storage

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (100% area)
- **Wind:** <260 W/m² (10% area)
  260-420 W/m² (80% area)
- **Biomass:** 10.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

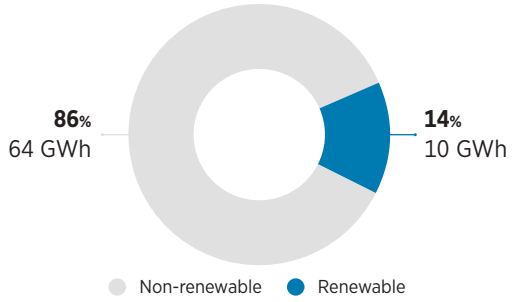
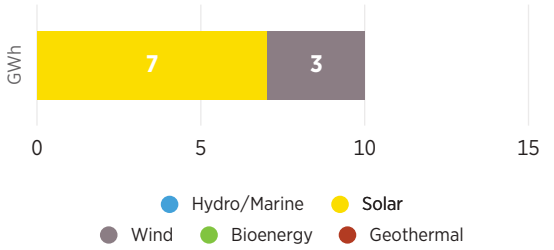


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Tonga

Support completed

1	Provide capacity building trainings on forestry inventory, greenhouse gas inventory system set-up and the information necessary for clarity, transparency, and understanding. Support data collection and collation to inform the defining of the adaptation goal and target and refining of sub-sector emission reduction targets for agriculture, energy, transport and waste. Strengthen and add sectoral greenhouse gas reduction targets and sectoral non-greenhouse gas targets. Align NDC targets with the country's long-term strategies	
	Work package: Data and statistics	**Source:** NDC Partnership

Support in implementation

1	Grid integration study and resource assessment	
	Work package: Power system flexibility	**Source:** NDC Partnership
2	Socio-economic analysis	
	Work package: Data and statistics	**Source:** Government of Tonga

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2020), IRENA Statistical Profile*

TRINIDAD AND TOBAGO

Membership since

15 February 2014 **SIDS**

Population

1 403 374 (2021)[1]

GDP per capita

USD 15 243.12 (2021)[2]

TPES[3]

Total: 718 242 TJ (2019)
(Renewable: 296 TJ)

Energy-related emissions relative to global

22.79 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Does not include quantifiable renewable energy targets

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (10% area)
  1.6-1.8 MWh/kWp/yr (92% area)
- **Wind:** 260 W/m² (95% area)
  260-420 W/m² (8% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

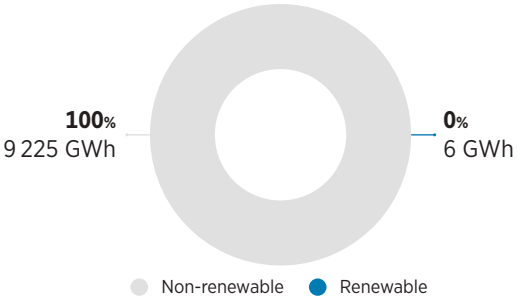
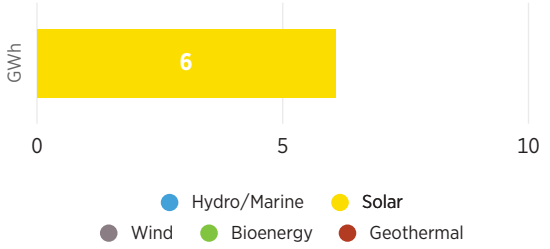


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Trinidad and Tobago

Support in implementation

1	Assessment of the cost effectiveness of mitigation options for the power and transport sectors as input to the development of renewable energy policy and NDC implementation	
	Work package: Technology and infrastructure technical analysis	**Source:** Government of Trinidad and Tobago
2	Readiness assessment of the energy sector	
	Work package: Renewables readiness assessment	**Source:** Government of Trinidad and Tobago
2	Technology plan for renewable energy transport electrification to support the NDC enhancement and implementation	
	Work package: Technology and infrastructure technical analysis	**Source:** Government of Trinidad and Tobago

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2018), IRENA Statistical Profile*

TÜRKIYE

Membership since

1 April 2012

Population

85 042 736 (2021)[1]

GDP per capita

USD 9 586.61 (2021)[2]

TPES[3]

Total: 6 081 863 TJ (2018)
(Renewable: 852 391 TJ)

Energy-related emissions relative to global

378.51 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Conditional (by 2030):
10 GW of solar and 16 GW of wind

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (17% area)
  1.4-1.6 MWh/kWp/yr (45% area)
  1.6-1.8 MWh/kWp/yr (37% area)
- **Wind:** 260 W/m² (82% area)
  260-420 W/m² (10% area)
- **Biomass:** 3.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

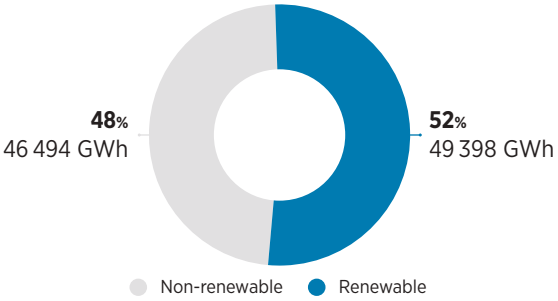
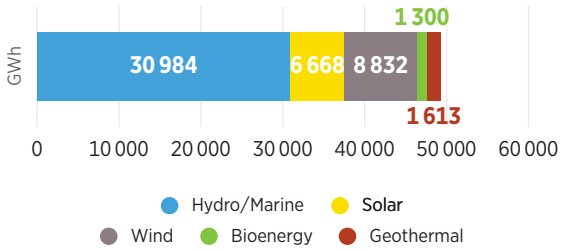


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Türkiye

Support in implementation

SolarCity Simulator

1	**Work package:** Resource assessment	**Source:** Government of Türkiye

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

TUVALU

Membership since

12 February 2013 **SIDS**

Population

11 925 (2021)[1]

GDP per capita

USD 5 291.49 (2021)[2]

TPES[3]

Total: 499 548 TJ (2018)
(Renewable: 361 178 TJ)

Energy-related emissions relative to global

0.01 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2020:
100% renewables in electricity generation

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (75% area)
- **Wind:** 260 W/m² (98% area)
  260-420 W/m² (5% area)
- **Biomass:** 4.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

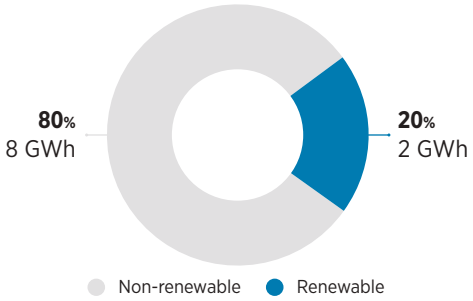
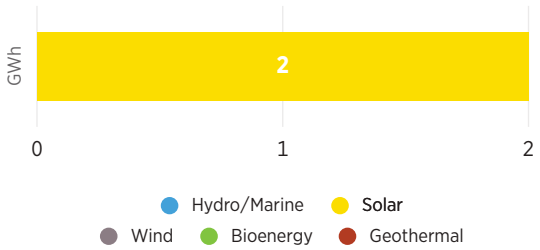


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Tuvalu

Support in implementation

Socio-economic analysis

1	**Work package:** Data and statistics	**Source:** Government of Tuvalu

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2016), IRENA Statistical Profile*

UGANDA

Membership since

17 May 2012 **LDC / LLDC**

Population

47 123 533 (2021)[1]

GDP per capita

USD 858.06 (2021)[2]

TPES[3]

Total: 966 391 TJ (2019)
(Renewable: 888 523 TJ)

Energy-related emissions relative to global

11.16 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, 18 800 GWh of renewable generation, representing 96% of total electricity production, with 3 040–3 080 MW of installed renewable capacity, including: 2 410 MW of hydropower, 383 MW of small hydropower, 140 MW of solar home systems, 62-92 MW of mini-grids; 20 MW of grid-connected solar PV, 9-19 MW of other off-grid and 16.5 MW of biomass

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (47% area)
  1.6-1.8 MWh/kWp/yr (52% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

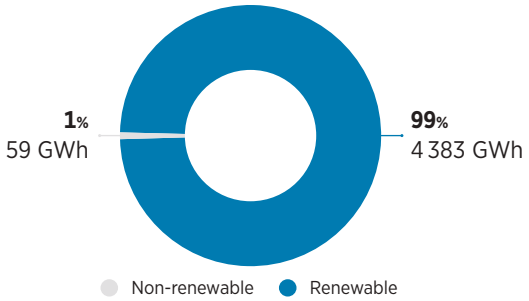
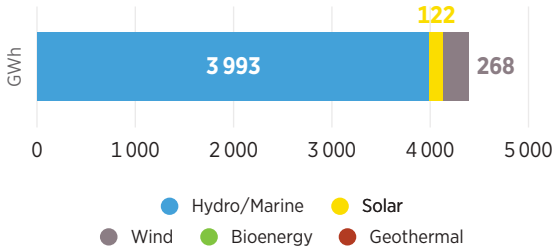


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Uganda

Support in implementation

1	Data collection and collation to inform the defining of the adaptation target/goal and refining of sub-sector emission reduction targets for agriculture, energy, transport and waste. Includes: conduct energy data audit, analyse results, identify gaps and prepare activities to bridge the gaps; train NDC stakeholders in the analysis of energy statistics, including their use for appraising and setting targets; support NDC stakeholders in the identification, appraisal and refinement of energy-related targets, including contribution to and/or peer review of the revised NDC

Work package:	**Source:**
Data and statistics	NDC Partnership

Acknowledgement of IRENA support

"On behalf of the Ministry of Water and Environment, I wish to take this opportunity to thank all the partners and stakeholders involved in the NDC update process for their technical and financial support. These include … the International Renewable Energy Agency (IRENA)."

(Uganda's first [updated] NDC submission, 12 September 2022)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2022), IRENA Statistical Profile*

UNITED ARAB EMIRATES

Membership since

18 July 2009

Population

9 991 083 (2021)[1]

GDP per capita

USD 36 284.56 (2020)[2]

TPES[3]

Total: 2 194 984 TJ (2019)
(Renewable: 23 323 TJ)

Energy related emissions relative to global

208.52 $MtCO_2eq$ (2019)[4]

Renewable energy targets in second NDC[5]

Increase the share of clean energy, including renewables and nuclear, to 50% of the installed power capacity mix by 2050, and reduce energy consumption 40% by 2050

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (10% area)
  1.8-1.9 MWh/kWp/yr (95% area)
- **Wind:** 260 W/m² (80% area)
  260-420 W/m² (18% area)
- **Biomass:** 0.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

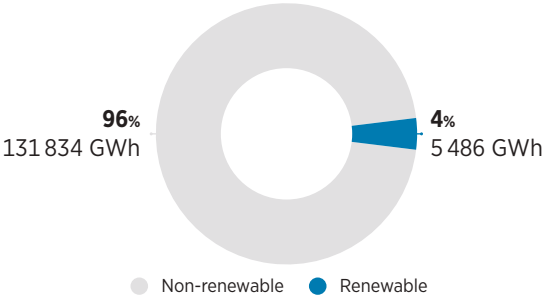
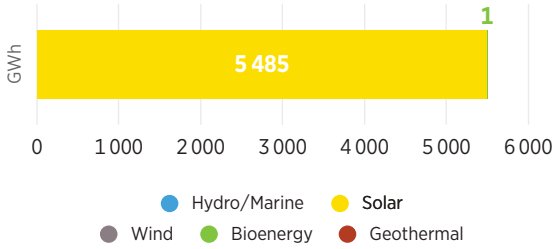


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in United Arab Emirates

Support in implementation

Support is currently under discussion

1	**Work package:**	**Source:** Government of United Arab Emirates

Acknowledgement of IRENA support

"In furthering bilateral and multilateral collaboration on technology development and deployment, the UAE has championed infrastructure and energy projects. These efforts have been pursued through formal channels including, but not limited to, the UAE-Pacific Partnership Facility for Pacific island countries, the UAE-Caribbean Renewable Energy Fund, and the joint project facility by IRENA and Abu Dhabi Fund for Development that supports renewable energy projects in developing countries."

(United Arab Emirates' second NDC, 29 December 2020)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2022), IRENA Statistical Profile*

URUGUAY

Membership since

28 August 2011

Population

3 485 152 (2021)[1]

GDP per capita

USD 17 020.65 (2021)[2]

TPES[3]

Total: 209 177 TJ (2019)
(Renewable: 118 956 TJ)

Energy-related emissions relative to global

6.56 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2025, renewable power generation comprising: 1 450 MW of wind, 220 MW of solar, and 410 MW of biomass, including 250 MW for self-consumption by private industry

Resource Potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (100% area)
- **Wind:** 260 W/m² (97% area)
  260-420 W/m² (5% area)
- **Biomass:** 8.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

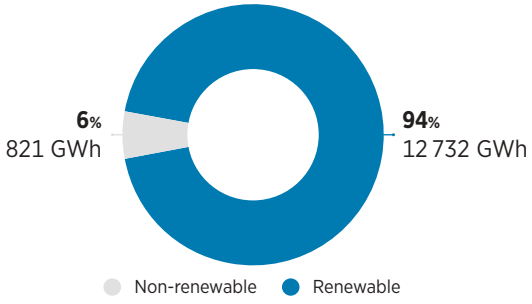
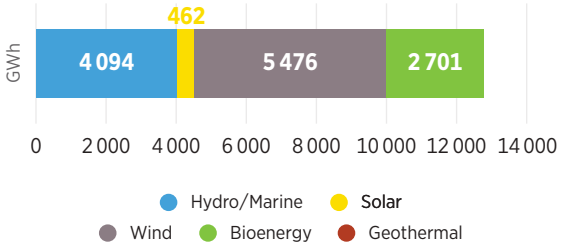


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Uruguay

Support completed

1	Technical inputs from the FlexTool programme to assess the adequacy and flexibility of a more ambitious power expansion plan	
	Work package: Power system flexibility	**Source:** NDC Partnership
2	Technical report with references to relevant existing published work that support biomass gasification for production of hydrogen and methanol	
	Work package: Technology and infrastructure technical analysis	**Source:** NDC Partnership

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2017), IRENA Statistical Profile*

UZBEKISTAN

Membership since

24 August 2017 **LLDC**

Population

34 915 100 (2020)[1]

GDP per capita

USD 1 983.06 (2021)[2]

TPES[3]

Total: 1 993 583 TJ (2019)
(Renewable: 19 122 TJ)

Energy-related emissions relative to global

138.14 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Increase renewables to 25% of total power generation; construct a total capacity of 10 GW, including 5 GW of solar, 3 GW of wind and 1.9 GW of hydropower plants

Resource potential[6]

- **Solar PV:** 1.2-1.4 MWh/kWp/yr (10% area)
  1.4-1.6 MWh/kWp/yr (90% area)
- **Wind:** <260 W/m² (25% area)
  260-420 W/m² (58% area)
  420-560 W/m² (15% area)
- **Biomass:** 0.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

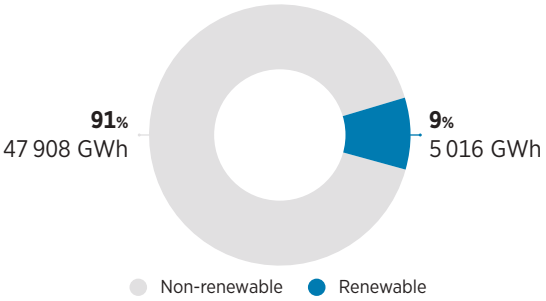
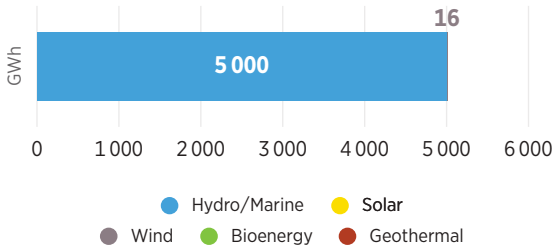


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Uzbekistan

Support in implementation

SolarCity Simulator

1	**Work package:** Resource assessment	**Source:** UNDP

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

ZAMBIA

Membership since

22 June 2013 **LDC / LLDC**

Population

18 920 657 (2021)[1]

GDP per capita

USD 1 120.63 (2021)[2]

TPES[3]

Total: 460 015 TJ (2019)
(Renewable: 369 508 TJ)

Energy-related emissions relative to global

7.57 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

By 2030, 30% renewables in the electricity generation mix (excluding large hydropower)

Resource potential[6]

- **Solar PV:** 1.6-1.8 MWh/kWp/yr (95% area)
  1.8-1.9 MWh/kWp/yr (8% area)
- **Wind:** 260 W/m² (100% area)
- **Biomass:** 2.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

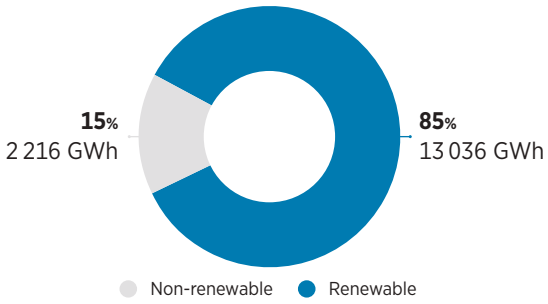
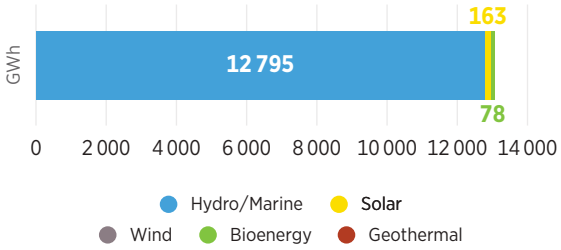


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Zambia

Support completed

1	Strengthen MRV system data collection, greenhouse gas projections analysis, and alignment of target with respective sector policies, strategies and plans. Integration of the NDC MRV system to the Central Statistics Office for national reporting and communication of projections	
	Work package: Monitoring, reporting and verification (MRV)	**Source:** NDC Partnership
2	Capacity building to data providers and establishment of data sharing platforms for quality assurance	
	Work package: Data and statistics	**Source:** NDC Partnership

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

ZIMBABWE

Membership since

17 September 2014 **LLDC**

Population

15 092 171 (2021)[1]

GDP per capita

USD 1 737.17 (2021)[2]

TPES[3]

Total: 465 908 TJ (2019)
(Renewable: 130 358 TJ)

Energy-related emissions relative to global

14.61 $MtCO_2eq$ (2019)[4]

Renewable energy targets in first NDC[5]

Increase electricity demand 16.5% by 2025 and 26.5% by 2030, corresponding to 2 100 MW of renewable energy capacity, including: 1 575 MW of solar, 275 MW of bioenergy, 150 MW of small hydropower, 100 MW of wind, 8 000 biodigesters and 288 institutional biodigesters

Resource potential[6]

- **Solar PV:** 1.4-1.6 MWh/kWp/yr (3% area)
  1.6-1.8 MWh/kWp/yr (75% area)
  1.8-1.9 MWh/kWp/yr (25% area)
- **Wind:** 260 W/m² (98% area)
  260-420 W/m² (3% area)
- **Biomass:** 2.5 tC/ha/yr

Figure 1 **Total electricity generation (GWh, %)**

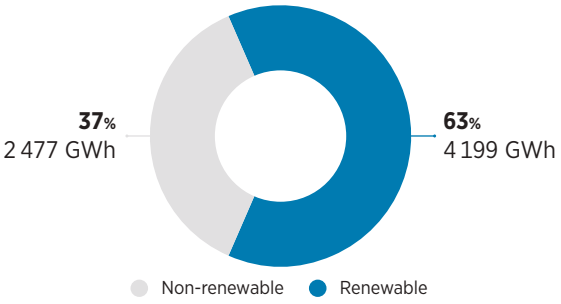
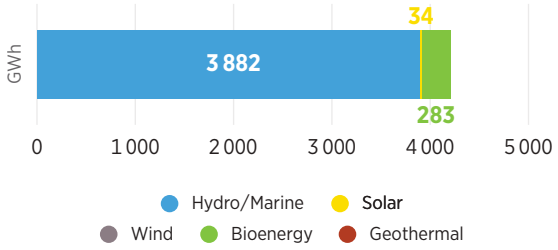


Figure 2 **Renewable electricity generation (GWh)**



IRENA climate action engagement in Zimbabwe

Support completed

1	Technical report referencing the existing published works and providing support to the comparative analysis of energy scenarios to inform the country's NDC enhancement process	
	Work package: Technology and infrastructure technical analysis	**Source:** NDC Partnership

Acknowledgement of IRENA support

"Zimbabwe's Revised NDC Report was developed under the auspices of the … International Renewable Energy Agency (IRENA). The Government of Zimbabwe (GOZ) would like to thank these organisations for their support in delivering Zimbabwe's revised Nationally Determined Contribution (NDC)."

(Zimbabwe's first [updated] NDC submission, 24 September 2021)

[1, 2, 3, 4, 5, 6] *World Bank national account data, OECD National Accounts data files, IRENA Statistical Profile, Climate Watch, Nationally Determined Contribution (2021), IRENA Statistical Profile*

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