

Tenth session of the Assembly
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**Annual Report of the Director-General
on the Implementation of the
Work Programme and Budget for 2018-2019**

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I. Introduction

1. This report provides an account of the progress the Agency has made in the implementation of the *Work Programme and Budget 2018 – 2019*. As of December 2019, IRENA's membership stands at 160 Members and 23 Signatories and States in Accession, attesting to the significance of its mandate and a strong need for international co-operation on renewable energy. With its near-universal membership and an established body of work, IRENA continues to play a leading role in the ongoing transformation of global energy systems, as requested by Members in the Medium-term Strategy 2018-2022. This mission continues to be of high relevance as countries are actively pursuing pathways to deliver secure, sustainable, affordable, and inclusive energy systems.
2. The need for a wide-ranging transformation, while not entirely new, has taken on a pronounced urgency and immediacy as part of the international response to climate change. In the report *IPCC Special Report on Global Warming of 1.5°C*, the UN Intergovernmental Panel on Climate Change (IPCC) stresses that limiting global temperatures to 1.5°C requires global emissions to peak in 2020 and reach net zero around 2050. The report emphasises that such changes are possible and that investments in low-carbon energy technology and energy efficiency are a central avenue for shared prosperity and economic stability.
3. To limit warming to 1.5°C, annual energy-related CO₂ emissions would need to fall by more than 70% between now and 2050. A large-scale shift to renewable energy and electrification, as well as ramped-up energy efficiency, could deliver as much as 90% of the needed reductions in energy-related emissions. Current national plans and investment patterns, however, show a stark mismatch with the pathway to hold the line at 1.5°C. IRENA analysis shows that while NDCs would result in 2.9 TW of global renewable installed capacity at the end of 2030, current and planned policies are expected to deliver 5.2 TW. A higher level of renewable energy deployment, equal to 7.7 TW in 2030, is possible under the REmap scenario. The analysis also finds that the pace of renewable energy deployment described in current NDCs is slower than actual deployment trends, which have been averaging at over 8 % since 2015.
4. In the report, *Transforming the energy system – and holding the line on rising global temperatures* (Sept. 2019), IRENA analyses investment and policy needs to put the world on a path towards a clean, climate-resilient energy transformation. The report finds that the pace and depth of investments in renewables must be accelerated without delay to hold the line at 1.5°C by 2050. Government plans currently call for an investment of at least USD 95 trillion in energy systems over the coming three decades. IRENA notes that planned fossil fuel investments need to be redirected towards energy systems that prioritise renewables, efficiency, and associated infrastructure. With USD 15 trillion added to the total investment by 2050, the global energy system in 2050 could be largely climate-proof. Recent Agency analysis estimates that this shift in investments is yet to commence at a serious scale; institutional investors (i.e. pension plans, insurance companies, sovereign wealth funds, and endowments/foundations), hold well over USD 100 trillion of assets, yet have only invested about USD 6 billion directly in renewable projects in 2018, financing a mere 2% of new renewable energy projects.



5. Investments at scale can deliver a broad array of socio-economic benefits, including gross domestic product (GDP) gains of about USD 98 trillion and a 14% increase in jobs in the energy sector, as well as improved social welfare costs and reduced human healthcare costs, environmental damages, and subsidies.
6. Significant progress in deployment of renewables has been made to date. According to the latest IRENA renewable energy generation statistics, 171 GW of new renewables were added in 2018, an increase of 7.9%. By the end of 2018, the installed capacity of renewables reached 2,351 GW, constituting over 33% of the total power-generating capacity. Importantly, IRENA analysis shows that off-grid renewable capacity has tripled in the last decade, from 2.65 GW in 2008 to 7 GW in 2017, with at least 133 million people now being served by these technologies.

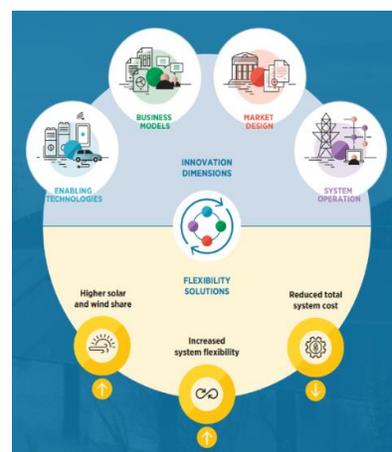


Figure 1: The transformation of the power sector requires technology, market and policy innovations

7. Increased renewable generation can be in great part attributed to the declining costs of key renewable energy technologies, especially in solar and wind and the policies that drove this learning. IRENA's *Renewable Power Generation Costs in 2018* (May 2019) highlights that the price of solar PV modules dropped by more than 90% since 2009, with a reduction of around one-third between 2017 and 2018. The price of wind turbines fell around 10% to 20% between 2017 and 2018, and the costs of onshore wind electricity dropped by 13% between 2017 and 2018. Onshore wind and solar PV power are now, frequently, less expensive than any new fossil-fuel option, without financial assistance.
8. Auctions are playing a significant role in renewable deployment in the power sector. IRENA's recent report *Renewable Energy Auctions: Status and Trends Beyond Price* (June 2019) estimates a total volume exceeding 110 GW of electricity was auctioned in 2017-2018, with solar PV and onshore wind accounting for more than half and almost a third, respectively, of the total volume. Price results for solar and wind auctions have overall decreased in the past decade but in 2018, while PV prices kept decreasing, albeit at a slower pace, the price of wind went upwards.
9. The widespread adoption of renewable energy technologies creates employment opportunities up and down the supply chain. According to the Agency's latest analysis, the renewable energy sector employed 11 million people by the end of 2018 worldwide, compared to 10.3 million in 2017. The renewables-based transition would accelerate these trends; a 14% increase in jobs in the energy sector and 64% growth in renewable energy jobs across all technologies by 2050.
10. Although change is underway, it is not happening fast enough. Achieving energy systems that meet global development and climate objectives requires acceleration of deployment and rapid innovation in technologies and business models that span many sectors and facets of the economy.
11. Variable renewable energy (VRE) technologies, particularly solar PV and wind power, already play a central role in the energy transition. IRENA estimates that VRE capacity will lead the way forward, rising from 900 GW today to 13,000 GW in 2050 when it accounts for around 60% of total power generation. This requires a tripling of annual wind capacity additions and a doubling of solar PV capacity additions from 2017 levels. The diversity of innovations emerging and the

speed at which they are being adopted, specifically in the case of VRE, will have far reaching implications for the configuration and operation of both energy systems and the roles of all actors involved. IRENA's report, *Innovation landscape for a renewable-powered future* (Feb. 2019), highlights the necessity to actively promote innovation not only across technologies, but also in policies and markets.

12. As the business case for renewables has become more compelling, innovation is taking place organically as well; encouraging trends are noted in off-grid electricity technologies, as detailed in the report *Off-grid renewable energy solutions to expand electricity access: An opportunity not to be missed* (Jan. 2019). These technologies, including stand-alone systems and mini-grids, have emerged as a mainstream, cost-competitive option to expand access to electricity and help achieve Sustainable Development Goal on Energy (SDG7), which calls for universal access to affordable, reliable, sustainable and modern energy by 2030.
13. As one of the UN-appointed co-custodians for the tracking of SDG 7 (together with IEA, UNSD, World Bank and WHO), IRENA was one of the lead authors of the *Tracking SDG 7: Energy Progress Report 2018* and *2019*. Building on latest available data, findings show that unprecedented progress has been made towards ensuring access to affordable, reliable, sustainable and modern energy for all. Yet at the current rate of ambition, the world would fall short of meeting the SDG 7 target by 2030. These findings, together with recommendations on how to further accelerate progress towards SDG 7, have been presented in a series of events including the High-Level Dialogue on the implementation of the United Nations Decade of Sustainable Energy for All 2014-2024, Clean Energy Ministerial (CEM) and EU Sustainable Energy Week (EUSEW).
14. With IRENA chairing the work of the upcoming *Tracking SDG 7: Energy Progress Report 2020*, custodians have been working closely together to develop a refined outline for the upcoming report, and to improve datasets with input from UN regional commissions. In addition to contributing datasets tracking SDG Indicator 7.2.1 on renewable energy share in the total final energy consumption, IRENA has been appointed to lead the tracking of Indicator 7.a.1 on international financial flows to developing countries in support of clean and renewable energy. IRENA has also proposed to the Inter-agency and Expert Group on SDG Indicators an indicator for Target 7.b, "renewable electricity capacity per capita" on expanding infrastructure and technology for supplying modern and sustainable energy services in developing countries.
15. Supporting action at the ground level, the Agency is forging partnerships to realise change at the speed necessary for the energy transition to succeed in delivering a climate-safe future. With this in mind, and to further solidify a supporting network, IRENA is developing Memoranda of Understanding (MoUs) with key organisations. MOUs will enhance co-operation with international organisations and governments and ramp up efforts to promote the accelerated development and deployment of renewables and promote widespread adoption particularly in least developed countries, landlocked developing countries, and small island developing states (SIDS). These partnerships are proof of the international response to common action and the key role that renewable energy plays in securing a climate-safe future for all.

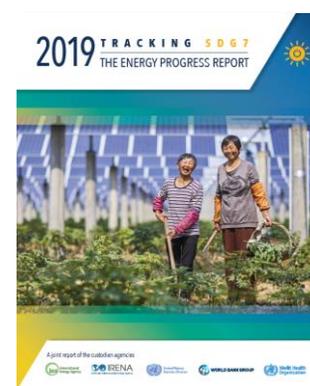




Figure 2: IRENA Director General speaks at the UN Climate Summit, New York City, September 2019, along with H.E. Mr. Ibrahim Mohamed Solih, President of the Republic of Maldives, H.E. Mr. Allen Michael Chastanet, Prime Minister of Saint Lucia, H.E. Mr. Tommy Esang Remengesau Jr., President of the Republic of Palau

16. The present report details the implementation of programmatic activities, informs Members of the Agency's performance, and shares information on selected analytical findings and regional and country experiences throughout the biennium. The report includes the matrix of outputs, which shows in detail the implementation of programmatic deliverables. To show the scope and scale of additional resources generously provided by several Members, as well as how they support the Agency's Work Programme and strategic mission, the report also includes an overview of projects supported by voluntary contributions. This provides greater clarity on the use of resources and visibility of contributions of non-assessed resources to the Agency's performance.

II. Centre of Excellence for Energy Transformation

17. Through its robust analytical work and global network, IRENA continues to guide countries in developing sustainable growth pathways and achieve their energy transformations goals.

Transformation Pathways

18. In April 2019, the Agency released its latest **global renewable energy roadmap** – *Global Energy Transformation: A Roadmap to 2050* (2019 edition) (GET 2019). *GET 2019* edition showed that renewable energy, electrification, and energy efficiency form the basis for long-term decarbonisation and low-carbon development with positive socio-economic outcomes globally. It concludes that the energy transition can enable economic growth, create jobs, and improve overall social welfare.
19. *GET 2019* edition is complemented by a background report, a web-based digital story, online interactive dashboards and regional data for key REmap energy indicators. The background report, *Global Energy Transformation: The REmap Transition Pathway* (April 2019), provides additional analysis and a perspective for global energy system development to 2050 with technical findings on the status of the shift to renewable energy and the REmap transition pathway. The digital story, entitled *How to Transform Energy System and Reduce Carbon Emissions*¹, is a web-based interactive presentation of key findings. This work was possible in part through a voluntary contribution from the Government of Germany.

¹ <https://www.irena.org/DigitalArticles/2019/Apr/How-To-Transform-Energy-System-And-Reduce-Carbon-Emissions>

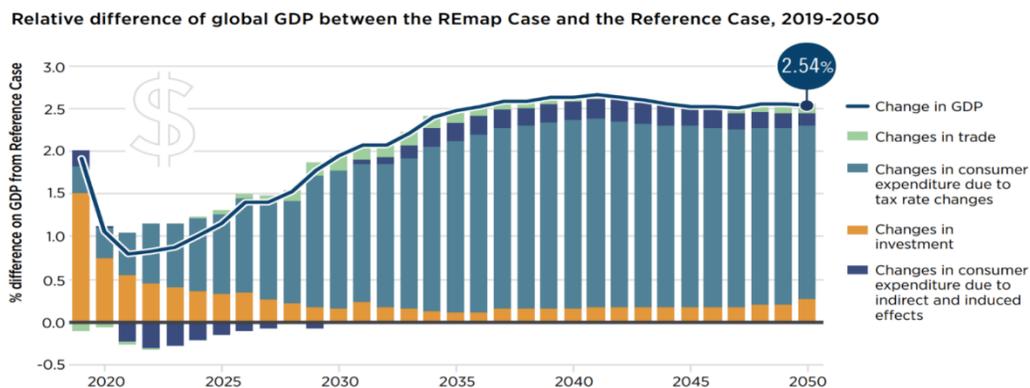


Figure 3: Compared to the Reference Case, the REmap Case boosts global GDP by 2.5% in 2050. The dominant factor is changes in consumer spending due to tax rate changes².

20. Energy transition roadmaps strongly interact with the socio-economic system when deployed. To provide insight for policy makers and transition planners, IRENA evaluates the socio-economic footprint of transition roadmaps, both at the global and regional/country level. One of these socio-economic footprint dimensions is GDP; the REmap energy transition roadmap boosts global GDP 2.5% over the reference case by 2050. However, it is in the welfare dimension that the transition generates the highest benefits. To shed light on this, IRENA has developed and is improving a **welfare indicator** that quantifies the wider benefits of the energy transition.

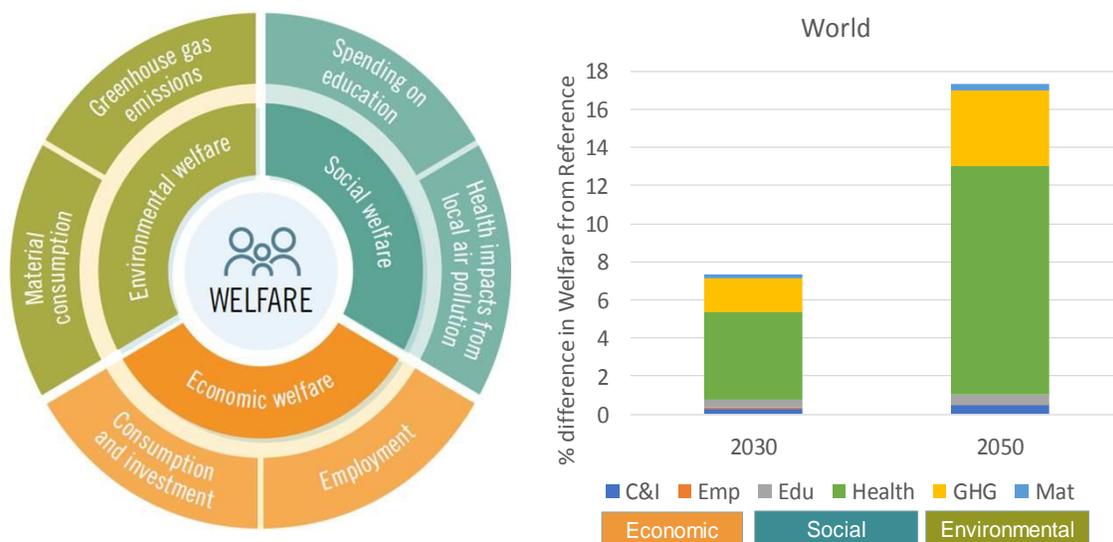


Figure 4: Welfare indicator

21. Based on the latest *GET 2050* analysis (2019 edition), two technology-specific Global Energy Transformation **working papers** (*Future of Wind* and *Future of Solar Photovoltaic*) were launched at the China Wind Power event in Beijing (Oct. 2019) and at the Sun World event in Lima, Peru

² This driver captures the impact of the changes in government income due to carbon taxes, fossil fuel phase-out, changes in fossil fuel royalties and other taxes.

(Nov. 2019). The working papers explore the prominent role of wind and solar PV technologies in accelerating the global energy transition to 2050. Specifically, the papers highlight the accelerated growth needed in wind and solar PV power capacity deployments to achieve Paris climate goals. They also offer insights on cost-reduction opportunities, technology trends, investments need, socio-economic aspects and the solutions and investments needed to prepare electricity grids to integrate rising shares of wind and solar PV power in the next three decades.

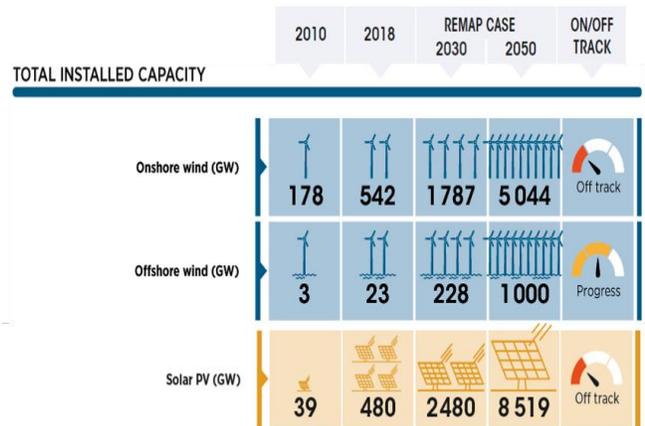


Figure 5: Future of Wind and Future of Solar Photovoltaic (October and November 2019)

22. IRENA continues to provide long-term prospects for power sector transformation in Africa, using the advanced energy systems optimisation tool **SPLAT** (System Planning Test model). The Agency’s analysis has been used as critical input to regional policy and target development across the continent. For example, analysis has been used in the African Union Programme for Infrastructure Development (PIDA) process, and contributed to the latest updates to the medium- to long-term Western African Power Pool and Southern African Power Pool masterplans in 2018, and the Central Africa Regional Renewable Energy Roadmap requested by the Secretariat of the Economic Community of Central African States (ECCAS) to support the region in developing a strategy for sustained deployment of renewable energy technologies.
23. Forming part of its advanced suite of tools to support the energy transformation, IRENA developed the **FlexTool**, designed to complement the REmap tool and national energy plans by providing a more detailed analysis of the power system through operational analysis and flexibility assessment. In May 2019, IRENA began the process of developing a regional REmap analysis and joint assessment of the flexibility of power systems in Central American Countries with the FlexTool. This formed part of a regional activity under the Central America Clean Energy Corridor (CECCA) to provide insights on the value of regional integration (see Network Hub - Regional Action Agenda for more information). This work is supported by a voluntary contribution from the Government of Norway.
24. To operationalise this work, IRENA and the Energy Secretariat of Panama co-organised the “First Regional Workshop: Renewable Energy Roadmap and Flexibility Analysis for Central America” in September 2019. The consultation workshop set the scene and scope of the project and provided a space for exchange among countries, and regional and multilateral institutions on the opportunities and challenges for widespread deployment of renewable energy in



Figure 6: First Regional Workshop: Renewable Energy Roadmap and flexibility analysis for Central America, Panama, September 2019

end-use and power sectors towards 2030. The overall aim of the workshop is to advance the Sustainable Development Goals (SDGs) and meet climate targets. Key partner institutions include the Economic Commission for Latin America and the Caribbean (ECLAC), the Inter-American Development Bank (IDB), the regional electric power market (MER) institutions, the Latin American Energy Organization (OLADE), the Central American Integration System (SICA), the United Nations Framework Convention on Climate Change (UNFCCC) Regional Collaboration Centre, and the World Bank. A similar programme has started for Southeast Asia and Central and Southeast Europe, respectively supported by voluntary contributions from Denmark and the European Commission. Further, country-specific flexibility assessments are ongoing for Republic of Moldova, as follow-up to the Renewable Readiness Assessment (RRA) analysis, and for the Hashemite Kingdom of Jordan, as part of the RRA process. This work is also supported by a voluntary contribution from the Government of Norway.

25. IRENA continues to disseminate best practices in **long-term planning** and modelling to represent high shares of VRE, as highlighted by the Agency’s project ‘Addressing Variable Renewable Energy in Long-term Energy Planning’ (AVRIL). AVRIL material provided the basis for two expert regional planning workshops carried out in Central Asia and MENA regions in 2019, in support of IRENA’s regional action agendas. A translation of the 2017 AVRIL report to Japanese was provided by the Ministry of Environment of the Government of Japan to facilitate further dissemination. AVRIL material continues to be updated.



Figure 7: “Long-term Energy Scenario (LTES) Campaign: 2019 International Forum” in Berlin, Germany, 10-12 April 2019

26. IRENA also continues to translate its analysis into consumable information for its stakeholders by contributing to and participating in energy planning partnership fora. This format fosters exchange of experiences and maximises synergies among planning entities. For example, the Agency’s role as the operating agent of the CEM Campaign on ‘Long-term Energy Scenarios for Clean Energy Transition’ (LTES campaign) has led to a broadened community where Campaign Members from 12 countries³ and seven technical partners⁴ discuss and exchange best practices in long-term energy scenario planning in the context of the clean energy transition. These discussions took place during dedicated sessions at over 20 events in 2018-2019 – for example, the CEM10 meeting in Vancouver and the International LTES Forum at the BETD in Berlin – reaching over 400 experts. Highlights from the first 12 months of activities were published in May 2019. To expand engagement beyond CEM countries, IRENA launched a ‘**Long-term Energy Scenarios Network**’ (LTES-Net) to support exchange of best practices. A voluntary contribution from the Government of Germany has supported IRENA’s contribution to the CEM Campaign in 2018. The current work, including the LTES-Net, is supported by a voluntary contribution from the Government of Denmark.

³ Brazil, Canada, Chile, Denmark, Finland, Germany, Italy, Japan, Mexico, Kingdom of the Netherlands, United Arab Emirates, United Kingdom.

⁴ China Renewable Energy Centre (CNREC), European Commission Joint Research Centre (EC JRC), International Energy Agency Energy Technology Systems Analysis Programme (IEA-ETSAP), International Energy Agency (IEA), National Renewable Energy Laboratory/Joint Institute for Strategic Energy Analysis (NREL/JISEA), State Grid Corporation of China (SGCC), World Energy Council (WEC).

27. IRENA develops targeted **Analytical Briefs** to provide Members with more detailed analysis of key emerging issues related to energy transformation. Throughout the biennium, IRENA consulted with energy modelling experts in international fora on system integration costs. Results of these discussions are being used to develop the analytical brief entitled *System Integration Cost Definition and Application* (forthcoming). An analytical brief is also under development on *100% VRE-based operation in power systems* (forthcoming). The brief builds on the white paper from the IRENA Coalition for Action which maps global 100% renewable energy targets and case studies at regional, national, city, island as well as utility levels. Briefs complement the IRENA analysis contained in the report *Innovative solutions for 100% renewable power in Sweden* (forthcoming), work of which is supported by a voluntary contribution from the Government of Sweden. A series of workshops conducted in 2019 feed into the analysis with highlights on experiences, challenges, and good practices between high ambition countries.
28. Considering the significant role of cities in the energy transformation, IRENA continues to undertake a range of analytical and technical activities to gain insights into urban best practices, technology solutions, and economic aspects. In collaboration with Local Governments for Sustainability (ICLEI) and the German Agency for International Cooperation (Deutsche Gesellschaft für Internationale Zusammenarbeit - GIZ), IRENA published six case studies in December 2018, which highlighted the use of local policy instruments to: ensure a reliable supply of renewable energy (Cape Town and Rosario); promote more efficient and renewable-sourced lighting (Sydney); develop renewable energy for heating (Malmö); integrate renewables into the transport sector (New Delhi); and fulfil a commitment to reaching a 100% renewables target (Vancouver). These case studies complemented an earlier set of studies published in 2013 (see Figure 8). Building on this work, IRENA conducted analysis on best practices, experiences, and solutions in the development of renewable energy in urban areas. Analysis is complemented with case studies of selected cities in China, Costa Rica, and Uganda. It reveals the specific national needs and contexts that shape and influence municipal-level action in the three selected countries and examines conditions common to all cities. Reports are being prepared for release in early 2020 (see Figure 8).

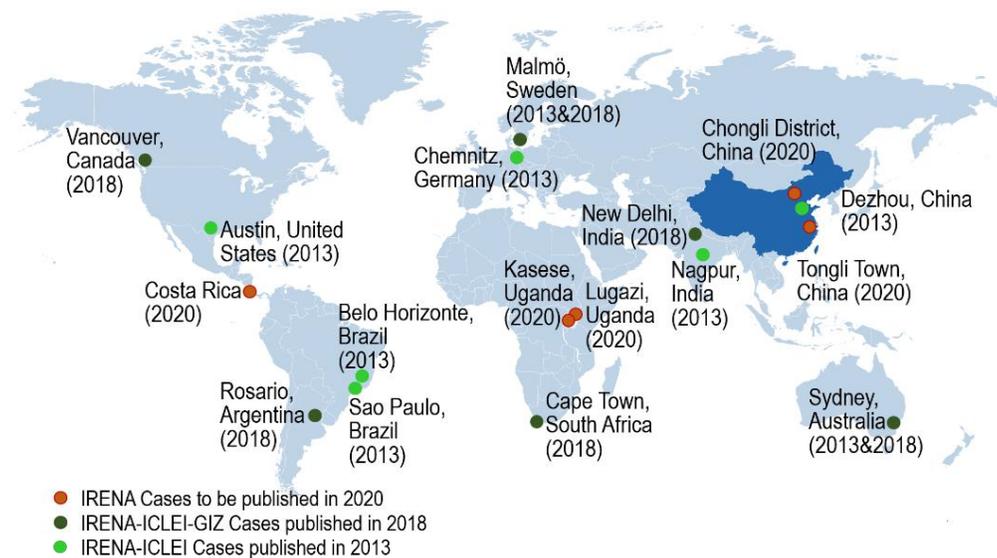
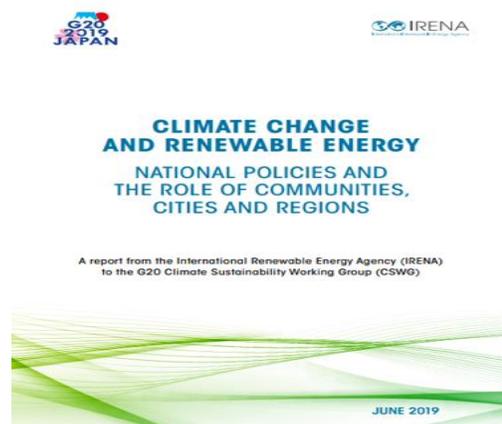


Figure 8: Showcasing IRENA's work on City case studies

29. IRENA has also completed a review of methods and tools for urban energy system planning to improve the understanding of how these tools are used for integration of renewable energy technologies in cities. The review focuses on the identification and evaluation of the prevailing tools, the need for technical assistance, as well as an analysis of gaps and challenges, and provides recommendations on how to close the gaps in the future development of urban energy system planning tools. In addition, to scale up the role of renewables in meeting the urban heating and cooling demands, IRENA is developing technical concept guidelines for renewable heating and cooling systems in cities and for the methodological framework that cities can use to assess their renewable energy potentials, identify technological options, including the sector-coupling approach, facilitate the integration of variable renewable sources into the urban energy systems. This work was supported by a voluntary contribution from the Government of Germany⁵.
30. IRENA, in collaboration with the China National Renewable Energy Center and People's Government of Zhangjiakou, has developed and launched the *Zhangjiakou Energy Transformation Strategy 2050* (Nov. 2019). The strategy sets a new paradigm for many other Chinese cities eager to wean their energy systems off coal and to take advantage of the uptake of renewable energy and other enabling technologies. Given the growing impetus in China to advance the energy transformation towards a green, clean and low-carbon energy system for the city, the strategy contributes to a rising tide of urban strategic energy development planning across China. This work was supported by a voluntary contribution from the Government of Germany⁶.
31. IRENA continues to provide analytical support to Members. As Japan assumed the Presidency of the 2019 Group of Twenty (G20), IRENA was requested by the Ministry of Foreign Affairs of the Government of Japan to contribute to the discussions. In response to this request, IRENA produced a report to the G20 entitled *Climate Sustainability Working Group (CSWG) on Climate Change and Renewable Energy: National Policies and the Role of Communities, Cities and Regions* (June 2019). The report explores the role of distributed energy resources (DER) as a solution for sourcing buildings, lighting communities in cities and rural areas, and powering companies. The report links several benefits to DER and society engagement. The Agency also participated in the discussions of the G20 Climate Sustainability Working Group (CSWG) and the G20 Energy Transition Working Group (ETWG), held in Nagano. As for the previous G20 presidency, held by Argentina, IRENA continues to provide support for the G20 work related to renewable energy and important actions required to accelerate the energy transition. This work was supported by a voluntary contribution from the Government of Japan.



⁵ This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

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Access Solutions

32. A Ministerial Roundtable on “Catalysing Off-Grid Renewable Energy Deployment towards Universal Electricity Access and Sustainable Development Goals” was held at the Ninth Session of the IRENA Assembly. The discussion benefited from IRENA’s input paper, *Off-grid renewable energy solutions to expand electricity access: An opportunity not to be missed* (Jan 2019), which takes stock of the opportunities available and details the dynamism and innovations in the off-grid renewable energy sector. Building on IRENA’s growing body of work on the topic, the paper highlights the latest trends and advances, including innovations in delivery and financing models. It also discusses policy and regulatory measures to harness the potential of off-grid renewables to help meet the SDGs, such as SDG 7 on clean and affordable energy.
33. IRENA is currently analysing the global financing landscape for off-grid renewable energy and the socio-economic impacts of universal energy access. Focus is placed on improving the measurement of the socio-economic implications of energy access, to produce insights that better inform the impact from different transition roadmaps (i.e., level of ambition or how distributional effects are addressed). To unlock the full potential of modern energy access for socio-economic development, it is important to not solely focus on facilitating deployment but to also consider the social and livelihood development aspects. To contextualise off-grid renewables within the broader narrative of poverty and livelihoods, IRENA is finalising the policy-brief *Achieving effective linkages between off-grid renewable energy solutions and livelihoods*. The brief showcases the importance of a livelihoods-approach to off-grid renewables, discusses the key element of a holistic ecosystem to support deployment in a manner that is in line with the sustainable livelihoods approach, and provides practical examples of projects/programmes following such approaches. IRENA continues to collaborate with major stakeholders in the field through participation in global and regional events and conferences such as SDG 7 for SDG 8 sustainable energy and livelihood nexus conference in Bangalore, India (April 2019). In addition, IRENA is a key contributing agency of various global initiatives such as Global Ecosystem Hubs for Sustainable Energy and Clean Cooking Initiative.
34. Among the roles of off-grid renewable energy solutions is the enhanced delivery of essential services such as health. In this regard, IRENA organised the first ‘International Conference on Renewable Energy Solutions for Healthcare Facilities’ on the side-lines of the International Off-grid Renewable Energy Conference and Exhibition (IOREC) in Singapore (for more information on IOREC see box below). Several messages from the conference proceedings are reflected in the objectives and priorities of the multi-stakeholder platform for enhanced co-operation among health and energy actors, the Global Health and Energy Platform of Action, set up by the World Health Organization (WHO) and the United Nations Development Program (UNDP). The platform was launched on 21 May 2019 at the WHO’s World Health Assembly in Geneva. IRENA is among the high-level partners of this platform and contributed to the development of the official action brief included in the UNDESA SDG 7 Policy Briefs in Support of the High-Level Political Forum, held in 2019. This work is supported by the Government of the Walloon Region of Belgium and the Government of Norway.

The 4th Edition of the International Off-grid Renewable Energy Conference and Exhibition (IOREC), Singapore, 31 October – 1 November 2018

The 4th Edition of the International Off-grid Renewable Energy Conference and Exhibition (IOREC)⁷ took place on 31 October to 1 November 2018 as a co-located event with the Asia Clean Energy Summit during the Singapore International Energy Week (SIEW). The ASEAN Ministers on Energy Meeting (AMEM) chaired by Singapore, also took place during SIEW. The co-locating of these events provided an opportunity to leverage synergies and disseminate the importance of off-grid renewable energy to a wider gathering of key stakeholders. The two-day conference highlighted the central role of off-grid renewable energy to achieving universal energy access and the nexus with a variety of development objectives. Key findings and recommendations contributed to the preparation of the report *Off-grid renewable energy solutions to expand electricity access: An opportunity not to be missed* (January 2019). IOREC was supported by a voluntary contribution from the Government of Norway.



Figure 9: 4th Edition of the International Off-grid Renewable Energy Conference and Exhibition (IOREC), Singapore, 31 October – 1 November 2018

35. Building on the outcomes of the IRENA International Conference on Renewable Energy Solutions for Healthcare Facilities, the Agency partnered with other key institutions to support the integration of off-grid solutions for healthcare facilities through a range of events, in particular, the international conference “Clean Energy for Health Care” (organised in partnership with UN Foundation, Energy Sector Management Assistance Program (ESMAP), Sustainable Energy for All (SEforAll), UNDP, UK Aid, WHO) held in Nairobi, Kenya, in April 2019, and the “Decentralised Health and Sustainable Energy Conference” (organised in partnership with SELCO Foundation, IKEA Foundation, and UN Foundation, among others), held in Bangalore, India, in December 2018.

Accelerating Innovation

36. IRENA continues to provide insights on the requirements of the energy transition. In this context, the Agency is finalising the policy brief *Power System Organizational Structure for the Renewable Energy Era* that frames concepts and challenges to be addressed to align power system structures with renewable energy systems. The brief analyses the misalignments between current power system structures and deployment of renewable energy. It highlights how these misalignments are embedded in the current power system design of the fossil fuel era (from vertically integrated to fully liberalised ones). It highlights the great efforts required for the overall redesign of the power system structure, using a holistic framework, and shows how partial fixes to solve current issues risk exacerbating the misalignments between power system structure and renewable energy deployment. Finally, the brief discusses how auctions and long-term procurement of energy mechanisms are likely to become the backbone of the energy market of the future. IRENA’s work on power system structure of the renewable energy era under different contexts has been disseminated to Member States, including at the Korean International Renewable Energy Conference (KIREC) in Seoul, the CSP4 Climate conference in Nicosia, and IRENA workshops (Bosnia and Herzegovina, North Macedonia and Montenegro).

⁷ <https://iorec.irena.org/>

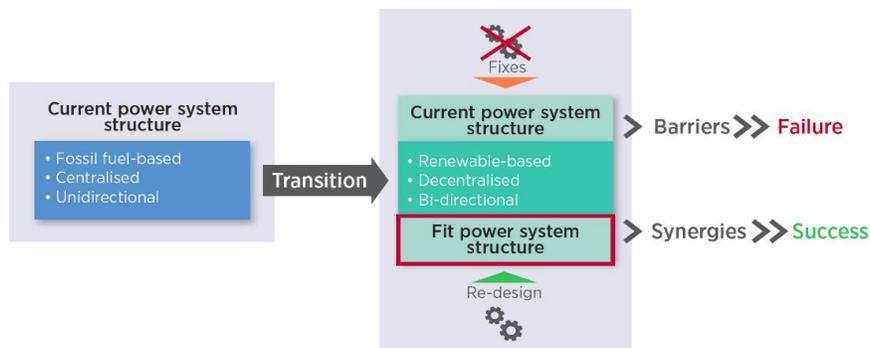


Figure 10: Power system structure “fixes” vs redesign

37. As auctions are increasingly adopted to drive renewable energy deployment in the power sector, IRENA continues to analyse and disseminate lessons learned and best practices in their design and implementation. An estimated total volume exceeding 110 GW of electricity was auctioned in 2017-2018, with solar PV and onshore wind accounting for more than half and almost a third, respectively, of the total volume. Price results for solar and wind auctions have overall decreased in the past decade but in 2018, while PV prices kept decreasing, albeit at a slower pace, the price of wind went upwards. Those trends were analysed in IRENA’s latest report on the topic, *Renewable Energy Auctions: Status and Trends Beyond Price* (June 2019). The report is the fifth of the series and it focuses on the design of auctions to achieve broader objectives, such as ensuring project completion, integrating high shares of VRE, and supporting an inclusive energy transition. IRENA’s work on auctions has been pivotal in supporting IRENA Member States in the selection and design of policy instruments and procurement mechanisms. Translating analytical work into action, IRENA provided technical assistance through different workshops including in the Ukraine, Thailand (in cooperation with UNESCAP), and Vietnam.

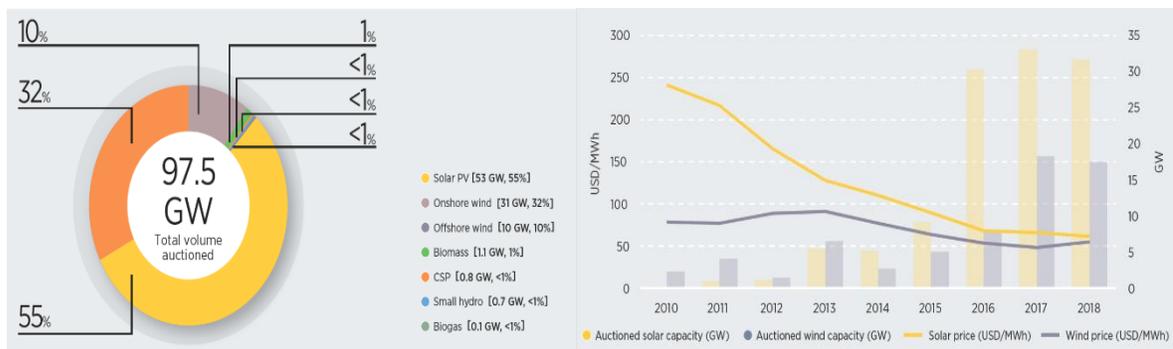


Figure 11: Share of the total volume auctioned in 2017-2018, by technology (left) and Global average prices resulting from auctions, 2010-18 (right)

38. The preliminary findings of the study were presented at the IRENA Policy Day organised back to back with the Seventeenth Meeting of the IRENA Council (for information on Policy Day please see box in section Global Voice, Realising socio-economic benefits). The full report will be launched at the tenth session of the IRENA Assembly in January 2020. The findings provided the basis for the three-day capacity building workshop “The Asia EDGE Regional Competitive Procurement Dialogue”, conducted in partnership with USAID in Bangkok in November 2019.

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39. In May 2019, the Agency launched the report *Innovation Outlook: Smart Charging for Electric Vehicles* that provides the latest information on how to unlock synergies between an electrified transport sector and the use of car batteries for the integration of renewable energy in power systems. This project is supported by voluntary contributions from the Government of Germany.⁸ After the release of the report, the Government of Luxembourg requested support to organise a Ministerial Conference on Electromobility, 21 and 22 October 2019 in Luxembourg. Ministers of Energy and Mobility from the Pentalateral Forum Countries - Luxembourg, Germany, the Netherlands, Belgium, France, Austria and Switzerland - discussed the nexus between the electricity and mobility sector, and the opportunities that it creates for their countries. The conference 'Closing the loop between Energy and Transport' was informed by IRENA's analysis and, for the first time ever, gathered key stakeholders from all sectors involved such as car manufacturers, electricity market players and e-mobility actors fostering intersectoral co-operation networks.
40. In the heating and cooling sectors, IRENA is partnering with IEA and REN21 on another joint-publication focusing on enabling, integrating and directing policies for renewable heating and cooling, building on the positive feedback received on the first report, *Renewable Energy Policies in a Time of Transition*. The study, which will be launched in the first half of 2020, identifies best practices in the adoption of policies measures to decarbonise the heating and cooling end-use as part of the energy transition and in the renewable era. The analysis covers the main decarbonisation pathways including higher electrification, green gas (hydrogen and biogas), renewable energy-based district heating and cooling, the direct use of renewable energy-based heat and the use of sustainable solid biomass.
41. In January 2018, IRENA and the Climate Policy Initiative (CPI) launched their first joint report, *Global Landscape of Renewable Energy Finance*, setting out global trends in renewable energy investment during 2013-2016 by technology, financial instrument, and region. Over 25,000 downloads and several citations from the Overseas Development Institute (ODI), SEforAll, World Bank, and others, ensured high visibility and wide use. Findings of the report were presented at numerous global fora including most recently the Africa Renewable Energy Initiative (Chad, April 2019). IRENA and CPI are now working together on an update of this analysis (*Global Landscape of Renewable Energy Finance 2020*), which will look at the investment landscape over 2013-2018.

⁸ This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

Enhancing the Business Case of Ocean Energy Technologies

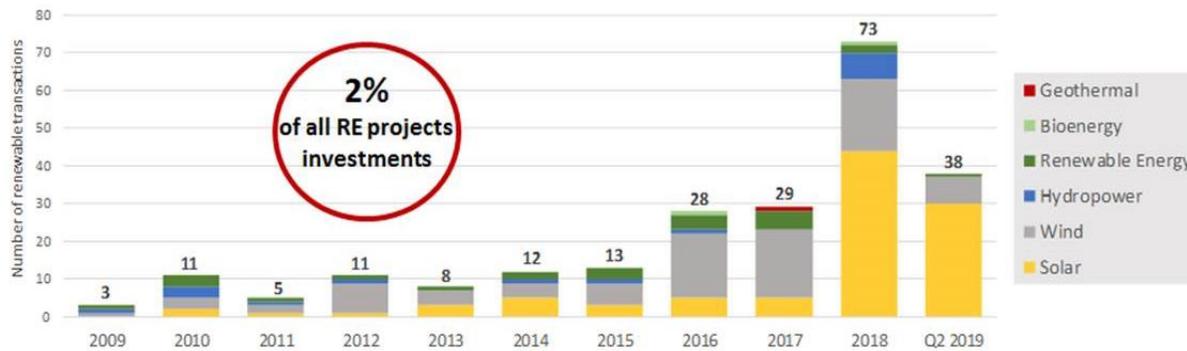
In 2019, the Agency expanded its work in ocean energy technologies to support commercialisation in islands and countries with coastal areas. As part of this area of work, the Agency hosted two regional events on the topic, one in Europe and one in North America, to collect input from experts and establish networks for a common action plan to accelerate the deployment of those technologies. Events brought together policy makers, private sector leaders, entrepreneurs and academia to discuss and agree on the next steps needed to reach commercialization of ocean energy technologies.

The event, ‘Unlocking the potential of ocean energy around the globe’ (October 2019, Ireland), held back-to-back with the annual Ocean Energy Europe conference (Dublin), saw participants discuss innovative designs, new business models – including sector- coupling opportunities – and the impact of ocean energy projects around the world with a special emphasis on Small Island Developing States (SIDS). SIDS representatives from Nauru, Fiji, Belize and Island Regional Associations, such as Pacific Community and SIDS DOCK, highlighted the great potential of OE technologies and actions needed to upscale their deployment.

To introduce novel pathways to couple ocean energy technologies with other energy sectors, IRENA organised a workshop at the conference Energy3 Canada, ‘Coupling ocean energy with other sectors: Innovative business models and complementarities with renewable offshore technologies’ (October 2019, Halifax, Canada). Through direct engagement with the industrial sector, participants explored business models that can enable new revenue streams for ocean energy projects; as it is the case of ocean power generation coupled with aquaculture, sea water desalination and building cooling, among others.



42. On a related theme, IRENA has finalised analysis on institutional investors (i.e. pension plans, insurance companies, sovereign wealth funds, and endowments/foundations), that are estimated to hold well over USD 100 trillion of assets yet have only invested about USD 6 billion directly in renewable projects in 2018, financing a mere 2% of new renewable energy projects. Analysis in the report *Mobilising Institutional Capital for Renewable Energy* has benefited from input from policymakers, public and private financiers, and developers, gathered via a series of roundtables held in Addis Ababa, Singapore and Abu Dhabi, as well as through an online survey. The report contains analysis on barriers to greater participation of institutional investors and provides actionable recommendations to policymakers and other stakeholders to tap into this important capital pool. The report will be launched at the IRENA General Assembly (January 2020) along with a brief on *Financing Renewable Energy with Green Bonds* that highlights new capital market development and its potential to grow renewable investments and help steer global capital towards sustainable solutions.



Source: IRENA analysis based on Preqin (2019) (subscription required)

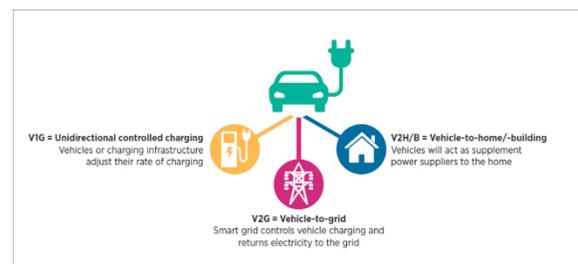
Figure 12: Number of renewable energy projects involving institutional investors, by technology, 2009-Q2 2019

43. Decentralised renewables hold great importance in efforts to achieve universal access to energy. To help scale up investments by identifying opportunities and highlighting innovative financing and business mechanisms, IRENA is conducting an analysis of the off-grid renewable energy financing landscape. To attract capital into the sector and ensure the rapid uptake of these technologies, financing challenges affecting project developers and consumers in emerging and developing countries must be addressed. Analysis will build on IRENA's work on policy instruments and innovative business models for energy access solutions, while informing policymakers and relevant investors about the main trends in off-grid renewable energy investment, identify gaps, and provide examples of replicable business/financing models and best practices.

Electric Vehicle (EV) Smart Charging

IRENA analysis indicates that if most of the passenger vehicles sold from 2040 onwards were electric, then more than one billion EVs could be on the road by 2050. In this context, future EV battery capacity may dwarf stationary battery capacity. In 2050, around 14 terawatt hours (TWh) of EV batteries would be available to provide grid services, compared to 9 TWh of stationary batteries. EV fleets can create vast electricity storage capacity; however, if everyone charges their cars at the same time, i.e., mornings or evenings, this will exacerbate the stress on the electricity network. The timing of charging is therefore critical. Smart charging means adapting the charging cycle of EVs to both the conditions of the power system and the needs of vehicle users. This facilitates the integration of EVs while meeting mobility needs. Advanced smart charging approaches, such as direct control mechanisms, will be necessary as a long-term solution at higher penetration levels and for delivery of close-to-real-time balancing and ancillary services.

The main forms of such charging, including V1G, V2G, V2H, and V2B, are defined in the figure to the right. IRENA's report, *Innovation Outlook: Smart Charging for Electric Vehicles* (May 2019), informs countries on how to exploit the complementarity potential between the deployment of VRE sources, PVs and wind power, and EVs. It considers how this potential could be tapped through smart charging up to mid-century.



Innovation, IRENA Innovation Days and European Utility Week 2019

To understand the role of VRE in innovation, IRENA mapped innovations to support countries in their strategies to transform their power sectors. *Innovation Landscape for a Renewable-powered future* (Feb. 2019), guides countries on how to build solutions to transform their power system fostered by synergies between innovations in business models, market design, enabling technologies, and system operation. The deployment of these innovations results in lowering the cost of integrating high shares of VRE, while making energy production, transmission, and consumption more flexible, and empowering a new generation of energy consumers. Results show that a paradigm shift in the re-design of power system setups to render them fit for a renewable energy-based energy system is needed.

Building on this analysis, IRENA organised several region-focused events including Innovation days for Uruguay (July 2019), Thailand (Sept. 2019) and Turkey (Nov. 2019), as well as European Utility Week (Nov. 2019). Innovation Days have been attended by more than 150 stakeholders each, connecting industry experts and policy-makers and showcasing emerging technology-driven innovations. European Utility Week 2019, the landmark venue for the energy industry in Europe, had an audience of 18 000 international energy professionals, with over 800 exhibiting companies. IRENA's Director-General opened the Week, addressing the innovative solutions to integrate high-shares of renewables in power systems before 1,000 industry experts and entrepreneurs. As part of this engagement, the Director-General met CEOs from leading European energy companies where industry expressed their interest in engaging more closely with IRENA to accelerate the deployment of renewables on the ground.



Figure 13: IRENA DG at European Utility Week 2019

Knowledge Hub

44. Building a growing knowledge base for its Members and consistent with emerging needs, IRENA has been conducting analysis on renewable energy targets, focusing on the power sector. As the energy transition unfolds, renewable energy targets provide a clear indication of the deployment timelines envisioned by governments. Targets often become key drivers of policies, investment, and development in the sector. Building on its analysis on *Renewable Energy Targets*, IRENA, in collaboration with REN21, is working on a new study, *National Renewable Energy Targets: A Global Quantified Estimate*, which provides the first global estimate of renewable electricity targets in terms of installed capacity and total investment cost. It assesses the effectiveness of the targets covered in the 2015 report and draws on lessons learned in designing and setting targets. It also evaluates

the alignment between the renewable energy targets in the power sector and Nationally Determined Contributions (NDCs). By highlighting opportunities to raise the ambition of such targets, the work contributes to the Agency's discussions in preparation for and during the 2019 Climate Action Summit hosted by the UN Secretary-General, and COP25 in Spain.

45. As countries prepare to review their NDCs in 2020, IRENA has worked on an update of the analysis of renewable power commitments in current NDCs, comparing these with actual renewable energy deployment observed through 2018, targets included in other national energy plans across the world, and IRENA's REmap scenario for 2030. The study, launched at COP25, has shown that while NDCs would result in 2.9 TW of global renewable installed capacity at the end of 2030, current and planned policies are expected to deliver 5.2 TW (Current Plans in Figure 14). A higher level of renewable energy deployment, equal to 7.7 TW in 2030, is projected under the REmap scenario (Energy Transformation in Figure 14). The analysis also finds that the pace of renewable energy deployment described in current NDCs is slower than actual deployment trends, although this is in part due to some countries not restating their national renewables targets in their NDCs. In 2020, countries have the chance to significantly strengthen their renewable energy power targets in a cost-effective way and with significant socio-economic benefits.

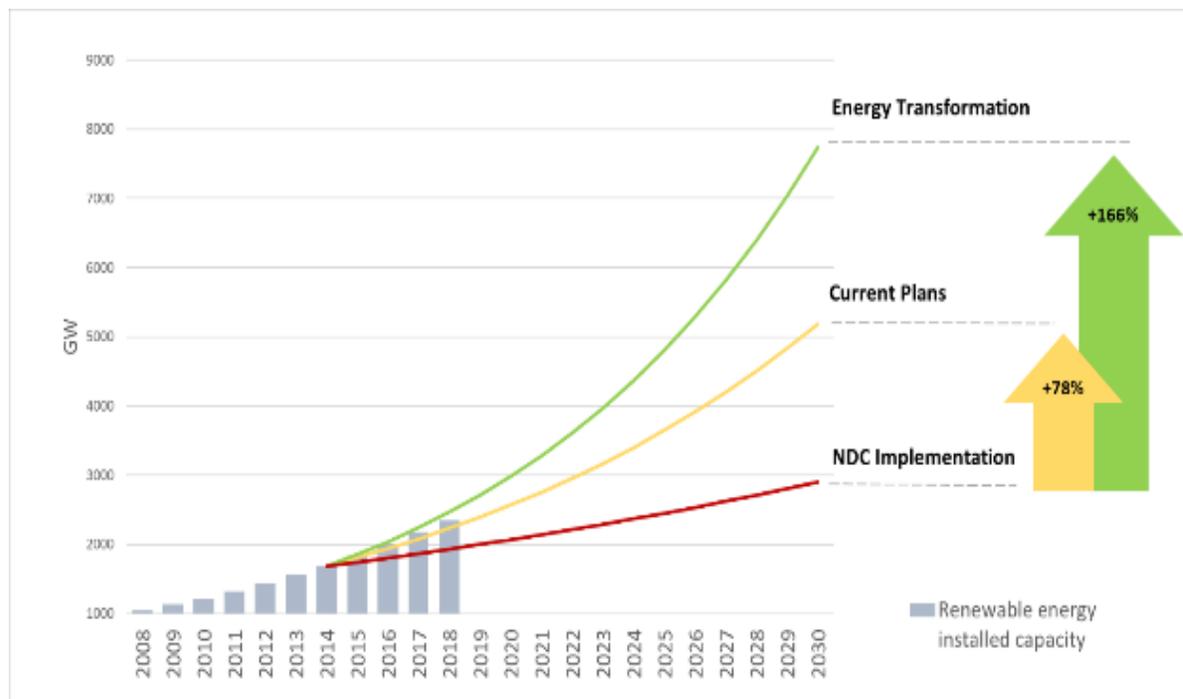


Figure 14: Projected level of renewable energy deployment through 2030 under three scenarios: NDC Implementation, Current Plans and Energy Transformation

Note: for simplicity, constant CAGR is used to project global renewable energy deployment up to 2030 in the three scenarios i.e. NDC Implementation, Current Plans, and Energy Transformation.

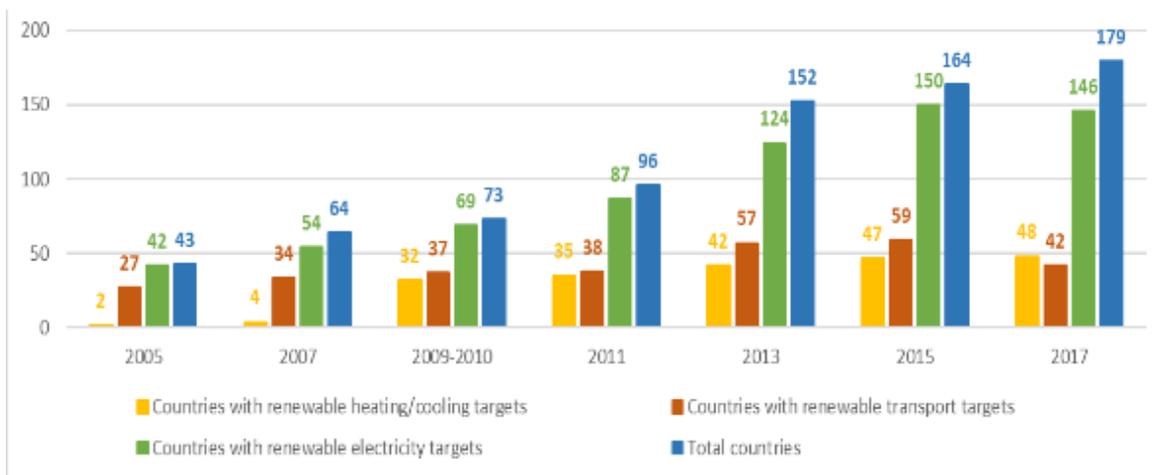


Figure 15: Countries with national renewable energy targets

46. Examining additional opportunities for strengthening such targets, IRENA has started working on two studies to address the potential contribution of renewables to climate change adaptation and resilience building and the role of market-based mechanisms in meeting NDC renewable energy targets. The Agency is developing a tool that determines the benefits of deploying renewables in adaptation measures to help decision-makers and other stakeholders design supportive policies, strategies and financing mechanism to achieve climate adaptation goals. IRENA research to date on market-based mechanisms focused on Southeast Asia and Europe, where such mechanisms have been used prominently, and has found that of the four mechanisms studied (emission trading system (ETS), renewable energy certificates (RECs), clean development mechanism (CDM), and voluntary carbon market (VCM)), renewable energy certificates have so far demonstrated the most significant positive impact on renewable energy deployment. These studies are funded through voluntary contributions of the Government of the Walloon Region and the Government of Japan.

Hydrogen



Hydrogen has emerged as an important part of the clean energy mix needed to ensure a sustainable future. Falling costs for hydrogen produced with renewable energy, combined with the urgency of cutting greenhouse-gas emissions, has given clean hydrogen unprecedented political and business momentum.

In this context, IRENA prepared a report for the 2nd Hydrogen Energy Ministerial Meeting in Tokyo, Japan, which examines the potential of hydrogen fuel for hard-to-decarbonise energy uses, including energy-intensive industries, trucks, aviation, shipping and heating applications. But the decarbonisation impact depends on how hydrogen is produced. Current and future sourcing options can be divided into grey (fossil fuel-based), blue (fossil fuel-based production with carbon capture, utilisation and storage) and green (renewables-based) hydrogen. Green hydrogen produced through renewable-powered electrolysis is projected to grow rapidly in the coming years. Among other findings, the report highlights that important synergies exist between hydrogen and renewable energy. Hydrogen can boost renewable electricity market growth and broaden the reach of renewable solutions. This report received support from a Voluntary Contribution of the Government of Japan.

III. Global Voice of Renewables

47. As a voice of renewables at the global, regional, and local levels, IRENA works to influence the global energy discourse. Backed by an extensive body of work, IRENA is engaging with its widening global network to communicate the role of renewables in the transformation of the global energy system and amplify their impact.
48. IRENA is leading a new “Sustainable Energy Jobs Platform” with a number of international partners⁹. The Platform was initiated by IRENA under the umbrella of the SDG7 Technical Advisory Group convened by the UN Department of Economic and Social Affairs (UNDESA). It arose out of discussions surrounding the High-Level Political Forum process for the review of SDG 7 in 2018¹⁰ and 2019¹¹. The Platform will be launched officially at the Tenth Session of the IRENA Assembly. It aims to (a) improve knowledge on data, taxonomy and methodologies; (b) pursue research and policy analysis; (c) offer advocacy and communication; (d) facilitate knowledge sharing; and (e) support capacity building to ensure a just energy transition. Affordable and clean energy, along with decent work and economic growth, are key Sustainable Development Goals. Renewable energy will be a jobs motor of growing significance. As the transition picks up speed, creating a skilled workforce is essential for translating energy and climate ambition into on-the-ground reality. By weaving IRENA’s unique insights together with partners’ analyses, the Platform can help policymakers navigate both the opportunities and challenges of the energy transition, bringing about a just transition.



Renewable Energy and Jobs – Annual Review

At the Seventeenth Meeting of the IRENA Council in June 2019, IRENA introduced the sixth annual review of renewable energy jobs worldwide. The report, *Renewable Energy and Jobs Annual Review 2019* (June 2019), reflects the latest available estimates and calculations based on a wide range of sources and represents an ongoing effort to refine and improve data and methodologies. Since the start of the series, employment in the sector has grown from 7.3 million jobs in 2012 to 11 million in 2018. IRENA’s reports on this topic have encouraged several governments, most recently Argentina’s, to issue national estimates of renewable energy employment. Report findings have been disseminated widely at conferences and workshops around the world. As in previous years, the report has received a broad and positive echo in print and online media.



⁹ At present, Platform members include: European Commission (EC), Global Green Growth Institute (GGGI), GOGLA, GWNet, Institute for Advanced Sustainability Studies (IASS), International Labour Organization (ILO), Power for All, SELCO Foundation, UNIDO, World Bank.

¹⁰ https://sustainabledevelopment.un.org/content/documents/22877UN_FINAL_ONLINE_20190523.pdf

¹¹ https://sustainabledevelopment.un.org/content/documents/18041SDG7_Policy_Brief.pdf

Realising Socio-economic Benefits

49. Through its state-of-the-art analysis in employment, local benefits and policy, to name a few, IRENA continues to inform on the socio-economic benefits of an expanding renewable energy sector.

50. IRENA's socio-economic footprint analysis measures the wider socio-economic outcomes of deploying transition roadmaps, providing insights and informing transition

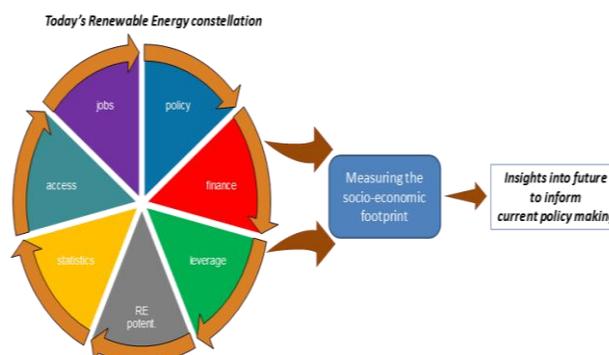


Figure 16: Socio-economic footprint analysis

policy making. Under a comprehensive and integrated framework, the interactions between the energy and socio-economic systems, as well as between the different world economies, are tracked to evaluate the net outcome. All Agency areas of expertise are integrated into the process, informing the projections of the likely transition outcomes.

51. As input to the ninth Session of the IRENA Assembly, the Agency produced a brief titled *Measuring the socio-economic footprint of the energy transition: The role of supply chains* (Jan. 2019). It provided insights into the structural elements and related policy interventions required to maximise socio-economic benefits from the energy transition. This was achieved in part through sensitivity analyses on trade and domestic supply chains. The brief revealed that the strength and depth of domestic supply chains play a key role in determining how countries and regions will fare in the energy transition. This work is supported by a voluntary contribution from the Government of Germany.

52. IRENA will launch the report *Measuring the socioeconomics of the energy transition: Focus on Jobs* based on modelling jobs impacts in the energy transition to 2050 at the tenth Session of the IRENA Assembly. The report presents the results of selected regions and countries in terms of economy-wide employment, energy sector jobs and renewable energy jobs, including occupational requirements. It discusses the structural realities of many economies and potential misalignments that may emerge in the labour market during the energy transition. It further proposes a comprehensive policy framework capable of addressing the challenges and opportunities that present themselves. Given increased interests in national level studies from Members, IRENA is finalising the socio-economic footprint analysis for Japan and Republic of South Korea. Analysis for Japan is supported by voluntary contribution from the Government of Japan.

53. IRENA also continues to work on improving its socio-economic modelling and welfare indicator for the energy access dimension to gain full visibility in the socio-economic footprint analysis. The socio-economic implications of energy access, and the evolution of energy use through the energy use ladder, are poorly measured when evaluating the impact of transition roadmaps. This lack of visibility hinders the development and deployment of planning and policies that enable the potential benefits of energy access.

54. Complementing its global analysis on socio-economic impacts of renewable energy, IRENA is finalising a report titled *Community engagement in Sub-Saharan Africa: Experiences of large-scale wind and solar projects*. The report examines key lessons learned and best practices that can be drawn from case studies in the region. It explores community engagement practices, job creation, skills

development, and gender equality. The report assesses major drivers of socio-economic outcomes, including national policies, requirements by financial lenders, industry policies and strategies, and host community requests. Based on a literature review and project visits, the analysis fills an important knowledge gap and supports policy-making towards a just, fair, and inclusive energy transition.

55. Findings on IRENA's socio-economic benefit analysis were discussed and disseminated at a wide range of international conferences and workshops across the world. Most recently, these included the "Energy Horizons" annual conference hosted by the Council on Energy, Environment and Water (CEEW) in New Delhi; meetings in support of the SDG 7 High-Level Political Forum process in New York and Bangkok; the Vienna Energy Forum; and Regional Climate Weeks in Brazil and Thailand, as well as at KIREC.

The IRENA Policy Day – Attracting RE Investments



Accelerating the deployment of renewable energy requires policies that contribute to an enabling environment for attracting investments in the sector. As deployment has grown and technology matured, renewable energy policies are increasingly integrated into overall energy sector planning while also addressing wider growth and development objectives. To inform policy-making, IRENA provides state-of-the-art analysis of enabling policy frameworks and finance mechanisms spanning the entire renewable energy development cycle. This analysis forms the basis for the discussions at the **IRENA Policy Day**.

Policy Day provides a forum for renewable energy policy dialogues where countries and stakeholders can share experiences and disseminate best practices in policy-making to ensure the efficient deployment of renewable energy and the maximisation of benefits realised.

Policy Day generates feedback from policy-makers and experts, provides key inputs to support IRENA's implementation of the Work Programme and Budget in the policy realm, and thus ensures relevance and accuracy.

The fifth IRENA Policy Day took place on 27 June 2019 and addressed topics including renewable energy policies and finance in a time of transition, auction trends and design elements, the allocation and management of project-related risks and finance mechanisms to facilitate investments, in addition to policies to maximise the benefits. Country representatives presented their experiences in designing a mix of deployment and finance policies for successful project development. Representatives from both developing and developed countries shared experiences on the factors and enabling conditions that contributed to success in deploying renewables and ensuring socio-economic benefits.

For more information on the IRENA Policy day, please visit IRENA online at <https://www.irena.org/events/2019/Jun/IRENA-5th-Policy-Day>



Figure 17: Policy day participants

Informing Markets

56. IRENA’s data and **statistics** are trusted references for decision-makers as they take steps towards a clean energy transition. IRENA’s *Renewable Capacity Statistics 2019* report, published in March 2019, shows that renewable electricity generation increased by 7.9% (171 GW) to reach 2,351 GW at the end of 2018. As in previous years, solar capacity expanded the most (24%), adding 94 GW, followed by wind energy with an increase of 49 GW (10%). IRENA also produced a new dataset for reporting SDG Indicator 7.a.1 - International financial flows to developing countries in support of clean and renewable energy. The data shows that international co-operation on renewables has increased substantially, from only USD 1.3 billion in 2000 to USD 18.6 billion in 2016. Traditionally, most funding has been directed towards hydropower development, but support for other renewables has increased in recent years and solar accounted for over half of all funding in 2016.



Figure 18: Workshop participants discussing how to overcome barriers to data collection in the Pacific

57. IRENA continues to work with countries to improve their national renewable energy statistics through training and the dissemination of technical information. Four training workshops have been held during the biennium, covering Central Asia, West Africa, Pacific Islands, and the Caribbean. These workshops were held in collaboration with regional energy bodies and trained 97 national statisticians from 49 countries. The latest two workshops in the SIDS also included sessions on how to analyse and interpret energy data to set up national policies, plants and targets and revising NDCs. This was particularly appreciated by participants, many of whom are in the process of revising their NDCs.

58. IRENA’s **cost data** is a source of timely, up-to-date information that is used by a wide range of stakeholders involved in the energy transition. In January 2018 and May 2019, IRENA released annual updates of the trends in renewable power generation costs and performance, *Renewable Power Generation Costs*, these included expanded coverage in the form of installed cost breakdowns, performance metrics and operations and maintenance cost data. Data from the reports were made available online and to stakeholders for use as their official statistics (e.g., the IEA and REN21, among others). IRENA has also analysed learning rates for onshore wind and proposed a methodology that increases usefulness of analysis for policy-makers in understanding cost reductions for other technologies. This information is currently being prepared as a working paper. With support from the Government of Germany, IRENA has analysed the cost reduction potential for solar (PV and CSP) and wind (onshore and offshore) technologies to 2030 in each G20 country, a report on which will be released in 2020. IRENA has also used its latest cost data to analyse the evolution of energy sector subsidies in the energy transformation, based on the REmap cases to 2050. Results will be released by the end of 2019.

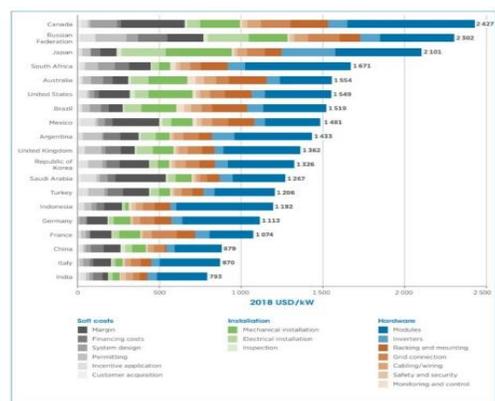


Figure 19: Detailed Breakdown of Utility-Scale Solar PV Installed Costs by G20 Country, 2018

IRENA Informs the Important Role of Quality Assurance and Standardisation to Safeguard the Current and Future Operation of Renewable Energy Technologies

At the International Electrotechnical Commission (IEC) General Meeting in China, 21 October 2019, IRENA showcased the importance of deploying quality assurance schemes and standardisation to protect the performance of renewable energy technologies. In this context, IRENA explained the benefits of complying with assurance schemes when developing renewable energy technologies to representatives from over 15 countries at the Conformity Assessment Board meeting. During the IEC, the Agency also participated at the “Workshop for Industrialising Countries”, where it shed light on how to bring on board renewable energy quality schemes in developing economies, and how this contributes to achieving SDG7. The Workshop included discussions with representatives from Cote d’Ivoire, Peru, Kenya, Togo, Mexico, among others, who expressed the need of securing quality assurance in their local renewable energy projects.



Figure 20: International Electrotechnical Commission

Amplifying Impact

59. IRENA continues to strengthen its **communication and outreach activities** globally and multi-lingually on regional and sub-regional levels. Since the beginning of the biennium, IRENA has been referenced in 30,494 media articles in 40 languages across 170 countries. IRENA has published several flagship reports during the period, addressing key issues for the global shift to renewable energy. These were disseminated to policy-makers, the media and other target readers with key graphics, related digital stories and high-level summaries available in a range of languages. For example, the *Renewable Power Generation Costs* study released in May 2019 with a press release and fact sheet in seven languages, was mentioned in 539 articles at the time of writing of this report, including by Reuters and Forbes. The report was downloaded more than 37,000 times in three months.
60. The number of visitors to IRENA’s **website** grew by 60% in 2018 and by a further 29% in 2019, with the website registering over 1.1 million visits. Current activities aim to stimulate user interaction, increase time spent on the site, boost return visitor rates, and confirm the position of irena.org as a reliable knowledge hub for renewables. Page views have increased by 34% to exceed 4.5 million for the biennium to date. Web news pieces have performed strongly, helping to retain user attention and drive traffic throughout the website. IRENA’s Newsroom was browsed by almost 11% of users; press releases related to capacity data and jobs were the most read. Energy source overview pages also rank high, with solar and wind attracting the most attention. IRENA’s publication pages were accessed by 35% of all irena.org-users, with publications in PDF format being downloaded about 1.3 million times in the biennium to date.

61. IRENA has continued using social media and short videos to highlight global events, reports and news. Twitter account followers have grown 83% since January 2018 to over 69,000 by September 2019. IRENA's Facebook constituency increased to 431,000 followers, while its LinkedIn following grew by 114% to 43,000. A new email format for sharing key publications has more than doubled the email "open" rate among subscribers. IRENA's email subscription list has grown to 47,000.

IV. Network Hub

62. The transformation of the global energy system requires increased connectivity on national, regional, and global scales. This ranges from regional and national policy considerations, through cross-border trade and grid interconnections, to city and community engagement. IRENA is building on its collaborative frameworks, such as the Clean Energy Corridors, SIDS Lighthouses Initiative, and Global Geothermal Alliance (GGA) to conduct needed analysis, support peer-to-peer exchange and transfer of knowledge and provide targeted advice.

Regional Action Agenda

63. The Agency has continued to advance its **Renewable Energy Market Analysis** series to capture the wealth of knowledge and experience embedded in a region and identify emerging trends and themes at the intersection of public policy and market development. Market analysis combines outcomes from different areas of IRENA's work, including policy, data and statistics, finance, costs, benefits, potentials, tools, technology brief and roadmaps, and country support.
64. The fifth Renewable Energy Market Analysis focused on Southeast Europe (SEE). In addition to an examination of the status and potential of renewables in the region, the report highlights the role of biomass and focuses on the finance landscape, the socio-economic and environmental impacts of renewable energy, and existing and needed policies. It identifies the key moment in a region where well-informed policy-making can steer an energy sector heavily reliant on locally sourced lignite and traditional biomass towards greater sustainability and reduced energy poverty and energy vulnerability. Analytical findings have been presented during a dedicated event at the EU Sustainable Energy Week and during the ENERGA Fair in Sarajevo, Bosnia and Herzegovina. The report was officially launched in Skopje, North Macedonia, in December 2019, at the RENEXPO fair.
65. Underpinned by IRENA's analytical work, regional **action agendas and plans** continue to guide the Agency's activities worldwide. To date, work has been undertaken to develop regional agendas and plans for Africa, Central Asia, Latin America, South and Southeast Asia, South East Europe, and Middle East and North Africa.
66. **Africa.** The Agency is working closely with the African Union Commission (AUC) and African Union Development Agency - New Partnership for Africa's Development (AUDA-NEPAD) to provide substantive input into the preparatory process for the next phase of the Programme for Infrastructure Development in Africa (PIDA) for the 2020-2030 period. IRENA's work, undertaken by the Clean Energy Corridor initiatives in Africa, is contributing to this effort. In July 2019, IRENA took part in the "Africa Energy Planning Policy Dialogue" to discuss a newly established programme of the AUDA-NEPAD, focused on energy security and

integration approach to planning following the endorsement by the African Heads of States of the concept note on energy security. Further, the Agency is supporting AUDA-NEPAD with analysis on the assessment of planning and prospects for variable renewable energy in Eastern and Southern Africa, including country-level resource assessments, zoning of solar PV and wind resources, and scenario modelling. This work is based on the System Planning Test (SPLAT) model that has been updated and refined for the East and Southern African Power Pool regions. Based on the technical analysis, IRENA suggests potential solar PV and wind capacity and transmission infrastructure projects to be considered under the PIDA process. The results of the analysis will be presented in a study to be finalised this year and will also provide inputs to the update of EAPP and SAPP master plans.

67. The Second Ordinary session of the African Union Specialised Technical Committee on Transport, Transcontinental and Interregional Infrastructure, Energy and Tourism (STC-TTIEI), held in Cairo in April 2019, recommended Member States, regional, and continental bodies to integrate the concept of the Clean Energy Corridors into their renewable energy and climate change agendas as well as in the design, implementation, and update of regional and continental initiatives and programmes to support the Continent's transition to more sustainable, reliable, and affordable energy systems.
68. The Agency is also engaging at a continental level through its membership in the Steering Committee of the PIDA. As part of the Steering Committee, IRENA is participating in discussions on the update of the PIDA Priority Action Plan (PIDA-PAP), for which a second phase (PIDA-PAP 2) for 2021-2030 is currently under development. Given the need for a larger role of non-hydro renewables in PIDA-PAP 2, the Agency is building on work undertaken as part of the implementation of the Clean Energy Corridors in Africa to help the continent identify economically-sound renewable energy projects to be integrated into the continental energy planning with IRENA suggesting potential solar PV and wind capacity and transmission infrastructure projects to be considered under the PIDA process.
69. IRENA has supported West African Power Pool as they update the ECOWAS masterplan. Insights from the updated System Planning Test model for West Africa (SPLAT-W) analysis were shared and discussed with the WAPP leadership and the technical service provider responsible for the masterplan update. As a result, IRENA's work was extensively used for the updated regional power sector masterplan. The plan displays high ambition in low-cost solar PV deployment and overall levels of renewable energy generation in flexible, well-interconnected national systems by 2030. After several rounds of consultation and validation at the technical level, the ECOWAS Revised Master Plan for the Generation and Transmission of Electrical Energy was adopted and endorsed at Ministerial and Heads of State level in December 2018.
70. IRENA has also supported the development of the *Economic Community of Central African States (ECCAS) Renewable Energy Roadmap* in November 2018, which is comprised of six main pillars: (i) resource assessment, (ii) energy data, (iii) long-term energy planning, (iv) enabling policy and regulatory frameworks for investments (v) renewable energy project development and finance, and (vi) institutional set-up and skill development across the renewable energy value chain. At the request of ECCAS and as input to the Roadmap, IRENA undertook regional SPLAT model and scenario analysis. The Roadmap is ready to be presented for Ministerial approval.

71. Upon invitation from the European Commission, IRENA has been involved in the process of the Africa-Europe High-level Platform for Sustainable Energy Investments in Africa (SEI), launched in November 2018 in Johannesburg. The objective of the SEI platform is to provide recommendations to address long-term challenges and strategic interests of the EU and Africa for the realisation of SDGs and the Paris Agreement. The SEI platform, comprising three multi-stakeholder working groups, focuses on business models for sustainable investments, improvements in the enabling environment, and business-to-business partnerships. The Agency has contributed to the work of the Working Group on Business Models for Sustainable Investments. Building on input from meetings held in Brussels in April, July and September 2019 as well as in Conakry in June 2019, the working groups provided recommendations that were adopted by the High-level platform in Johannesburg in November 2019 during the Africa Investment Forum.
72. IRENA is providing support to the African Renewable Energy Initiative (AREI), hosted by the African Development Bank. AREI focuses on developing integrated solutions in increasing access to clean energy services, improving human well-being and putting African countries on the path to sustainable and climate-friendly development. IRENA contributed analysis and expertise to a series of sub-regional workshops, themes of which are set by AREI member countries. For example, at the 2-day Regional Training and Experience Sharing Platform for North Africa, organised and hosted by AREI and RCREEE in Cairo, Egypt, held in August 2019, Agency staff presented an assessment of the role of private sector financial institutions and an analysis of the job creation and socio-economic benefit potential of renewables. In addition, the Agency is supporting the AfDB-led Desert-to-Power Initiative and contributed significantly to the inaugural Ministerial and Heads of States Meeting held in Ouagadougou, Burkina Faso, for the endorsement of the initiative in the G5 Sahel countries (Burkina Faso, Chad, Mali, Mauritania and Niger). The initiative promotes the development of 10 GW of solar generation capacity by 2030 and supply electricity to 250 million people including across 11 countries of the Sahel region (Burkina Faso, Chad, Djibouti, Eritrea, Ethiopia, Mali, Mauritania, Niger, Nigeria, Senegal, and Sudan). Most recently, IRENA became a member of its Steering Committee and attended the inaugural meeting on the margins of the Africa Investment Forum in Johannesburg in November 2019. The Agency and AfDB are currently in discussions on the operationalisation of the partnership between the two entities in the context of the initiative.

IRENA Renewable Energy Site Assessment Service

Through IRENA's Site Assessment Service, support has been provided to assess the technical and financial pre-feasibility of 95 sites over eight countries in Africa earmarked for solar PV and wind energy projects development. This service provides a benchmark tariff for the opening of solicited bids within those sites and allows local authorities and prospective project developers to have a clearer understanding of the technical and economic viability of the sites in pipeline for development. This work is supported by voluntary contributions from the Government of the Walloon Region of Belgium and the Government of Norway.

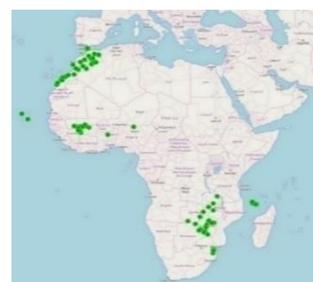


Figure 21: Assessed sites in Africa

76. In September 2019, as part of the XII Eurasian Forum, the Government of Kazakhstan, the KAZENERGY Association and IRENA organised a dialogue on “The role of renewables in the energy systems of tomorrow” with discussions on innovative solutions for accelerating the energy transformation based on the findings of IRENA’s *Global Energy Transformation* (April 2019) report. Speakers shared their experiences with national stakeholders in Kazakhstan and discussed the pressing challenges across the sectors for the transition to sustainable forms of energy.
77. **Latin America.** In May 2018, in the context of the Central American Integration System’s (SICA) Directors of Energy meeting, the Agency presented outcomes from its regulatory and technical projects in Panama, namely on the design of solar PV and wind power PPAs for the country’s power system operations, and simulation software for VRE integration. Building on the outcomes of this meeting, and as part of the technical support provided under IRENA’s Clean Energy Corridor of Central America (CECCA) initiative, the Agency held a series of trainings in partnership with GIZ and in collaboration with the Regional Operator Entity (EOR) of Central America for national and regional power system operators. The first training (December 2018) featured deep technical discussions on the underlying concepts and parameters of VRE models for grid studies and their specific applications in Central America, together with the simulation of power systems using the software PSSE. A post-training survey was conducted by IRENA with results indicating a higher level of participant satisfaction compared to previous workshops. A follow-up workshop took place in December 2019 to build further capacity in the areas of planning, operating and maintaining power systems with higher shares of VRE. Both training activities included the participation of six central American countries and regional organisations.
78. IRENA has been supporting various regional platforms in Latin America in contribution to the regional discussions on promoting the development of renewable energy. As part of this support, the Agency actively participated in the Energy Congress of Central America (COREN) in 2018 and 2019, respectively. In 2019, IRENA participated in the opening panel discussion, reiterating the importance of the CECCA initiative in facilitating the regional energy strategies for the countries in Central America. The Agency also highlighted the role of renewable energy in decarbonisation pathways towards the achievement of the international climate agreements, as well as the role of innovation as a key enabler of the energy transformation.
79. The Agency is enhancing collaboration with regional organisations, actively participating in OLADE Energy Week in 2018 and 2019. During the III OLADE Energy Week (Uruguay, December 2018), IRENA co-organised a session on renewable energy innovation, exploring key trends and sharing best practices on innovative technologies that facilitate the deployment of renewable energy in the region in partnership with OLADE and the Interamerican Development Bank (IDB). At the IV OLADE Energy Week (November 2019) IRENA participated in a series of panel discussions on renewable energy together with key regional stakeholders.
80. In December 2018, IRENA participated in the Council of Ministers of Energy of SICA to present work carried out under the CECCA initiative. The meeting provided an important opportunity to present and discuss the next steps in the implementation of CECCA. Following the validation by Ministers of Energy of SICA countries to renew the IRENA-SICA Memorandum of Understanding, IRENA expanded its engagement in the region to undertake a regional joint REmap and FlexTool analysis for Central America. The process was initiated in

May 2019 for the countries in the region, including Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama (see Centre of Excellence, Transformation Pathways for more information on REMap and Flextool). REmap and FlexTool analysis is supported by a voluntary contribution from the Government of Norway.

81. In January 2019, during the pre-Assembly day of the Ninth Session of the IRENA Assembly, the Agency held the “High-level Meeting on Renewable Energy in Latin America”, which brought together Ministers and high-level representatives from 18 Latin American countries, as well as partner organisations, to discuss opportunities and challenges to scaling-up renewables in the region, and present IRENA’s new regional action plan. The High-Level Meeting followed a period of stakeholder consultations, undertaken by IRENA with Latin American Members in 2018, to identify priority areas for support in the region. As an outcome of this process, the Agency developed the regional action plan, which lists future IRENA technical advisory and capacity building activities that address the main barriers to renewable energy deployment. This work leverages a range of IRENA’s tools and analytical products and is intended to be undertaken in collaboration with key partners and in conjunction with ongoing initiatives in the region.



Figure 24: High-level Meeting on Renewable Energy in Latin America at the Ninth Session of IRENA Assembly, Abu Dhabi, United Arab Emirates (UAE), January 2019

82. In 2019, IRENA initiated the implementation process of the Action Plan, the first activity a, workshop on “Accelerating Renewable Energy Investments in Latin America” was held in September 2019 in Bogota, Colombia and was organised with the support of the Ministry of Mines and Energy of Colombia and included government representatives from eight South American countries, the private sector, and international and local financial institutions. It discussed the investment landscape for renewable energy in the region and identified challenges and possible strategies, including policy options, to accelerate the development of renewable energy projects in Latin America.



Figure 25: Regional Workshop on Accelerating Renewable Energy Investments in Latin America, Bogota, Colombia, September 2019

83. With a view to supporting the efforts of the countries of Latin America in undertaking the transformation of their energy sector, IRENA, GIZ and the Ministry of Environment and Energy of Costa Rica co-organised a regional workshop to exchange lessons learned and best practices in the development and implementation of decarbonisation strategies driven by renewable energy, energy efficiency and electrification. The event took place in October 2019 in San Jose, Costa Rica under the framework of the pre-COP meetings, with the participation of representatives of 14 Latin American countries.
84. Furthermore, IRENA has actively engaged in high-level energy meetings in Latin America, namely the OLADE Ministerial meetings in December 2018 and November 2019, and the SICA Ministerial meetings in December 2018 and October 2019. The Agency's active participation in these meetings has led to the close collaboration between IRENA, its member countries and the regional organisations in Central and South America.
85. **South Asia.** IRENA has been deepening its engagement in South Asia in collaboration with regional intergovernmental organisations, such as International Centre for Integrated Mountain Development (ICIMOD) and the South Asian Association for Regional Co-operation (SAARC). Progress has been made in discussions with SAARC, which recently invited IRENA as a special observer of the "9th Meeting of SAARC Working Group on Energy", in Islamabad, Pakistan in April 2019, to discuss possible collaboration. An MoU is currently being discussed with SAARC, to shape future regional co-operation in South Asia.
86. With a view to advancing the understanding of energy needs in remote mountain communities, and the opportunities offered by renewable energy solutions for enterprise development, the Agency and the International Centre for Integrated Mountain Development (ICIMOD) designed a 'Regional Initiative on Renewable Energy' for Hindu Kush Himalayas. The results of the scoping exercise were presented at a regional consultative workshop on "Renewable energy solutions for enterprise development in Hindu Kush Himalayas" (Kathmandu, Nov. 2019). At the workshop, draft action areas were discussed with stakeholders, including government ministries, energy sector practitioners, development partners and other regional stakeholders. The outcomes of these deliberations will help to form a Regional Action Plan, which will act as a call for action for delivering tailored renewable energy solutions for enterprise development in the Himalayas.
87. IRENA also partnered with USAID and the Hawaiian Natural Energy Institute (HNEI) for a three-day capacity building workshop on the design of auctions. The 'Asia EDGE Regional Competitive Procurement Dialogue' (Bangkok, Nov. 2019) gathered more than 60 participants from the region that are planning to introduce auctions to support deployment.
88. **Southeast Asia.** The Association of Southeast Asian Nations (ASEAN) and IRENA signed a MoU to support the scaling up of renewable energy in the region at the 36th ASEAN Ministers on Energy Meeting (AMEM) and Singapore International Energy Week (SIEW) in Singapore in October 2018. Key priorities to implement the MoU, as outlined in the Action Plan, have been identified as: energy planning; development of a regional renewable energy roadmap; policy and regulatory frameworks to support renewable energy deployment; capacity building on renewable energy-related topics; and renewable energy technology, innovation, and financing. A workshop "Accelerating Investment in Southeast Asia" was conducted in conjunction with the ASEAN Renewable Energy Subsector Network (RE-SSN) Annual Meeting in Vietnam in May 2019. The workshop improved the understanding of renewable energy project financing and risk mitigation instruments. It also supported the development of bankable renewable energy

projects and facilitated their access to financing. The Agency also supported efforts of the region to develop bankable solar PV projects by organising the “Regional Project Facilitation Technical Workshop” (Brunei Darussalam, Aug. 2019). This work is supported by voluntary contributions from the Government of Denmark and the Government of Japan.

89. IRENA has also been actively engaged in ASEAN high-level energy meetings, namely Senior Officials Meeting on Energy (SOME) and AMEM in June and September 2019 in Bangkok, Thailand, where the role of ASEAN in the global energy transition was discussed. Participants welcomed the areas of focus proposed by IRENA to implement the ASEAN-IRENA MoU to assist the region in meeting its aspirational target of 23% renewables share by 2025 as well as to address the challenge of transformation towards clean and sustainable energy. Participation in other ASEAN Member States events has included the Asia Clean Energy Forum (June 2019), the Singapore International Energy Week (SIEW) (Oct. 2019), the EBTKE Conex (Indonesia, Nov. 2019) and High-Level Meeting and Stakeholder forum of Vietnam Energy Partnership Group (Dec. 2019). During the SIEW the Agency organized a roundtable discussion that highlighted the findings from GET2019 and discussed key implications of the Agency’s work for Southeast Asia in scaling up renewable energy and the socio-economic benefits of such a scale-up.

90. The Danish Ministry of Energy, Utilities and Climate has provided IRENA with a voluntary contribution for the period 2019-2021 to support long-term planning with a focus on Southeast Asia. The project is leveraging the ASEAN-IRENA MoU and placing special focus on planning work in the ASEAN region. Long-term planning provides critical input to markets and investors, offering directional predictability and policy stability and more importantly, is vital to sustainable development and strategies for global greenhouse gas emissions mitigation. Focus is being placed in a first stage on regional analysis and system dynamics of the energy transition. Under this first outcome,



Figure 26: IRENA Director General delivered an Opening Keynote speech at Singapore International Energy Week, October 2019

IRENA will develop a regional energy outlook for ASEAN with a focus on long-term energy scenarios and renewable energy scale-up. Analysis will benefit from IRENA’s ongoing activities in ASEAN, including with the RE-SSN and cooperation with the ASEAN Centre for Energy (ACE). The Agency has finalised an agreement with ACE and is hiring experts to assist with the project. It has also held several bi-laterals and discussions with ACE and countries in the region. The project builds upon IRENA’s regional and country-level work to date, including its market analysis for Southeast Asia, renewable readiness assessment (RRA)/REmap Thailand, REmap Indonesia, RRA Philippines, REmap ASEAN, as well as ongoing work with the ASEAN Secretariat and ACE.

91. **Southeast Europe.** Building on the Abu Dhabi Communiqué on “Accelerating the Uptake of Renewables in South East Europe”, adopted in January 2017, IRENA has continued the implementation of the regional action plan. Three regional workshops were held during this biennium. In June 2018 in Belgrade, Serbia, a renewable energy project development and financing workshop was co-hosted with the Serbian Ministry of Mining and Energy to build

capacities of governments, financial institutions, project developers and academia in developing renewable energy projects. Focus was placed on solar PV including improving the conditions for financing projects. In November 2018, a second workshop was organised jointly with Energy Community Secretariat in Vienna, with a focus on grid integration of VRE sources. A third regional workshop was co-hosted with the Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina in June 2019 in Sarajevo on “Renewable Energy Benefits: Can South East Europe realise the full potential of the Energy Transition?”. Here, preliminary findings of the *Renewable Energy Market Analysis: Southeast Europe* (Dec. 2019) report, the latest edition of the series, were presented in addition to preliminary results from Central and Southeast Europe REmap analysis conducted in the framework of the CESEC initiative.

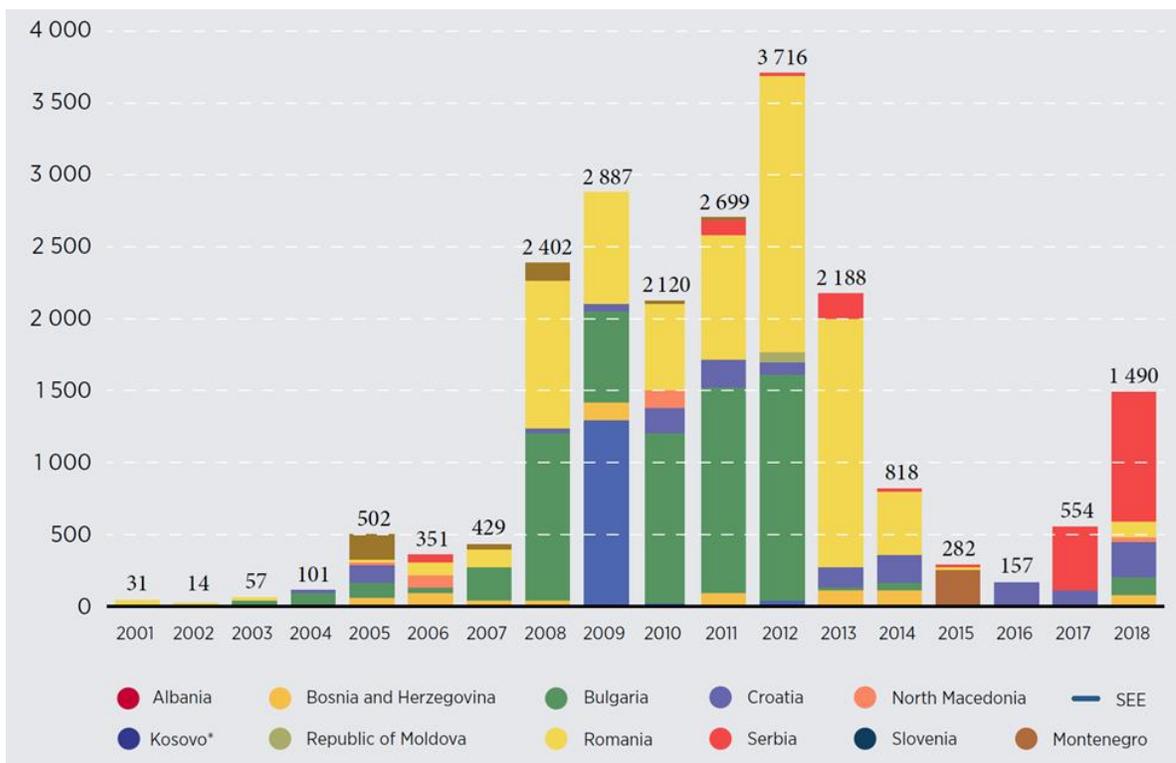


Figure 27: Investment in renewable energy by year and location, SEE, 2001–2018 (USD million)

92. The Agency also supported efforts of Ukraine to design an auction system for renewables by organising an expert webinar in October 2018 and jointly holding an international conference in Kyiv in February 2019 with the State Agency on Energy Efficiency and Energy Savings. The workshop brought together stakeholders in the sector, together with international and IRENA experts, to provide recommendations on the design of the auctions.
93. Through analytical input and participation in discussion the Agency has continued to support various regional processes. For example, IRENA’s report *Cost-competitive Renewable Power Generation: Potential across South East Europe* (Jan. 2017) influenced the debate on the inclusion of renewable energy into the European Commission-led Central and South Eastern European Energy Connectivity (CESEC) initiative. Latest updates in renewable energy global trends and potentials for SEE were presented in April 2019 during the High-level Group Meeting on CESEC and a national parliamentary workshop, both hosted by the Romanian Presidency of the Council of the European Union.

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94. In close co-operation with the European Commission and the Energy Community, IRENA is carrying out a REmap analysis for the CESEC region, to support development of countries' National Energy and Climate Plans. Building on the kick-off workshop in October 2018, a first sectorial workshop was held in Vienna in January 2019 and interim results were presented to CESEC Members in Sarajevo in June 2019. The draft results of the study were presented to CESEC Members at the project workshop in Brussels in December 2019.

PACE Initiative

In March 2019, IRENA co-organised a four-day workshop in Amman, Jordan to identify the gaps for planning and share best practice experiences. The workshop, organised with the Islamic Development Bank (IsDB), the League of Arab States (LAS), and the Regional Centre for Renewable Energy and Energy Efficiency (RCREEE), gathered more than 50 expert participants from ten countries' planning and technical institutions in the region. As follow-up, a technical report was produced to synthesize the information and act as a platform for bilateral networking between countries around specific issues, or follow-up cooperation with IRENA.

In September 2019, a regional workshop on financing and de-risking of renewable energy investments in the MENA region was held in collaboration with the LAS, the Lebanese Center for Energy Conservation (LCEC), RCREEE and UNDP in Beirut, Lebanon. By bringing together key decision-makers and leaders from governments, industry, and financial institutions, the workshop served as a forum for exchanging the latest financing tools, including public finance, capital markets, green bonds, and green sukus in mobilising investment for renewables. Discussions and feedback from Member States centred on the importance of partnerships in mobilising key financial instruments to harness synergies towards supporting governments and building local capacities to increase investments.

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95. **Middle East & North Africa.** Following an extensive consultation process, IRENA assessed existing gaps to the implementation of the Pan Arab Clean Energy Initiative (PACE). Results indicated the region would benefit from additional detailed renewable resource assessments, particularly for solar and wind. IRENA thus focused on improving renewable resource assessment practice in the Arab region, identifying the suitable clusters for utility scale solar and wind installations with their respective generation profiles and storage potential, and providing solutions to streamline early stage solar and wind market planning by leveraging in-house expertise and its vast access to high quality resource datasets. Dissemination of the results will be conducted in part through sub-regional engagement with sector decision makers such as utility companies, ministries, regulatory authorities, and the business community. The project is supported by a voluntary contribution from the Government of Norway.

Collaborative Platforms

96. **Global Geothermal Alliance.** IRENA continues to support international co-operation and the development of enabling frameworks for geothermal energy through the Global Geothermal Alliance (GGA). Since the launch of the initiative in December 2015, the Alliance has expanded its reach to 46 members and 39 partners¹².
97. Following the High-Level Conference of the Alliance in 2017, the Agency has expanded its activities to cover geothermal heat applications. In April 2018, IRENA co-organised the event “Geothermal Direct Utilisation and Food Security” with the Ministry for Foreign Affairs of Iceland and the Iceland Geothermal Cluster. During the meeting, key factors behind successful experiences were identified, lessons shared, and partnerships highlighted. The outcomes of workshop, complemented by further expert consultations, formed the basis of the IRENA publication entitled *Accelerating geothermal heat adoption in the agri-food sector: Key lessons and recommendations*¹³ (Jan. 2019). As a follow-up, the Agency will undertake capacity-building activities on geothermal applications in the agri-food sector in selected regions. This work is supported by the Government of France, the Government of Iceland and the Government of Japan.
98. In East Africa, the Agency is working with partners to strengthen capacities of governments and other key stakeholders to support the removal of institutional obstacles, while enhancing enabling frameworks to support geothermal development. In this context, a regional workshop was organised in 2018 together with the Governments of Kenya and Japan, and the African Union Commission, where delegates from nine countries and experts from around the world identified key factors to reduce risks and improve the bankability of geothermal projects in the region. As follow-up, IRENA is finalising a Geothermal Market Assessment in East Africa illustrating the state of play and perspective development for geothermal power and specific direct use applications. This project is supported by the Government of Japan.

¹² **Member Countries:** Argentina, Bolivia, Burundi, Chile, Colombia, Comoros, Costa Rica, Djibouti, Ecuador, Egypt, El Salvador, Ethiopia, Fiji, France, Germany, Guatemala, Honduras, Iceland, India, Indonesia, Italy, Japan, Kenya, Kingdom of the Netherlands, Malaysia, Mexico, Nicaragua, New Zealand, Pakistan, Papua New Guinea, Peru, Philippines, Poland, Portugal, Romania, Saint Vincent & the Grenadines, Switzerland, Solomon Islands, Uganda, United Republic of Tanzania, United States of America, Tonga, Turkey, Vanuatu, Zambia, Zimbabwe.

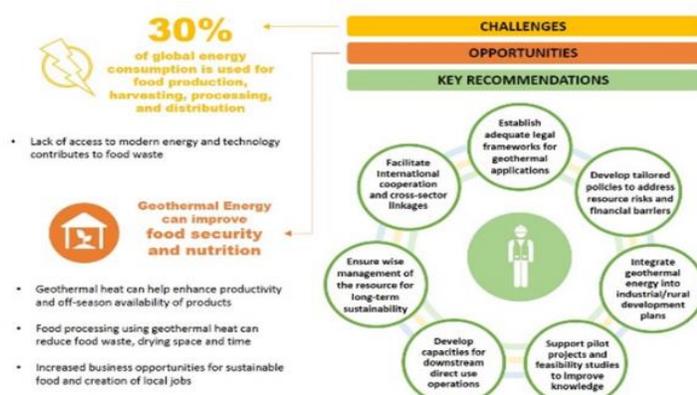
Partner Institutions: African Development Bank, African Union Commission, AGH University of Science and Technology (Poland), Andean Geothermal Centre of Excellence (Chile), Asian Infrastructure Investment Bank (AIIB), Association GeoEnergy Celle e.V. (Germany), Canadian Geothermal Energy Association, Caribbean Electric Utility Services Corporation (CARILEC), Centro Mexicano de Innovación en Energía Geotérmica (CeMIEGeo), Chinese Renewable Energy Industries Association (CREIA), Eastern African Power Pool, Energy Institute Hrvoje Požar (Croatia), European Geothermal Energy Council, Geothermal Canada, GEODEEP - Geothermal Cluster for Heat and Power (France), Geothermal Resources Council (USA), Geothermal Power Plants Investors Association (Turkey), Iceland GeoSurvey, Iceland Geothermal Cluster Initiative, Inter-American Development Bank, International Geothermal Association, IRENA, Islamic Development Bank, National Energy Authority (Iceland), New Partnership for Africa’s Development, Nordic Development Fund, North Macedonian Geothermal Association, Organization of American States, Organisation of Eastern Caribbean States, Regional Centre for Renewable Energy and Energy Efficiency, Serbian Geological Society, Southern Africa Power Pool, Pacific Community, United Nations Environment Programme, United Nations Industrial Development Organization (UNIDO), United Nations University - UNU GTP, United States Energy Association (USA), University of Geneva, and World Bank.

New 2019 partners include: Asian Infrastructure Investment Bank (AIIB); Caribbean Electric Utility Services Corporation (CARILEC) Chinese Renewable Energy Industries Association (CREIA); Geothermal Canada; United Nations Industrial Development Organization (UNIDO); and University of Geneva.

¹³ www.irena.org/publications/2019/Jan/Accelerating-geothermal-heat-adoption-in-the-agri-food-sector

Key lessons and recommendations to accelerate geothermal heat adoption in the agri-food sector

Food production, harvesting, processing and distribution accounts for almost one third of the world's energy consumption. Heavy reliance on fossil fuels in the food value chain therefore significantly adds to harmful emissions. Several geothermal applications in food processing and agriculture require low temperatures and can therefore be deployed in areas where the geothermal resources would not be suitable for power generation, thereby reducing food waste and greenhouse gas emissions and boosting economic development.



In support of the scale-up of renewable energy in cities, IRENA organised a capacity building workshop in collaboration with the European Bank for Reconstruction and Development (EBRD), targeting policy-makers, urban planners and other key stakeholders in Southeast Europe. The event, which took place in Serbia in December 2019, contributed to knowledge-sharing about existing tools and solutions to improve the enabling frameworks for the integration of low-temperature renewable heat sources such as geothermal energy into district energy systems. Furthermore, in September 2019, IRENA established an advisory group of practitioners from GGA members and partners supporting the on-going development of a guidebook for policy-makers in partnership with Aalborg University. This project is supported through voluntary contribution from the Government of Germany.¹⁴

99. IRENA is one of the founding partners of the Climate Investment Platform (CIP), together with UNDP, the Green Climate Fund (GCF) and SEforAll. The platform proposes an integrated and inclusive approach that combines work on NDCs, initiatives to improve policies, risk mitigation mechanisms and a marketplace to connect governments, private investors, development finance institutions, and commercial lenders to facilitate climate related investments. The Platform was presented on the margins the UN Secretary General's Climate Action Summit in September 2019 as part of the "Energy Track" and is supported by multiple institutions and countries. During the Summit, IRENA joined the following initiatives: 3 Percent Club, Climate Investment Platform, Coalition for Sustainable Energy Access, Cool Coalition, LAC 70% Non-Conventional RE Initiative, SIDS Package, Shipping – Getting to Zero Coalition, and Solar Risk Mitigation Initiative.

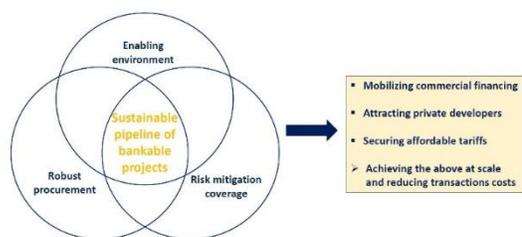


Figure 28: SRMI goals

¹⁴ This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

100. IRENA is also one of the founding partners of the Solar Risk Mitigation Initiative (SRMI), together with ESMAP (World Bank Group), the French Development Agency (Agence française de développement - AFD), and the International Solar Alliance (ISA). SRMI will support the development of sustainable renewable roadmaps, provide concessional climate finance and offer technical support to create an enabling environment to reduce country risk. It will support the selection of private sector developers and investors in a competitive and transparent manner and develop viable risk mitigation solutions for private investors. IRENA will work together with its partners to deliver these objectives, in close coordination with the other initiatives in which it participates.
101. **SIDS Lighthouses Initiative.** Since 2014, IRENA has consolidated its work with SIDS under the umbrella of the SIDS Lighthouses Initiative (LHI), comprising 36 SIDS¹⁵ and 24 development partners¹⁶. Five new partners have joined the Initiative in 2018-19: Denmark, the Caribbean Electric Utility Services Corporation, the Organisation of Eastern Caribbean States, the Pacific Islands Development Forum, and the Solar Head of State. The LHI has been announced as one of the Energy Transition Track Initiatives under the 2019 UN Climate Summit. Other Initiatives announced are Getting to Zero Coalition – decarbonising shipping; 3 Percent Club for Energy Efficiency; Cool Coalition; Climate Investment Platform; LDC Coalition for Sustainable Energy Access; Latin America Renewable Energy Target “Towards cleaner electricity in Latin America and the Caribbean”; Energy Storage Initiative; and Powering Past Coal Alliance (PPCS) and Beyond Carbon 2.0.
102. On 27 September 2019, a High-Level Breakfast Meeting on Pathways and Partnerships was organised to leverage the energy transition for climate resilience and sustainable development co-benefits in SIDS. The event was co-organised by AOSIS, Palau, IRENA and the UN Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLLS) and was attended by 20 SIDS at both the ministerial and the technical levels¹⁷ and representatives of 17 development partners¹⁸.
103. SIDS have highlighted the importance of closing the financing gap for SDGs and NDCs whilst considering the unique situation of SIDS due to their size and vulnerabilities, which make this a matter of survival. While most SIDS have shifted significantly to renewables in the power sector, more needs to be done in end-use sectors such as transport and the food-water-health-energy nexus. Emerging technologies should also be considered, such as floating solar farms, waste-to-energy and ocean energy technologies. SIDS have reiterated the importance of strengthening their resilience to adapt to the extreme climate change effects through the uptake of renewables in relation to, among others, early warning systems and power supplies for emergency

¹⁵ Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, British Virgin Islands, Cabo Verde, Comoros, Cook Islands, Cuba, Dominican Republic, Micronesia (Federated States of), Fiji, Grenada, Guyana, Kiribati, Maldives, Marshall Islands, Mauritius, Montserrat, Nauru, New Caledonia, Niue, Palau, Papua New Guinea, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Sao Tome and Principe, Seychelles, Solomon Islands, Tonga, Trinidad and Tobago, Turks and Caicos, Tuvalu, Vanuatu

¹⁶ France, Japan, Germany, Italy, New Zealand, Norway, United Arab Emirates, United States of America, Association of the Overseas Countries and Territories of the European Union, Clean Energy Solutions Centre, Clinton Climate Initiative, ENEL, European Union, Indian Ocean Commission, IRENA, Organisation of Eastern Caribbean States, Pacific Islands Development Forum, Rocky Mountain Institute - Carbon War Room, Solar Head of State, SEforAll, UNDP, World Bank

¹⁷ Antigua and Barbuda, Belize, Cuba, Curacao, Cook Islands, Curacao, Guyana, Kiribati, Maldives, Marshall Islands, Mauritius, Palau, Saint Vincent and the Grenadines, Samoa, Seychelles, Singapore, Suriname, Tonga, Tuvalu and Vanuatu

¹⁸ Austria, Denmark, Germany, Norway, CARICOM, GIZ, IRENA, Pacific Community (SPC), Rocky Mountain Institute – Carbon War Room, SEforAll, Solar Head of State, UNOHRLLS, UNDESA, UNIDO and the World Bank

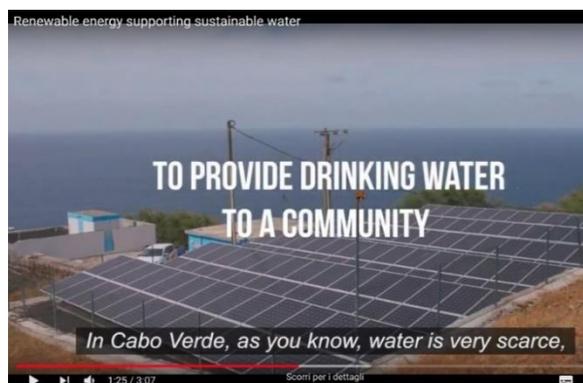


Figure 29: Videos highlighting role RE technologies can play on SIDS LHI's website

services. Development partners made a commitment to increase their financial support and make climate action a central part of development co-operation. Multilateral banks have adapted their rules for SIDS to easily access finance, not only for energy but for general infrastructure development, addressing land issues through improved regulatory frameworks and strengthening local capacity through regional centres of excellence in renewable energy and energy efficiency in close partnership with SIDS and development partners at regional and international levels.

104. IRENA has also been actively involved in the review of the SIDS Modalities of Action (S.A.M.O.A.) Pathway, the international framework to promote international assistance to address challenges faced by SIDS for the period 2015-2025. The S.A.M.O.A Pathway was developed as the outcome of the “Third SIDS Conference” held in September 2014 in Samoa.
105. IRENA is raising awareness and reinforcing links between renewables and food, water, and health in line with new Initiative priorities. To this end, the Agency produced a series of videos highlighting the role that renewable energy technologies can play in the supply, storage, pumping, and distribution of drinkable water resources in households and communities in islands; lighting and medicine storage in rural health clinics; and agricultural, food processing, and other food production related activities. The videos are available on the SIDS LHI website¹⁹.
106. In October 2019, IRENA partnered with the Pacific Community (SPC) with financial support from the Government of Germany to deliver the Pacific Islands Renewable Energy Statistics training, attended by representatives of 15 Pacific SIDS. The training helped countries collect, validate and analyse renewable energy statistics, following international best practices and the agreed-upon definitions and methodologies used for energy statistics. A similar training for the Caribbean SIDS took place at the end of November 2019, organised by IRENA in partnership with CARICOM, CCREEE and OLADE.
107. In November 2019, the Agency partnered with the Pacific Power Association (PPA), International Finance Corporation (IFC) and the Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE) to deliver a capacity building event on the design of bankable power purchase agreements for the Pacific SIDS. The event supported PPAs improvement and enhanced the capacity of power utilities and regulators to design and negotiate bankable contracts, with the final goal of contributing to effective commitment of private capital to the deployment of renewable energy.
108. Relatedly, the Agency, in partnership with ECLAC, organised a three-day project facilitation workshop (Nov. 2019) to support the development of bankable bioenergy projects in Cuba. The workshop brought together Government representatives, private sector, civil society, local authorities and international organisations to develop ambitious green solutions from harnessing bioenergy.

¹⁹ <https://islands.irena.org/>

109. The Agency has held and participated in several workshops to building knowledge and capacity in project development and facilitation, and renewable energy financing in the Pacific and Caribbean regions, in collaboration with partners. Most recently, IRENA participated in the Pacific 4th Energy and Transport Minister’s Meeting (Sept. 2019, Samoa) where it presented a ministerial paper entitled *Capacity Building on Sustainable Energy in the Pacific* that was developed in partnership with the Pacific Community (SPC) and the University of the South Pacific (USP).
110. Through NDC Partnership, IRENA is working closely with countries to develop the NDC Partnership Plan, specifically with the Marshall Islands, Saint Lucia and Sao Tome and Principe. At the end of 2019, IRENA also worked with SPC and CARICOM to deliver regional training workshops on renewable energy statistics collection, analysis and interpretation and setting national and regional renewable energy targets.
111. SIDS LHI work is supported by voluntary contributions from the Governments of Denmark, France, Germany, Japan, the Kingdom of the Netherlands, Norway, and the UAE.

Multi-stakeholder Engagement

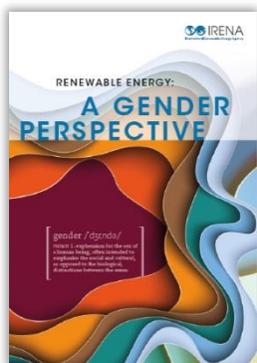
112. Including a multi-stakeholder perspective in IRENA’s work is vital to enrich programmatic outputs while ensuring inclusive and broad support. The IRENA Coalition for Action has grown substantially over the last biennium from 75 members in January 2018 to nearly 100 members at the end of 2019, strengthening its position as a key global platform amongst non-governmental and governmental stakeholders to develop actions to drive the energy transition. There has been particularly strong interest from global leading private sector entities to engage with IRENA through the Coalition and all major renewable energy industry associations are now represented in the network. The Coalition continues to promote increased public-private dialogue and facilitates non-governmental and subnational engagement in IRENA’s work. Most recently, several private sector members of the Coalition shared their experiences through active participation in the regional Innovation Days as well as the fifth IRENA Policy Day (for more information on IRENA Policy Day see box in section Global Voice, Realising socio-economic benefits). In 2019, members were also formally invited to participate for the first time in parts of the Seventeenth Meeting of the IRENA Council.
113. The IRENA Coalition for Action members continue to produce analytical work under its various Working Groups. Based on a series of meetings, the Business and Investors Group have developed country-specific white papers on Algeria, Colombia, Jordan, Mozambique, Senegal, Tunisia, and Vietnam, providing an industry perspective of key challenges and opportunities to scaling up renewable energy investment in these countries. The white papers will serve as a basis for bilateral dialogue with country delegations during the IRENA Assembly. Supporting IRENA’s workstream on 100% renewable energy, the Coalition “Towards 100% Renewable Energy Working Group” has developed the white paper *Towards 100% Renewables: A Utility Perspective*, to be presented at the upcoming Assembly’s Public-Private Dialogue 2020.
114. Building on its *Corporate Sourcing of Renewables: Market and Industry Trends* (May 2018), IRENA continues to undertake dissemination and communication of its findings on corporate sourcing through various events, including as keynote speakers and presenters at the EUSEW, and the RE-Source Platform Event, amongst others. To inform an in-depth and updated overview of the status of corporate sourcing options by country, IRENA has further developed a corporate sourcing of renewable energy survey targeting Members (forthcoming).

115. IRENA strengthened its engagement with Legislators in 2019 at the fourth Legislators Forum which was held in conjunction with the Ninth Session of the IRENA Assembly. Highlights include a session focusing on the energy access gap in Africa that facilitated the exchange of experiences and best practices with parliamentarians from around the world and among peers from African countries. The forum was attended by members of parliament from 27 countries and the European Union.
116. The Agency is continuing to work on building and strengthening its collaboration with national, regional, and global parliamentary organisations and networks to establish common actions and further develop its parliamentary outreach for the deployment of renewables. The importance of maintaining a global platform for parliamentarians to share best practices and exchange views on the transformation of the energy sector has been expressed by many participants at the Legislators Forum and IRENA will continue to seek opportunities to identify such fora, possibly through partnerships forged over the last few years with global and regional parliamentary networks.
117. The Agency has initiated preparations for conducting IRENA's first youth event to be held at the margins of the Tenth Session of the IRENA Assembly in January 2020. The event, entitled "IRENA Youth Forum: The New Generation of Decision Makers", will encourage and promote youth input on the renewable energy discourse. On 21 September 2019, the Agency launched a call for participation to select 40 youth from all regions. Over 500 applications were submitted to the Secretariat by the deadline.



Figure 30: At the margin of the UN Youth Climate Summit, IRENA's Director-General Francesco La Camera met with youth delegates in New York.

Renewable Energy: A Gender Perspective



Following the launch of IRENA's report, *Renewable Energy: A Gender Perspective* at the Ninth Session of the IRENA Assembly, findings have been shared widely. Events at which IRENA presented include the World Bank's South Asia initiative WePOWER, Astana World Economic Forum 2019, BETD 2019, CEM10, and EU Sustainable Energy Week 2019. Most recently, insights were shared at KIREC 2019, Clean Energy Business Council in Dubai, and Women Leaders in Clean Energy, Science and Technology organised by ICEC and Sabancı University in Istanbul, as well as in webinars organised by GWNET, Institut de la Francophonie pour le développement durable, and the Clean Energy Solutions Center (NREL).

Furthermore, international media such as the Financial Times and the independent The Beam Podcast have requested interviews on the topic. Expressions of interest in IRENA's gender-related insights were received from a range of respected institutions, such as The Elders, R20 (founded by former California Governor Schwarzenegger), and the B Team. Also, some member countries requested to include IRENA's findings in regional workshops co-organised by the agency. Inspired by IRENA's flagship report, the Costa Rican Ministry of Energy requested to include the gender dimension in the socio-economics debate during the workshop organised by IRENA on the sidelines of pre-COP.

Given the great reception of findings across the world and the growing acknowledgment of gender as a compelling topic, the agency decided to explore specific technologies, starting with the wind industry. This new study, undertaken in collaboration with GWEC and GWNET, will be released at the Tenth Assembly. The report constitutes the first systematic effort to track women's presence across the full value chain of the wind sector; highlight their participation in technical versus non-technical roles; study access to gender-inclusive policies; and analyse perceptions of gender bias. Findings are derived from a survey of around 1000 individuals (women and men) and organisations, with good coverage of key regions.

Gender Survey of the Wind Industry

912	132	789	71
Responses	Organisations	Individuals	Countries



V. Source of Advice and Support

118. Through direct engagement with Members, IRENA continues to provide policy-relevant and accessible tools, platforms, and methodologies to the public. Specifically, the Agency has developed targeted support in project development, access to finance, and resource and readiness assessments. It has further developed its renewable energy solutions lab offering direct support to entrepreneurs and local businesses.

Project Support and Facilitation

119. Creating a renewable energy project pipeline is a priority for the acceleration of the global energy transformation. IRENA contributes to this with its convening power, expert knowledge, and tools and platforms that facilitate projects. The **Project Navigator** makes an important contribution in this context. Through the Navigator, IRENA supports governments, project developers, investors, and multilateral banks to accelerate the deployment of renewable energy projects by building technical local capacities to increase the quality of project proposals, reduce project risk profiles, and increase the bankability of renewable energy projects. The Navigator has reached a new milestone with more than 7,000 registered users. It now supports projects based on all major renewable energy sources, with new modules for end-use applications and climate resilience, and offers access to a training-of-trainers (ToT) module to multiply impact on the ground. Over 500 stakeholders have been trained through Project Navigator workshops this year in the Middle East, SIDS, Southeast Asia, and Sub-Sahara Africa, blending on-site and remote training workshops and directly supporting the preparation of bankable project proposals. SIDS module of the Project Navigator is supported from a voluntary contribution from the Government of Germany²⁰.

²⁰ This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

120. Organised within the framework of IRENA's Regional Initiative in Southeast Europe and co-hosted by the Serbian Ministry of Mining and Energy, IRENA organised a workshop in June 2018 to build the capacities of governments, financial institutions, project developers and academia in developing renewable energy projects with a focus on solar PV, including with regards to improving conditions for financing such projects in the region. The workshop featured a technical training based on IRENA's Project Navigator for the preparation of robust, bankable renewable energy project proposals. The outcomes of the workshop provided substantive inputs for the preparation of regional renewable energy projects.
121. Eswatini's Ministry of Natural Resources and Energy (MNRE) has requested IRENA's support in increasing the country's energy resilience through reduced reliance on imported electricity and through the development of local renewable energy projects that can meet the country's environmental clean energy objectives and help underpin economic growth. In this context, IRENA organised a technical training workshop in June 2019 focusing on the development of bankable solar energy projects and the development of bankable independent power producer (IPP) projects in the Southern African region. The technical training supported the development of the Eswatini Independent Power Producers Policy (ESIPPP) that aims to increase the utilisation of local renewable energy resources, including biomass and solar energy, and enhance energy security and self-sufficiency. The training workshop was organised in collaboration with international organisations and in consultation with regional organisations.

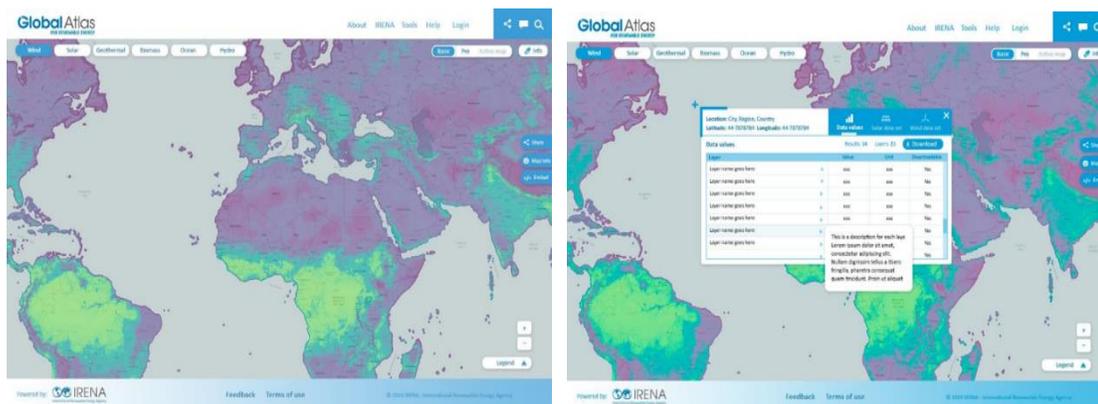


Figure 31: Global Atlas 4.0 Design Blue Print

122. As part of the 7th Power and Energy Infrastructure Cluster (PEIC) of the Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area (BIMP-EAGA), IRENA organised a regional project facilitation technical training workshop in August 2019 in Brunei Darussalam on the development of bankable solar energy projects in the region. Professionals from Brunei, Indonesia, Malaysia and the Philippines, coming from public authorities, energy agencies as well as the private sector with industry associations, businesses, civil society organisations, took part in the workshop. The BIMP-EAGA covers Brunei Darussalam; the provinces of Kalimantan, Sulawesi, Maluku and West Papua of Indonesia; the states of Sabah and Sarawak and the federal territory of Labuan in Malaysia; Mindanao and the province of Palawan in the Philippines. The sub-region covers a land area of 1.6 million square kilometres with a population of 70 million. The sub-region has a combined pipeline of priority infrastructure projects estimated at USD 21 billion according to the Asian Development Bank. This work is supported by a voluntary contribution from the Government of Norway.

123. The IRENA **Global Atlas for Renewable Energy** (Platform) continues to provide renewable energy data required in resource and infrastructure planning with users granted access to maps contributed by expert institutions and private companies world-wide. Most recently, the Agency upgraded the platform and is working on the next version (Global Atlas 4.0), to feature the latest

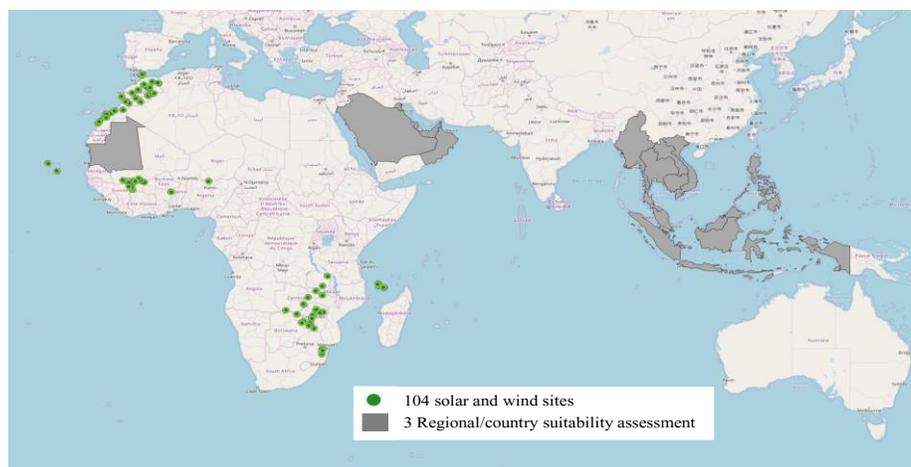


Figure 32: IRENA's Resource Assessment Services.

solar, wind, and geothermal maps. Global Atlas 4.0 is scheduled to be operational in the next biennium and is planned to also feature a section on hydropower with spatial datasets for conducting assessments of this resource across the world. This work is supported by a voluntary contribution from the Government of Norway.

124. IRENA continued its efforts to translate the information on the Global Atlas and close the gap between resource maps and on-the-ground project development. IRENA's Site Assessment Service provided direct support in screening 104 solar PV and wind sites in Africa and SIDS (see section Network Hub for more information). In addition, IRENA's spatial suitability assessment contributed to regional market analysis reports. Recent market analyses conducted for Southeast Asia and Golf Cooperation Council (GCC) benefitted from the assessment of the technical potential for on-grid solar and wind projects development in the regions using IRENA's suitable areas assessment algorithms.
125. The IRENA Global Atlas, the International Geothermal Association (IGA) and the World Bank's Energy Sector Management Assistance Programme (ESMAP) have trained more than 100 high-level stakeholders and geothermal practitioners from three countries/regions on the application of the UNFC-2009 geothermal specification, to standardise the estimation and reporting of geothermal resource. The specifications were applied on a pilot basis in Indonesia (Mar. 2018), a cluster of Eastern Caribbean states (Dec. 2018) and Ethiopia (Feb. 2019) on a portfolio of selected geothermal fields as part of the training exercise. This project is supported from voluntary contributions from the Government of France in the framework of the Global Geothermal Alliance.



Figure 333: Regional Geothermal Resource Data Gathering UNFC Classification and Training Workshop, Castries

126. IRENA's **Sustainable Energy Marketplace** has continued to serve as an investment catalyst within the sustainable energy space by connecting project developers and owners with financiers, investors, and service and technology providers. The Marketplace currently comprises over 253 sustainable energy projects (translating into 5.5 GW of installed capacity and USD 12.1 billion worth of investment opportunities), 184 financing instruments, 228 service providers and 92 technology providers. The projects on the platform include 98 solar, 59 bioenergy, 36 hydropower, 20 wind and 40 others. The platform also comprises 184 financing instruments including 71 equity, 26 subordinated debt, 25 senior debt, 16 grant, and 46 other instruments (e.g., guarantees, leasing, results-based financing and others).



Figure 344: IRENA's Sustainable Energy Marketplace

127. In 2019, IRENA supported 35 projects by improving their business proposals and investor pitches. IRENA hosted three project finance matchmaking events (in Latin America and Sub Saharan Africa) where a total of 21 projects were presented to over two dozen investors and financiers, including from multilateral and bilateral development finance institutions, private equity firms, and venture capital funds, as well as global and regional asset managers and strategic investors. The Marketplace is featuring as a key contribution to the Climate Investment Platform, announced at the UNSG Climate Action Summit.



Figure 35: Sustainable Energy Marketplace key data

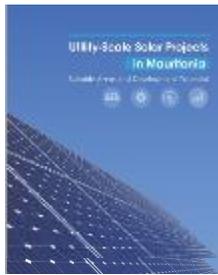
128. In December, IRENA completed the first phase of the Risk Assessment and Mitigation Platform (RAMP). The project includes a detailed database of insurers and guarantors who are active in the renewable energy sector. By using several filters, project owners and other users can easily identify potential solutions for a given risk in a given country and access the full details of the providers that are shortlisted that way.

SolarCityEngine

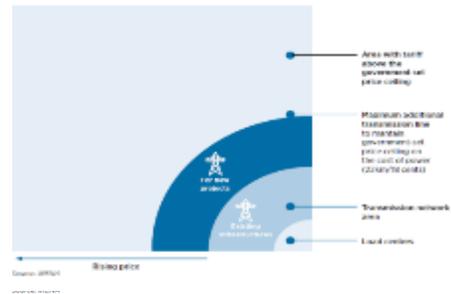
In May 2019, IRENA released The Global Atlas - SolarCityEngine to support home owners, businesses, and municipal authorities in cities to assess the prospects to meet electrical energy demand from rooftop solar PV installations. The SolarCityEngine is the first of these solutions to be built and deployed in a developing country and comes at a time where cities around the world are looking to contribute to providing affordable energy services to their constituents through well-designed city-level energy programmes and incentives. SolarCityEngine has been implemented in Kasese City (Uganda) and implementation in Zhangjiakou city (China) is underway. Plans to roll out the solution to other major cities in the next biennium are currently ongoing with the World Bank, which has indicated interest in partnering with IRENA on the solutions expansion.²¹



Capacity building through Project Development Support. The case of Mauritania.



In May 2018, Mauritania’s Ministry of Petroleum, Energy and Mines requested the Agency’s support in implementing recommendations put forth in the RRA study for Mauritania (published in 2015). Support provided includes spatial suitability assessment, and mapping of highly suitable areas for renewable energy



project planning and subsequent development. The solar variant has been completed and submitted to the country, while the wind version is ongoing. This analysis will assist the local Ministry to select new areas for renewable energy technology development and support the creation of least-cost master plans, thus enabling the energy sector to conduct a more detailed evaluation of prospective plants. The pilot project served as the basis for conducting future suitability assessments, on both a regional and global scale. Following the success of the analysis for on-grid solar projects, the analysis was initiated with the suitability analysis for the on-grid wind projects under finalisation.

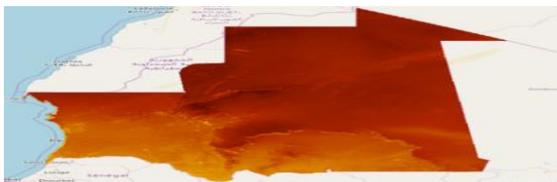


Figure 36: Suitability assessment, Mauritania

²¹ This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

Renewable Energy Solutions Lab

129. IRENA is supporting the United Nations High Commission on Refugees (UNHCR) in addressing the issue of clean and affordable energy provisions in the humanitarian context. Through this collaboration, IRENA is analysing technically and financially sound renewable energy options for UNHCR to implement in selected field locations. IRENA is conducting detailed energy audits in four refugee camps (two in Iraq and two in Ethiopia). Based on the data provided by UNHCR and collected from the field locations, IRENA will prepare a detailed analysis on various renewable energy options to provide clean, reliable, and cost-effective energy access to refugees, including technical designs of the renewable energy systems and recommend suitable delivery models with possible entry points for private actors. Analysis will feed into a blueprint for electricity supply in situations of displacements and for UNHCR's strategy and vision for addressing the energy requirements in humanitarian response. This work is supported by voluntary contributions from the Government of the Walloon Region of Belgium.
130. The Agency also continues to assist entrepreneurs to scale up renewable energy enterprises through its Southern African Development Community (SADC) Renewable Energy Entrepreneurship Support Facility, which provides training and mentorship support. In April 2018, the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE) and IRENA launched the first call for applications for SADC-based entrepreneurs to submit requests for assistance under the Facility. The second call was launched in September 2019 and 70 applications were received from across the region. The Technical Committee for the Facility was set up in December 2019 and it will hold a meeting at the end of January 2020 to review applications received and prepare the capacity building activities for the entrepreneurs. This work is supported by voluntary contributions from the Government of the Walloon Region of Belgium.
131. The Agency is also supporting the establishment of a regional certification scheme for solar PV technicians in the 15 Member States of the ECOWAS region. Coordinated by ECREEE, the regional certifying body, the initiative is also supported by GIZ and the World Bank. Two pilot examinations for certification of off-grid solar PV technicians were held in Senegal and Ghana in January and June 2019 respectively. The scheme is presently being rolled-out in other ECOWAS member states parallel to the development of certification content and processes for large and grid-connected solar PV technicians.

Local Solutions and Tailored Advice

132. IRENA provides **energy planning** capacity building support to several countries. For example, IRENA provided trainings and technical support to a working team of national staff to develop the Eswatini Energy Masterplan 2034. Upon cabinet approval and the launch in October 2018, the Masterplan has now become the official national energy plan, which features “100% renewable power” as the preferred scenario. Based on the Masterplan, Eswatini also developed a short-term (5-year) power sector roadmap and prepared a tender for auctioning renewable energy capacity (solar PV and biomass). In Sierra Leone, IRENA conducted four training courses to support the national working team in building capacity on modelling and scenario development. Based on the trainings, the national working team, co-ordinated by the Ministry of Energy, developed a draft national energy master plan report to 2040. This report is being

expanded and revised by the national working team with technical support from IRENA, based on refinements to the IRENA SPLAT Sierra Leone (SPLAT-SL) model and the national energy planning scenarios. The government considers this as one of their flagship projects, as shown on the government’s website. This work was enabled by voluntary contributions provided by the Government of Norway.

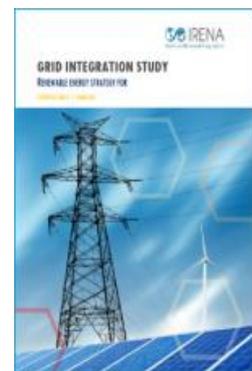
133. In December 2018, the **RRA** process for El Salvador was initiated during the “RRA Expert Consultation Workshop”. Held in consultation with the government of El Salvador the workshop gathered stakeholders from public and private sector, industry, civil society, and academia. During the workshop, challenges and recommendations for scaling-up renewables in the country were identified related to institutional frameworks, regulation and policy for renewable energy deployment, financing of renewable energy projects and geothermal energy development. It was an opportunity for stakeholders to express their commitment in the implementation of the post-RRA actions in the company of development partners. The challenges and recommendations have been validated by the main energy stakeholders of El Salvador during the RRA Validation Meeting in October 2019. Workshop outcomes will provide substantive inputs for the development of the final RRA El Salvador report. This work is supported by a voluntary contribution from the Government of Norway.



Figure 37: RRA El Salvador Expert Consultation Workshop San Salvador, El Salvador, 3-4 December 2018

134. In April 2019, the Albanian Ministry of Energy and Infrastructure and IRENA initiated the RRA for Albania. A first multi-stakeholder consultative workshop was held in Tirana in December 2019, results of which will feed into the first draft of the report. In February 2019, the Ministry of Economy and Infrastructure and IRENA released the RRA for the Republic of Moldova on 19 February 2019 in Chisinau bringing together around 70 experts. Based on the RRA recommendations, Moldovan power system dispatch analyses for 2021, 2023 and 2030 were conducted. This work is supported by a voluntary contribution from the Government of Norway. In September 2019, the Ministry of Energy and Water, the Malian Renewable Energy Agency and IRENA released the RRA for the Republic of Mali. The event was attended by over 60 participations. In November 2019, the Ministry of Energy, the State Agency for Alternative and Renewable Energy Sources (SAARES), and IRENA released the RRA for Republic of Azerbaijan. The event provided an opportunity to share the latest developments in the renewable energy sector of Azerbaijan and place the sector under the national spotlight, highlighting the opportunities for scaling up renewable technologies in the country and the associated benefits. In December 2019, the Department of Renewable Energy of the Ministry of Economic Affairs of Royal Government of Bhutan and IRENA released the RRA for the Kingdom of Bhutan. The RRA for Bhutan is being supported by a voluntary contribution from the Government of Norway.
135. The Renewable Energy Outlook (combined RRA-REmap analysis) for Lebanon has been finalised and the report is ready for release. A multi-stakeholder (Beirut, March 2019) and validation (Beirut, May 2019) workshop supported report development through in part attendance by key representatives including national institutions, companies and banks, responsible for driving renewable energy deployment in Lebanon.

136. Building on the success of the process in Egypt, Lebanon and Thailand and upon the request by the government, a new Renewable Energy Outlook analysis has recently been initiated for Malaysia. This work is supported by a voluntary contribution from the Government of Denmark.
137. In May 2019, IRENA started the first RRA study with a module on the IRENA FlexTool for Jordan. The RRA study addresses the policy, regulatory and institutional challenges, while providing detailed power system analyses through structural and operational recommendations to address concerns in system flexibility to enable Jordan to meet its ambitious 2025 targets. The process included two workshops – a multi-stakeholder workshop held in October 2019 and a validation workshop held in December 2019. IRENA is also engaged with Mozambique to support the work in high-priority areas such as grid integration studies and site assessments (for full information on site assessments see sit assessment service box under Network Hub, Regional Action Agenda). Work undertaken with Jordan and Mozambique is supported by voluntary contributions from the Government of Norway.
138. IRENA is also collaborating with Nigeria and South Africa for a national REmap analysis. In the case of Nigeria, a loaned officer from the Energy Commission of Nigeria (ECN) supported the development of the REmap database and analysis for Nigeria. IRENA is now planning for the first workshop in Nigeria to discuss the preliminary results of the analysis, expected in January 2020. In the case of South Africa, the analysis and report have been completed and are currently being approved by the Ministry of Energy.
139. The Chinese National Renewable Energy Centre (CNREC) has requested IRENA to provide a perspective on renewable energy development in China and key topics for energy transition in the country for the long-term. The report will be considered as input for the Chinese Government’s consultative process for a National Energy Development Strategy 2035 and 2050, led by National Reform and Development Commission (NRDC). The focus of the report will include a presentation of IRENA experience and best practice insights for the development of long-term energy scenarios; a view on global energy transition scenarios, the role of China and key energy system indicators; and a perspective on the power sector transformation and end-use sector transformation implications.
140. IRENA continues to provide advice on the integration of high shares of renewable energy in power systems to achieve renewable energy targets. The grid study *Grid Integration Study-Renewable Energy Strategy for Espiritu Santo, Vanuatu* provides analysis on the options for incorporating shares of VRE in the island of Espiritu Santo, including a grant funded hydropower plant and an extension of the power system into Port Olry. The study identifies the most cost-effective implementation plan and provides recommendations on the enablers required to maximise the shares of renewables to achieve 100% renewable energy. The grid integration study concluded that the best option was to incorporate 1100 kW of hydropower and 2 MW of solar PV along with battery and diesel uninterrupted power supply aiming at achieving 87% of renewable energy in the island by 2030.
141. The study *Grid Integration Study- Renewable Energy Strategy for The Island of Viti Levu, Republic of the Fiji Islands* (forthcoming) supports the government of Fiji to achieve its NDC targets by assessing the location and capacity of PV that can be incorporated with existing Viti Levu island



infrastructure, a peak demand of 160 MW in 2017, principal supply of diesel and hydropower, and without undertaking major investments. The grid integration study recommended that the Viti Levu system integrates 65 MW of PV (25 MW of utility scale PV and additional 40 MW of distributed PV systems) by introducing changes in system operation. The capacity of the system to host 65 MW corresponds to almost 40% of the peak demand verified in 2017.

142. The Agency is also finalising the *Grid Integration Technical Study on the Impacts of High Shares of Variable Renewable Energy in the Operation of the Power System of the Dominican Republic* which will assist in assessing the feasibility of achieving 25% of renewable energy targets by 2025 (as defined by Dominican Republic) and 43% of renewable energy by 2030 (as proposed in IRENA's REmap study) without constraints. Should constraints be identified, IRENA will provide recommendations on required operational measures.

IRENA/Abu Dhabi Fund for Development (ADFD) Project Facility

The IRENA/Abu Dhabi Fund for Development (ADFD) Project Facility continued to facilitate project selection and financing of renewable energy projects in developing countries. Allocated loans by ADFD to date, in the first six of seven annual funding cycles, amounts to USD 245 million for 24 renewable energy projects in 23 developing countries. Co-financing of USD 450 million from government sources and other development funds has been mobilised to cover the rest of the project costs. These projects are expected to deliver 150 MW of renewable energy and advance sustainable development.

In the seventh cycle, 95 projects from 48 developing countries were evaluated. This represents the highest number of eligible projects submitted to IRENA for evaluation than in all previous cycles. Fifteen projects were recommended to ADFD for funding following evaluation of the project submissions by an independent panel of experts and the Advisory Committee. The projects range from utility scale solar PV with battery storage to rooftop solar PV, solar public lighting, solar/wind hybrid systems, biogas, biomass and hydropower and represent over 130 megawatts of new installed capacity. A total of USD 182.54 million was requested in loans from the ADFD for the recommended projects with USD 287.02 million in co-financing from governments, development funds and the private sector representing total projects costs of USD 469.56 million. ADFD will make their final selection from this recommended list by the end of December 2019 and announce results at the tenth session of the IRENA Assembly. IRENA/ADFD Facility projects advancing with construction that will be commissioned and generating electricity in 2019 are:

10 MW grid-connected solar PV project, Cuba: Four solar parks of 10 MW cumulative capacity were commissioned as of May 2019. A reduction in costs led to a saving of around USD 5 million, which is being used to increase generation capacity to 15 MW. The project is contributing to the national objectives to reduce the use of fossil fuels and greenhouse gas emissions.



Small scale waste to energy project, Maldives: The project includes the construction of waste-to-energy plants on two islands (Addu and Vandhoo). The Vandhoo Island plant has been completed and is handling waste from 40 surrounding islands. It has a generation capacity of 500kW. These waste-to-energy facilities are part of the country's broader waste management framework and contribute to the government's "Scaling Up Renewable Energy Program".

Ile de Romainville Solar Park, Seychelles: This government-driven project is being implemented by the Public Utilities Corporation (PUC) and involves the construction of a 5 MW solar PV plant that will be integrated into an existing wind farm located on a small island off of the largest island of Mahé. The project is part of the long-term objective of the Government of Seychelles to achieve 15% renewable energy contribution in the power generation mix by 2030.



Solar Park in Sierra Leone: Developed by the Ministry of Energy, the project involves the construction of a 6MW grid-connected solar PV park near the capital city of Freetown. The solar park will be connected to the national grid and will improve the national power reliability for over 190,000 electricity consumers in Freetown while reducing greenhouse gas emissions. Construction is underway with completion and commissioning expected in 2020.

VI. International Co-operation and Strategic Engagement

143. As requested by Members, the Agency continues to provide leadership in global agenda-setting on energy transformation. Following the accession of Canada in January 2019, IRENA's global family now includes 160 Members and 23 Signatories and States in Accession. This ever-increasing global reach is enabling the Agency to draw on a broad and extensive range of country-level knowledge and expertise for the implementation of its mandate in promoting the global energy transformation. Participation in, and collaboration with, various global, regional, and national fora is the backbone of this effort. IRENA, led by its Director-General, has contributed to a range of global convenings to help shape the global discourse on energy.
144. The Director-General has placed a strong emphasis on the centrality of renewable energy for sustainable development and climate action and highlighted how a more action-oriented Agency can support its Members on the ground. He outlined these priorities at key forums and forged new partnerships to take them forward, further enhancing the international standing of the Agency. The Director-General addressed several major events including the Berlin Energy Transition Dialogue in Germany, the 4th Mission Innovation (MI) and 10th Clean Energy Ministerial (CEM) in Canada, the G20 Ministerial Meeting on Energy Transitions and Global Environment for Sustainable Growth in Japan, the UN High-Level Political Forum on Sustainable Development, the PreCOP in Costa Rica, the COP25 in Spain, and he was the only representative of International Organisations (together with the World Bank) to address the United Nations Secretary-General's Climate Summit in New York. The Director-General also spoke at national and regional energy-related events including the Africa Renewable Energy Forum in Guinea, the African Investment Summit in South Africa, the 2nd Belt and Road Forum for International Cooperation in China, the 2019 EU Sustainability Week and the European Utility Week in Belgium, the International Renewable Energy Investment Forum in Ukraine, the 37th ASEAN Ministers on Energy Meeting and Associated Meetings (AMEM) in Thailand, the Singapore International Energy Week, the Global Green Growth Week in Korea, the World Energy Council in the UAE and the Russia Energy Week. He also took part in the UN Convention to Combat Desertification (UNCCD) COP in India and the BMWi-IEA: Global Conference on System Integration of Renewable Energy in Germany.

145. All these occasions presented opportunities for discussion with many Members, as well as representatives of international organisations, private sector, and civil society. These interactions are essential for increasing Member awareness of and engagement in the work of the Agency and forging strategic partnerships as the Agency aligns its focus to realising change on the ground. In his on-going effort to position IRENA at the centre of global efforts on renewable energy, the Director-General also forged new partnerships with a number of key international and regional organisations including the General Secretariat of the Central American Integration System (SG-SICA), the International Energy Agency (IEA), the Secretariat of the UNFCCC, the UNCCD, the UNDESA, the UNDP) the UN Industrial Development Organisation (UNIDO), the UN Economic and Social Commission for West Asia (UNESCWA) and the UN Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLLS).
146. In establishing such partnerships, the Director-General is seeking to ensure that IRENA is actively engaging with key institutions and stakeholders to leverage respective capabilities and resources to accelerate the energy transition. For example, the MOU with UNDP seeks to scale-up support to countries seeking to enhance their NDCs under the Paris Agreement and to advance the implementation of the Sustainable Development Goals. On the margin of the UNSG's Climate Action Summit, IRENA jointly with SEforAll, UNDP, in co-ordination with the GCF, and with the lead support of Denmark, announced the Climate Investment Platform. The Platform is an inclusive partnership with the objective to promote accelerated, transformative and scaled-up investments to support ambitious NDCs and the pursuit of the Sustainable Development Goals. It will facilitate integrated and streamlined support to developing countries and emerging economies, including private sector engagement. The Platform aims to address both climate change mitigation and adaptation, with an initial focus on the energy transition. The Platform is a well-articulated, country-driven, proactive and agile partnership, open to interested countries and institutions that commit to work together on the platform.
147. IRENA actively participated in major climate-related meetings to highlight the essential role of renewables in meeting global objectives. This included the Abu Dhabi Climate Meeting, where the Director-General delivered a keynote at the Leaders Roundtable on Energy Transition. He was also a speaker at the 2019 Climate Action Summit. His key message to the Heads of States and Governments in attendance was that it is possible, through renewables, to change our path and advance climate action, while enabling a just transition, a strong global economy and greater prosperity for all. He emphasised the needs of SIDS and the Least Developed Countries (LDCs), stressing the importance of mobilising resources to accelerating the energy transition and scaling-up low-carbon resilient economic future.
148. Leading the energy transition within the UN Climate Action efforts, IRENA was an organising partner for the Regional Climate Weeks in Ghana, Africa (March 2019), Salvador, Brazil (August 2019), and Bangkok, Thailand (September 2019), which were attended by over 7,000 participants in total. In this capacity, IRENA led several discussions on energy transition, including in the NDC regional dialogue and capacity building sessions on technology and policy. IRENA also worked with Chile to position renewable energy in the context of COP25. The Agency continues to collaborate closely with the NDC Partnership as an avenue to accelerating the deployment of renewables at the country level. The work on climate is supported by voluntary contributions from the Government of Denmark and the Government of the Walloon Region of Belgium.

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149. Members continue to be encouraged to accredit Permanent Representatives (PRs) and to facilitate engagement through regular meetings and discussions. Since the beginning of 2019, 23 PRs have been accredited to the Agency and five other Members are in the process of finalising accreditation. There are currently 50 PRs accredited, including Costa Rica, Maldives, Mozambique, Somalia, South Africa and Ukraine that have accredited PRs for the first time.

Governing Body Meetings

150. The planning of IRENA's programmatic and governing body meetings has been consolidated and streamlined to facilitate efficient organisational delivery in the implementation of the Work Programme and Budget for 2018-2019. Over the course of the biennium, IRENA organised four Council sessions (15th Council, 16th Council, 17th Council, and 18th Council) and two Assembly sessions (9th Assembly and 10th Assembly).
151. The Ninth Session of the IRENA Assembly and related meetings, held on 10-13 January 2019 in Abu Dhabi, provided the opportunity for 1,570 registered participants, including over 120 Heads of State or Government and Ministers, along with delegates from 147 countries and the European Union, to shape the global renewable energy agenda, monitor progress, and guide the Agency on important policy, programmatic, and governance matters. The attendees comprised of 135 Members of IRENA, 11 Signatories and States in Accession, two other States and 172 international and regional partners, organisations, and other entities engaged in the renewable energy field.
152. The Assembly was followed by the World Future Energy Summit (WFES) which featured various meetings hosted by IRENA, bringing together decision-makers and experts from government, the private sector, civil society, and research and academia to discuss policies, business models, and technologies as well as ways of international energy co-operation as drivers of up-scaling renewable energy deployment in the context of achieving the SDGs and decarbonising the economy.
153. The eighteenth Meeting of the IRENA Council, held from 5 to 6 November 2019 in Abu Dhabi, welcomed over 430 registered participants from 99 States and the European Union. Plenary discussions, side events and Committee meetings provided delegates with the opportunity to discuss current topics on the global energy transformation and provide guidance to the Agency on important policy, programmatic, and governance matters within the framework of the implementation of the current Work Programme and Budget for 2018-2019 and the Proposed Work Programme and Budget for 2020-2021. Delegates also considered and provided recommendations on several administrative and institutional matters, including the IRENA Staff Tenure Policy and Human Resources Trends. Preparations for the Tenth Session of the Assembly are underway.
154. The Fund for Developing Country Representatives (FDCR), which was established by the Second Session of the IRENA Assembly, facilitates the participation of representatives of developing countries in IRENA meetings. Since its establishment, FDCR has been instrumental in ensuring a high level of inclusiveness, ownership, and transparency in the decision-making processes and activities of the Agency. The Fund supported the participation of representatives of LDCs and SIDS in all IRENA's governing body meetings, including: Assembly, Council, and Committees. In 2019, the FDCR supported the participation of 101 delegates from 46 countries in different meetings of the governing bodies.

Efficient, Transparent and Innovative Management

155. The achievement of IRENA's strategic objectives relies on its responsiveness, effectiveness, internal capacity, and institutional efficiency. IRENA continues to apply dynamic, innovative, and results-focused solutions in the management and administration of the Agency's resources, underpinned by transparency and accountability as hallmarks of an open institution.

Strategic Management

156. The Agency has taken active steps to increase the environmental sustainability of its meetings and its operations, including engagement with partners and service providers to evaluate the success of current measures and to identify new options, while ensuring that its programmatic meetings are environmentally sustainable. Examples include the reduction of printing at the Seventeenth Meeting of the IRENA Council by 34% compared to the previous meeting. This was achieved by further developing tools to make documents available electronically.
157. IRENA has intensified its outreach to identify partners that can contribute to the diversification of its resource base. Due to this work, additional voluntary contributions continue to be provided to the Agency and several pledges have been made in 2019. IRENA has established an internal monitoring system on voluntary contribution to have a regular and transparent overview of the existing and forthcoming voluntary funds and the pace of their utilisation.
158. IRENA continues to gain a systematic overview of the strategic priorities of different countries to better connect them with the Agency's medium-term strategic objectives. Demonstrating the impact of IRENA's work is vital for its long-term direction and priority setting as well as for diversification of its resource base. IRENA is implementing a monitoring and evaluation system. In 2019, the focus lay on the creation of empirical baseline and analysis through the first self-evaluation process, as requested by Members in the Medium-term Strategy (MTS) 2018-2022. The outcome of this work is annexed to this report.
159. The Legal Office continues to provide legal advice and support in the conduct of IRENA's operations and activities, including in particular: assisting in the preparation and conduct of the Assembly and the Council meetings; advising on the privileges and immunities of IRENA and its personnel; advising on the interpretation, application and revision of IRENA's regulations, rules, procedures and policies; assisting in the negotiation, review, and drafting of funding and other agreements with states, intergovernmental, and non-governmental organisations, as well as contracts with private entities; advising on human resources and procurement matters; advising on the interpretation and implementation of the Host Country Agreements as well as reviewing publications and other documents with potential legal implications.
160. Internal audits continue to be carried out to ensure internal controls are in place and effective across the Agency. This included the audit of the general operating expenses on the maintenance of information and communications technology (ICT) and other office equipment, telephone, and internet expenses, in addition to work performed on the fixed assets at IRENA Headquarters as well as Bonn Office. Other assignments were completed for the period, as requested by the Director-General. Seven key recommendations stemming from these audits were reported to IRENA's Council meetings, three out of which were fully implemented, and the remaining four are currently under implementation. Internal audits are carried out independently and objectively to help management enhance governance, risk management and internal control systems, and will continue to be reported to the membership through specific reports.

Administration and Management Support

161. The Administration and Management Services Division supports efficient implementation of the work programme and facilitates the effective use of the Agency's resources. IRENA continues to innovate in its business processes and practices to remain responsive to the dynamic nature of its programmatic work. In this regard, the continued enhancement of the ERP system will go a long way to facilitate timely and streamlined support to programme implementation.
162. **Finance and Budget.** The Agency's full compliance with its Financial Regulations and Procedures in accordance with the International Public-Sector Accounting Standards (IPSAS) underpins finance and budget activities. Financial and budgetary services were provided to Members, staff, and other stakeholders, aligned with international accounting standards and budget practices. The services included preparation of the financial statements for IRENA, issuance of annual bills, allotments and administration of core funds and voluntary contributions. Finance and Budget follow up regularly with Members for the collection of outstanding assessed contributions, registering and allotting voluntary contributions, settlement of vendor, issuance of donor reports, supplier invoices, and regular internal support services including payroll, management of IRENA investments and Staff Provident Fund; budget utilisation updates, and general advice to support the sound financial management of the Agency. Additional activities included support for addressing internal and external audit recommendations and continuing efforts associated with ERP enhancement.
163. **Information and Communication Technology (ICT).** ICT continues to serve as a strategic enabler and tool for the Agency in the implementation of its Work Programme by providing state-of-the-art IT services and solutions to IRENA business units. ICT is regularly maintaining and consolidating its IT capabilities through initiatives for infrastructure modernisation (both in HQ and Bonn and New York Offices, cloud and on premise), operational excellence (IT governance, cost optimisation, proactive maintenance, regular monitoring) and internal capacity building (trainings, technology workshops). As per the IT strategy 2018-2022 closely aligned with the IRENA MTS 2018-2022, ICT is strengthening its roles as a driver of digital transformation towards higher institutional effectiveness and efficiency (through the maintenance and enhancement of the ERP and collaboration and knowledge management tools), an enabler of the development of value-added business capabilities on renewable energy (through the maintenance and enhancement of IRENA Website and platforms on renewable energy), and a pillar of the organisational resilience and compliance (through the implementation of the cybersecurity management framework and the business continuity plan).
164. **Human Resources.** Human resources span administrative, operational, and strategic activities. Significant effort was placed on aligning human resource policies and processes more closely with the Agency's strategic and programmatic objectives, including additional personnel sourcing and building organisational capabilities that are needed to achieve the Agency's operational objectives with the right combination of skills, knowledge, competencies, and expertise while promoting geographical, cultural, and gender diversity. Human resource practices, rules and procedures have continued to be refined and updated to ensure effective and efficient responsiveness to the emerging and evolving needs and challenges of the Agency while safeguarding its core values and principles.

165. Attracting, developing and retaining highly qualified staff is key to the Agency’s success. In this respect, IRENA has stepped up its outreach efforts to attract talent from all over the world, including tapping into Members’ expertise, and through the mechanisms provided by the decision of the Assembly at its second session (A/2/DC/5) such as loan arrangements and Junior Professional Officer Programme. Over the course of the biennium, 78 vacancies (core and project) were announced and over 8,300 applications received. Out of 90 core posts, 85 are filled or under recruitment (77 filled and 8 under active recruitment) and five are vacant. The 77 staff are from 43 nationalities out of which 49% are women and 51% are men.



Approved and filled/under recruitment posts by level as of 30 November 2019

Level	Approved	Filled or Under Recruitment
ASG	1	1
D-2	1	1
D-1	5	5
P-5	17	16
P-3/4	37	35
P-2/1	3	3
Sub-total Professional and above	64	61
General Services	26	24
Total	90	85

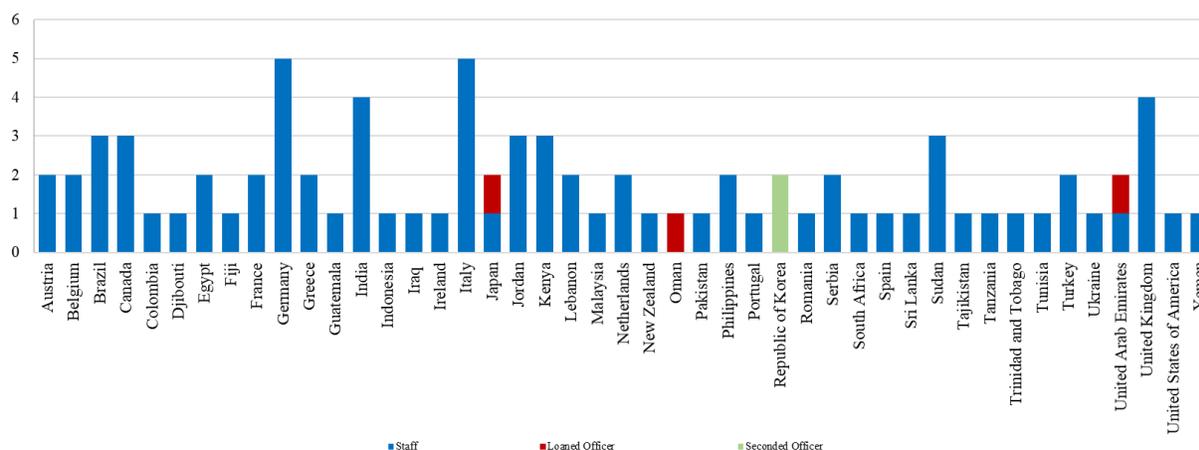
Loaned Personnel as of 30 November 2019

Division	Title	Loaned from
SMED	Liaison and Protocol Officer	UAE
SMED	Acting Chief Communications Officer	UAE
IITC	Bioenergy Analyst	Japan

Seconded Officers (Voluntary Contributions) as of 30 November 2019

Division	Title	Seconded Officers from
CSP	Programme Officer	Republic of Korea
KPFC	Associate Programme Officer, Climate Finance and NDC	Republic of Korea

Geographical distribution (core posts, loaned personnel and seconded officers)



166. **Procurement.** The Agency has continued to implement its planning for cost-effective procurement process of goods and services. To ensure transparency, fairness, openness, and competitiveness, the procurement bidding opportunities are posted on IRENA's website and disseminated to the vendors registered with IRENA's vendors' database. The Master Procurement Plan was updated in November 2019 to reflect the requirements until the end of the year. As of 30 November 2019, more than 550 procurement contracts for goods and services have taken place at approximately USD 8 million.
167. **General Services and Travel.** Travel support and services were provided to staff, delegates, and participants in conferences and workshops. As of 30 November 2019, the Agency facilitated participation in 4 800 travel and workshop related services in 2019. The section continues to provide facility management services for IRENA Headquarters and staff. This is an important function which contributes to a healthy and productive work environment while delivering continuous day-to-day services for staff. As part of these ongoing services, General Services has instituted a Health and Safety programme and further enhancement measures are in progress, to be implemented in the future.

Biennial budget overview

2018-2019 Biennium Budget Utilisation by funding source (in USD Thousands)

	2018-2019 Biennium Budget	Utilisation as at 30 November	
		Commitment and Expenses	Proportion of 2018-2019 Biennium Budget
Assessed Contributions (Core Budget)	43,130	41,222	96%
Core Non-Assessed UAE			
UAE Support	5,000	4,850	97%
Governing Body Meetings	3,200	3,181	99%
IT Infrastructure Support	920	920	100%
<i>Subtotal</i>	9,120	8,951	98%
Core Non-Assessed Germany			
Innovation and Technology Centre	10,200	10,120	99%
<i>Subtotal</i>	10,200	10,120	99%
Core Non-Assessed Other			
Core Non-Assessed Other	1,704	1,017	60%
<i>Subtotal</i>	1,704	1,017	60%
Total Core Non-Assessed	21,024	20,088	96%
Grand Total	64,154	61,310	96%

Core Non-Assessed Contributions
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as of 30 November 2019, in USD

	2018-2019	
	Committed	Received
Germany		
IRENA Innovation and Technology Centre	10,200,000	10,200,000
United Arab Emirates (UAE)		
UAE Support	5,000,000	5,000,000
Governing Body Meetings	3,200,000	3,200,000
IT Infrastructure Support	920,000	920,000
Subtotal UAE Contributions	9,120,000	9,120,000
Total Budgeted Voluntary Contributions	19,320,000	19,320,000

Other Voluntary Contributions

Donor/Project	2018-2019	
	Committed	Received
Belgium (Walloon)	2,285,787	2,285,787
Denmark	6,082,940	3,022,964
Germany	2,259,112	2,259,112
Italy	257,005	157,005
Japan	1,255,590	1,255,590
Kingdom of the Netherlands	26,042	26,042
Republic of Korea	629,284	629,284
Sweden	223,265	223,265
United Arab Emirates (UAE)	3,353,786	3,353,786
United Kingdom of Great Britain and Northern Ireland	88,637	88,637
UN-ESCWA	32,000	32,000
World Bank (IBRD)	13,438	-
Subtotal	16,506,886	13,333,472

Fund for Developing Countries Representatives
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Donor	2018-2019	
	Committed	Received
Belgium (Flanders)	20,524	20,524
Belgium (Walloon)	13,137	13,137
Germany	70,283	70,283
United Arab Emirates (UAE)	300,000	300,000
Subtotal	403,944	403,944

Total Other Voluntary Contributions	16,910,830	13,737,416
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Multi-Year Voluntary Contributions*
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Donor/Project	Multi-Year Commitments	Received prior to 2018	Received during 2018-19
European Commission	326,087	97,830	228,257
Germany	6,929,070	2,990,380	3,938,690
Norway	4,637,600	1,816,310	2,821,290
Total	11,892,757	4,904,520	6,988,237

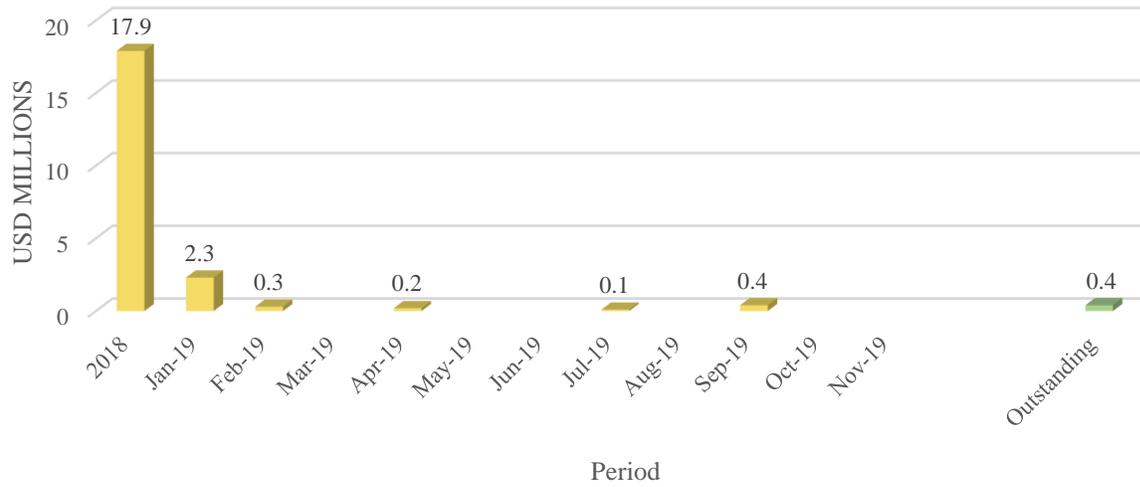
*Contributions pledged during 2016-17 and partially received during 2018-19

Pledged Voluntary Contributions for 2020-2021
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Donor/Project	2020	
	Committed	Received
Norway	4,332,756	-
Subtotal	4,332,756	-

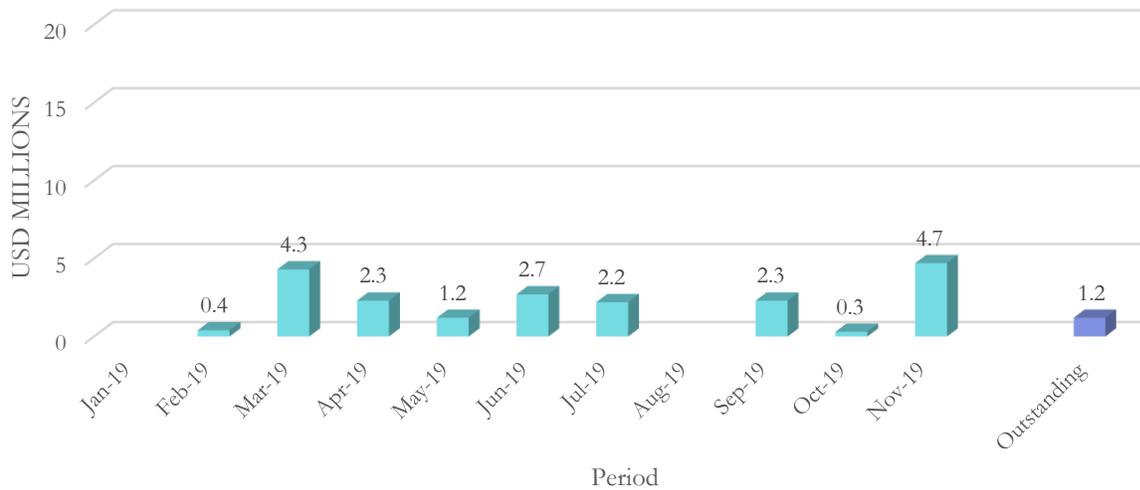
Received and outstanding assessed contributions for 2018 core budget (as of 30 November 2019)

Received: USD 21.2 M
 Outstanding: USD 0.4 M
 Total: USD 21.6 M



Received and outstanding assessed contributions for 2019 core budget (as of 30 November 2019)

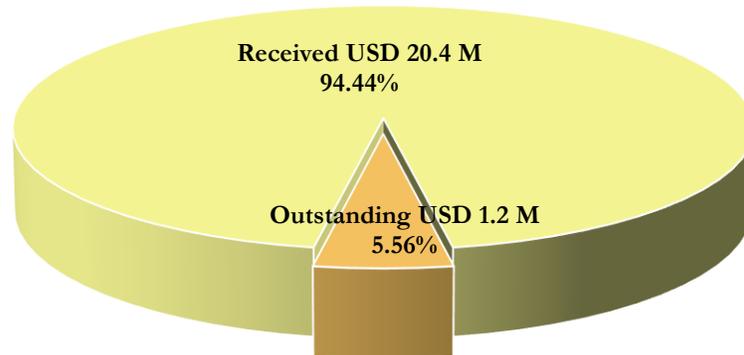
Received: USD 20.4 M
 Outstanding: USD 1.2 M
 Total: USD 21.6 M



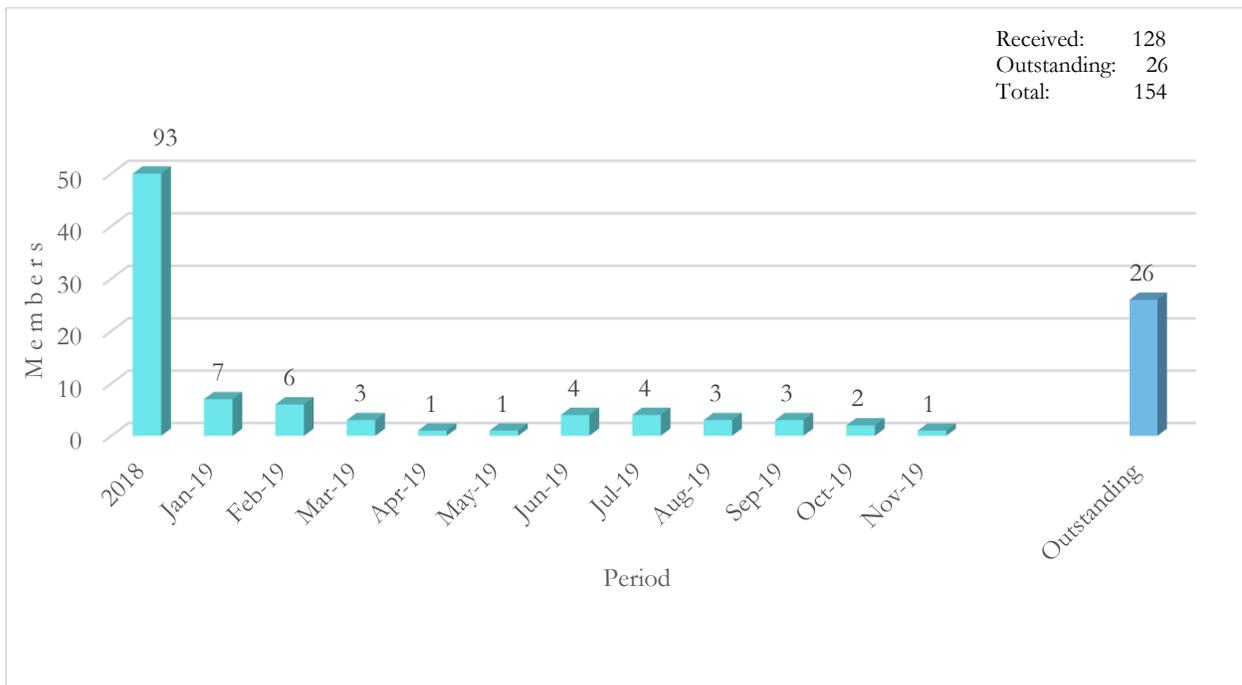
Status of contributions to the 2018 core budget (as of 30 November 2019)



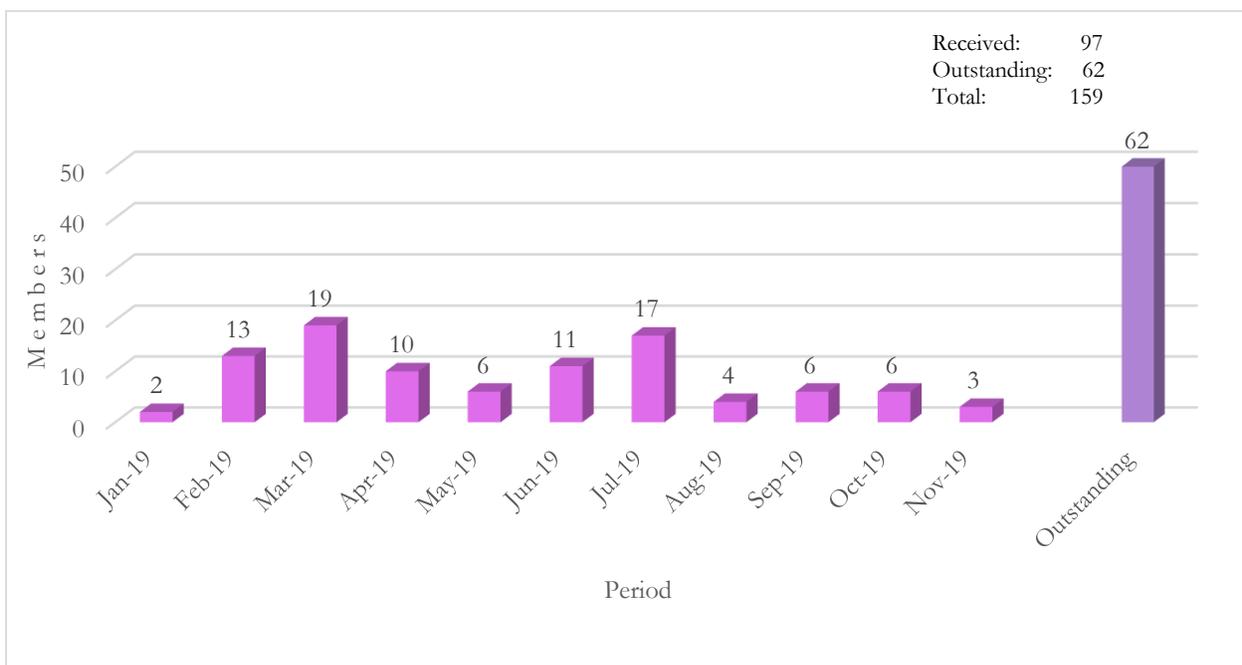
Status of contributions to the 2019 core budget (as of 30 November 2019)



Number of Members with received and outstanding contributions to the 2018 core budget
(as of 30 November 2019)



Number of Members with received and outstanding contributions to the 2019 core budget
(as of 30 November 2019)



VII. Summary of Progress

Centre of Excellence for Energy Transformation

Objective: Empower effective policy and decision-making by providing authoritative knowledge and analysis on renewables-based energy transformation at global, national and sectoral levels.

Transformation pathways		Core resources: USD 4,020,000
<i>Output: Countries provided with the tools and information necessary to support accelerated deployment of renewable energy.</i>		
Deliverable	Status ²²	
REmap Global report	Completed	<ul style="list-style-type: none"> - <i>Global Energy Transformation: a roadmap to 2050</i>, Berlin, April 2018. - <i>The Global Energy Transformation: A Roadmap to 2050</i>, Berlin, April 2019. - Background report: <i>Global Energy Transformation: The REmap transition pathways</i>. A detailed analysis of investments and stranded assets has been explored and analysed in the background document. - Web-based digital story <i>How to Transform Energy System and Reduce Carbon Emissions</i> available online as well as datasets and dashboards for key energy indicators for the regions. - <i>Future of Wind</i> (A Global Energy Transformation paper), launched at China Wind Power in Beijing, October 2019. - <i>Future of Solar Photovoltaic</i> (A Global Energy Transformation paper), launched at Sun World event in Lima, November 2019.
Grid integration planning guide for medium size power systems	Completed	- Technical Planning Studies for the Integration of variable renewables, September 2018.
Global report on policy and market design for integration of VRE	In progress	- In-depth analysis of policies, regulations and market instruments to support flexibility options (Q1 2020).

²² Definitions:

In planning: Preliminary discussions about the deliverable have commenced, deliverable concept is available or deliverable is in scoping phase.

In progress: Deliverable scope has been defined, budget and other resources have been identified, implementation has commenced.

Completed: Deliverable has been finalised and/or full completion reached.

Ongoing: Deliverable does not have a finite end, is cyclical or of operational nature (i.e., for governance and management related deliverables).

Report on long-term planning with high share of VRE	In progress	- Expert workshop planned for 12-13 December 2019. A report will subsequently be prepared based on workshop proceedings.
Analytical briefs (demand-side flexibility; 100% renewable power system operation; system integration costs)	Completed	<ul style="list-style-type: none"> - Policy brief on <i>Power Market Design for the Energy transition</i> (completed). - Analytical brief on <i>Demand-side flexibility</i> (completed). - Analytical brief on <i>System integration cost</i>: draft discussed with experts in September 2018 and June 2019 (draft near finalisation). - Analytical brief prepared with the University of Michigan on 100% renewable/100% VRE (Q4 2019). - <i>Electrification with Renewables: Driving the transformation of energy services</i> launched in January 2019 in collaboration with SGCC.
Development of Energy Transformation Model (integrating REmap, planning, flexibility and grid assessment models)	Completed	<ul style="list-style-type: none"> - A framework was put in place to enable communication and co-ordination between tools and activities. - Launch of the IRENA FlexTool at the 16th IRENA Council. - Launch of the report on flexibility for the energy transition at the 16th Council. - Integration of REmap and FlexTool completed. - Energy efficiency tool integration is underway.
Technical workshops on best practices for long-term planning and grid assessment	Completed	<ul style="list-style-type: none"> - Selected events include: <ul style="list-style-type: none"> o Energy Modelling Platform for Africa (UNECA) and for Europe (KTH), Addis Ababa, January 2018 o Strategic energy planning (UK-DFID), Lisbon, May 2018 o Renewable Grid Initiative seminar, Brussels, May 2018 o International Energy Workshop, Gothenburg, June 2018 o IAEA energy planning seminar, Zagreb, July 2018 o Capacity Development Workshop: Readiness in Implementing NDC in Senegal, November 2018 o International Energy Workshop, Paris, June 2019 o Central Asia Workshop on Long-Term Capacity Expansion Planning with a High Share of Renewables, Astana, March 2019 o Exchanging best practices to incorporate variable renewable energy into long-term planning in the MENA region, Amman, April 2019
REmap expert network	Completed	- REmap focal point meeting, 12 November 2018.

Access solutions		Core resources: USD 1,327,000
<i>Output: Countries informed of technology, policy and finance solutions for improved energy access.</i>		
Deliverable	Status ¹	Remarks
Report on renewable energy contribution to access	Completed	<ul style="list-style-type: none"> - <i>Off-grid Statistics</i>, May 2018. - <i>Off-grid Renewable Energy Solutions, Global and Regional Status and Trends</i>, July 2018. - <i>Achieving effective linkages between off-grid renewable energy solutions and livelihoods</i> (under finalisation)
Policy briefs on enabling frameworks for off-grid renewables	Completed	<ul style="list-style-type: none"> - <i>Policies and Regulations for Renewable Energy Mini-Grid</i>, launched at IOREC 2018, October 2018. - <i>Off-grid Renewable Energy Solutions to Expand Electricity Access: An opportunity not to be missed</i>, launched at the 9th IRENA General Assembly, January 2019.
Convening of stakeholders through IOREC	Completed	<ul style="list-style-type: none"> - 4th IOREC, Singapore, 31 October-1 November 2018. - International Conference on renewable energy solutions for healthcare facilities, 2 November 2018.
Accelerating innovation		Core Resources: USD 3,719,000
<i>Output: Countries are aware of the latest innovations in technology, policies and finance.</i>		
Deliverable	Status ¹	Remarks
Innovation Landscape report	Completed	- <i>Innovation Landscape for a Renewable Powered Future</i> , February 2019.
Technology status and outlooks	Completed	<ul style="list-style-type: none"> - <i>Status Report on Floating Offshore Wind</i>, CEM9, May 2018. - <i>Offshore Energy</i> report for G7 countries, Halifax, Canada, September 2018. - <i>Hydrogen from renewable power: Technology outlook for the energy transition</i>, September 2018. - <i>Technology brief: Solid biomass for heat and power</i>, February 2019. - G20 Report <i>Solutions to integrate high shares of variable renewable energy</i>, June 2019. - Parallel event at the 27th European Biomass Conference and Exhibition: “Where will we get our bio-jet?” May 2019. - <i>Innovation Outlook: Smart Charging for Electric Vehicles</i>, May 2019. - <i>Innovation Outlook Thermal Energy Storage draft completed</i>, launch 2020 - <i>Power System Organizational Structure for the Renewable Energy Era</i> (under finalisation)

Global report on innovative policy design and practice	Completed	<ul style="list-style-type: none"> - Joint IRENA-IEA-REN21 report <i>Renewable Energy Policies in a Time of Transition</i>, April 2018. - <i>Renewable Energy Auctions: Status and Trends Beyond Price</i>, June 2019.
Analytical briefs on innovative capital market instruments and investment trends	Completed	<ul style="list-style-type: none"> - <i>Global Landscape of Renewable Energy Finance</i> (2018 edition), January 2018. - <i>Global Landscape of Renewable Energy Finance</i> (2020 edition) (Planned date of completion Q1 2020). - <i>Mobilising Institutional Capital for Renewable Energy</i>, January 2020 - <i>Financing Renewable Energy with Green Bonds</i>, January 2020 - Analytical work on off-grid renewable energy financing landscape. - Joint IRENA-IEA-REN21 report <i>Renewable Energy Policies in a Time of Transition: Heating and Cooling</i>, Q2 2020.
Design of risk mitigation facilities	Completed	<ul style="list-style-type: none"> - IRENA expert workshop in Nairobi, Kenya, January 2018. - Risk Assessment and Mitigation platform, released in Q4 2019. - Solar Risk Mitigation Initiative: IRENA has recently become a partner to this multilateral initiative together with the World Bank, Agence Francaise de Developpement and International Solar Alliance.
Innovation week	Completed	<ul style="list-style-type: none"> - Bonn, Germany, September 2018.
Engagement with innovation-related fora (CEM, MI)	Completed	<ul style="list-style-type: none"> - Innovation Week 2018, Bonn Germany, September 2018. - CEM9 Denmark/Sweden, May 2018. - CEM10, Canada, May 2019. - Innovation Day Uruguay, June 2019. - Innovation Day Thailand, September 2019. - Innovation Day Turkey, November 2019 - Capacity building workshop 'The Asia EDGE Regional Competitive Procurement Dialogue', November 2019 - European Utility Week (EUW), November 2019 - Workshop 'Unlocking the potential of ocean energy around the globe', October 2019, Ireland

		- Workshop ‘Coupling ocean energy with other sectors: Innovative business models and complementarities with renewable offshore technologies’, October 2019, Halifax, Canada
Knowledge hub		Core Resources: USD 1,959,000
<i>Output: Information about renewable energy, including best practice, is presented in a timely and user-friendly way.</i>		
Deliverable	Status¹	Remarks
REthinking energy	Completed	- IRENA published <i>Global Energy Transformation: A Roadmap to 2050</i> , with the latest edition launched at Berlin Energy Transition Dialogue, April 2019.
Report on renewable energy targets and policies	Completed	- <i>National Renewable Energy Targets: A Global Quantified Estimate</i> .
IEA/IRENA policy database	In progress	- Developing a methodology to gather feedback from Member States on the tool.
REsource search engine maintenance and development	Completed	- REsource has been integrated into IRENA’s website, including: statistics on renewable energy auctions, renewables in NDCs, renewable energy balances, REmap options, finance, costing, technology innovation, patents, and socio-economic benefits.

Global Voice of Renewables

Objective: Shape the global discourse on energy transformation by providing relevant timely, high-quality information and access to data on renewable energy.

Realising socio-economic benefits		Core resources: USD 2,552,000
<i>Output: Contribution of renewable energy to socio-economic and climate goals articulated.</i>		
Deliverable	Status ¹	Remarks
Quantitative analysis of socio-economic benefits	Completed	<ul style="list-style-type: none"> - <i>Global Energy Transformation: A roadmap to 2050 (2018 edition)</i>, April 2018. - <i>Renewable energy benefits: Measuring the economics V2.0</i>, January 2019. - <i>Global Energy Transformation; A roadmap to 2050 (2019 edition)</i>, April 2019. - <i>IRENA Policy Day</i>, June 2019 - Sustainable Energy Jobs Platform, to be released January 2020 - <i>Measuring the socio-economic footprint of the energy transition: The role of supply chains</i>, January 2019 - <i>Measuring the socioeconomics of the energy transition: Focus on Jobs</i>, January 2020 release.
Report on best practice to maximise local benefits from renewable energy projects	In progress	<ul style="list-style-type: none"> - <i>Community engagement in Sub-Saharan Africa: Experiences of large-scale wind and solar project</i>, Q1 2020
Report on leveraging local capacity (selected technologies)	Completed	<ul style="list-style-type: none"> - <i>Renewable Energy Benefits: Leveraging Local Capacity for Offshore Wind</i>, May 2018.
Jobs annual review 2018	Completed	<ul style="list-style-type: none"> - 2018 edition of the <i>Renewable Energy and Jobs - Annual Review</i>, May 2018.
Jobs annual review 2019	Completed	<ul style="list-style-type: none"> - 2019 edition of the <i>Renewable Energy and Jobs - Annual Review</i>, June 2019.
Analytical framework for the renewable energy components in NDCs	Completed	<ul style="list-style-type: none"> - Member of the NDC Partnership (as of August 2018). - Input to UNFCCC in support of the Talanoa Dialogue, December 2018. - Regional Climate Weeks – NDC Dialogue facilitation; March, August, and September 2019. - <i>NDCs in 2020: Advancing Renewables in the Power Sector and Beyond</i>, December 2019

Informing markets		Core resources: USD 4,161,000
<i>Output: Unbiased, timely and accurate information about renewable energy trends and developments.</i>		
Deliverable	Status ¹	Remarks
Renewable energy statistics 2018	Completed	- <i>Renewable Capacity Statistics</i> , March 2018.
Renewable energy statistics 2019	Completed	- <i>Renewable Capacity Statistics</i> , March 2019.
Four cost-related reports, including annual updates on power generation	Completed	- <i>Renewable Power Generation Costs in 2017</i> , January 2018. - <i>Renewable Power Generation Costs in 2018</i> , May 2019. - <i>Energy Subsidies: Evolution in the Global Energy Transformation</i> , Q4 2019. - <i>Solar and Wind Cost Reduction Potential in G20 Countries to 2030</i> , expected Q1 2020.
Two topical cost briefs	In progress	- <i>Wind Power and Energy Technology Learning Curves for Policy Making</i> (Analysis in progress. Expected publication in Q1 2020). - <i>Renewables in the Building Sector: Heat Pump Costs and Performance</i> (Not complete. Data collection in progress. Have encountered data collection challenges).
Two reports on quality assurance (offshore wind and smart grids)	Completed	- <i>Nurturing Offshore Wind Markets: Good practices for international standardisation</i> , May 2018. - <i>Implementing quality infrastructure for smart mini-grids</i> (Draft completed and launch in Q1 2020)
Technical guides on data collection	Completed	- <i>Measurement and estimation of off-grid solar, hydro and biogas energy</i> , December 2018 - <i>Lessons learned from pilot testing the IRENA biogas survey in 6 countries</i> , November 2019.
Technical guides on quality infrastructure for emerging renewable energy technologies	Completed	- <i>Impact of extreme weather conditions on onshore wind and PV systems</i> (draft completed; launch in 2020)
Expanded Renewable Cost Database	Completed	- IRENA Renewable Cost Database expanded to 17,000 projects and the PPA/Auction database to 10,000 projects.
INSPIRE platform enhancement	Completed	- New data dashboards, May 2018.
INSPIRE new module on quality assurance systems for renewables	Completed	- New module available at: http://inspire.irena.org/Pages/qualityassurance/start.aspx .

Training on data collection	Completed	<ul style="list-style-type: none"> - Central Asia Renewable Energy Statistics Training Workshop, Abu Dhabi, UAE, September 2018. - West Africa Renewable Energy Statistics Training Workshop, Abuja, Nigeria, February 2019. - Pacific Islands Renewable Energy Statistics Training Workshop, Nadi, Fiji, October 2019. - Caribbean Renewable Energy Statistics Training Workshop, Bridgetown, Barbados, November 2019.
Training on the implementation of quality infrastructure	Completed	<ul style="list-style-type: none"> - Training for Asia on developing quality infrastructure for PV, June 2018. - Training for trade negotiators on quality infrastructure to support trade of RE technologies, July 2019.
Amplifying impact		Core resources: USD 5,566,000
<i>Output: Knowledge generated by IRENA is disseminated widely and accessible to target audiences.</i>		
Deliverable	Status¹	Remarks
Communication content for broad consumption	Completed	- Ongoing activity.
Communication content for target audiences	Completed	<ul style="list-style-type: none"> - Periodic e-bulletin and publication briefs issued. - Selective, targeted translation of press releases, promotional materials (e.g. IRENA/ADFD 7th cycle flyers and publications and a project impact video).
IRENA website maintenance	Completed	- “Our Collections” range on publications page expanded.
Publication development planning and management	Completed	- New email format for sharing targeted IRENA publications piloted with the launch of <i>Renewable Energy Prospects for the European Union</i> report.
Collaboration with media	Completed	- The Assembly-hosted media programme has cultivated key relationships with reporters from global news outlets.
Member Communicators network	Completed	- Communications survey conducted to refine support to Members in assessing the critical facets of the global energy transformation.
Dissemination of IRENA knowledge products (traditional and digital)	Completed	<ul style="list-style-type: none"> - ISBN registration expanded, capturing key releases since 2012 and improving visibility and accessibility for all IRENA output. - Ongoing outreach.

Network Hub

Objective: Provide an inclusive platform for all stakeholders, to foster action, convergence of efforts and knowledge sharing for impact on the ground.

Regional action agenda		Core resources: USD 7,025,000
<i>Output: Regional action plans and initiatives supported by IRENA.</i>		
Deliverable	Status ¹	Remarks
SEE regional market analysis	Completed	<ul style="list-style-type: none"> - Policy Guidelines on Competitive Selection and Support for Renewable Energy, IRENA, European Bank for Reconstruction and Development, and the Energy Community Secretariat, March 2018. - <i>Renewable Energy Regional Market Analysis: South East Europe, December 2019.</i>
GCC regional market analysis	Completed	<ul style="list-style-type: none"> - <i>Renewable Energy Regional Market Analysis: the GCC Region, January 2019.</i> - Suitability analysis of solar and wind development areas completed for the GCC.
Solar and wind site assessment/mapping (Africa, Central Asia, MENA)	Completed	<ul style="list-style-type: none"> - RE site assessment support provided to 104 sites over eight countries in Africa and two Small Island Developing states (SIDS). - Suitability assessment of solar and wind development areas completed for Mauritania. - Suitability assessment of solar and wind development areas completed for South East Europe.
Financial assessment tool for renewable energy PPAs (Latin America)	Completed	<ul style="list-style-type: none"> - Tool developed for Panama. Report completed (December 2018).
Planning workshops (Africa, MENA, SEE, Southeast Asia)	Completed	<ul style="list-style-type: none"> - Assessment of non-hydro renewable energy prospects in the ACEC in progress and preliminary insights presented to PIDA Steering Committee, March 2018, September 2019. - South East Europe workshop on planning and operating systems with higher shares of variable renewable energy, Austria, November 2018. - MENA long-term energy planning workshop, Jordan, April 2019 and corresponding knowledge report (December 2019) and following sub-regional long-term energy planning workshops in Maghreb and GCC (both in Q1 2020).

		- Workshop to increase investment levels on renewable energy in Lebanon, September 2019.
Regulations and policy workshops (Africa, Latin America, Central Asia, SEE, Southeast Asia)	Completed	<ul style="list-style-type: none"> - CECCA regional meeting in Panama, May 2018. - Regional trainings on the development on renewable energy PPAs in West Africa, Cote D'Ivoire and Ghana, June and July 2018. - Regional workshop on accelerating energy transformation in Latin America, Ecuador, August 2018. - Regional Workshop on Policy Support Mechanisms in Central Asia, Azerbaijan, October 2018. - RE Policy Workshop for Southeast Asia, Malaysia, November 2018. - Regional workshop on socio-economic benefits of RE in SEE, Bosnia and Herzegovina, June 2019. - Regional Workshop on Energy Transformation in Latin America, Costa Rica, October 2019.
Renewable energy statistics workshop (Central Asia)	Completed	- Central Asia Renewable Energy Statistics Training Workshop, UAE, September 2018.
Project development workshop (SEE)	Completed	<ul style="list-style-type: none"> - South East Europe Regional Workshop on RE project development and financing, Serbia, June 2018. - Regional Workshop on Accelerating Renewable Energy Investments in Southeast Asia, Vietnam, May 2019. - Regional Workshop on Accelerating Renewable Energy Investments in Latin America, Colombia, September 2019.
Grid integration workshops (Africa, Central Asia, Latin America, Southeast Asia)	Completed	<ul style="list-style-type: none"> - Regional training on the planning and operation of grids with higher shares of variable renewable energy in West Africa, Cote D'Ivoire and Ghana, May 2018. - Study tour in China for West African utilities, September 2018. - Grid integration and planning technical workshop for the Clean Energy Corridor of Central America, El Salvador, December 2018. - Central Asia Workshop on Long-Term Capacity Expansion Planning with a High Share of Renewables, Astana, March 2019.

		<ul style="list-style-type: none"> - Grid Integration workshop on Advanced Modelling for Renewables in PSS/E for Power System Studies for the Clean Energy Corridor of Central America, El Salvador, December 2019 - Dialogue on “The role of renewables in the energy systems of tomorrow” during XII Eurasian Forum, September 2019
Regional collaboration platforms and partnerships	Completed	<ul style="list-style-type: none"> - Joint Declaration by IRENA and International Solar Alliance (ISA) for the promotion of solar energy, India, March 2018. - Consultative meeting on the next phase of implementation of the Africa Clean Energy Corridor, Namibia, October 2018. - MoU between ASEAN and IRENA (signed in Singapore on 30 October 2018). - ECCAS Renewable Energy Roadmap Validated in November 2018 in Kigali, Rwanda. Included support provided to Economic Community of Central African States (ECCAS) Renewable Energy Roadmap, November 2018 - Contribution to the update of PIDA-PAP 2 as part of the Agency’s membership to the PIDA Steering Committee (ongoing). - Participation in the process of the Africa-Europe High-level Platform for Sustainable Energy Investments in Africa (Q1 to Q4 2019). - Study paper on <i>modern bioenergy in Africa</i> at the 27th European Biomass Conference and Exhibition, Lisbon, May 2019. - High-level Meeting on Renewable Energy in Latin America, Abu Dhabi, January 2019 - MoU between SICA and IRENA (signed in May 2019) - AfDB-led Desert-to-Power Initiative. As a member of its Steering Committee, IRENA attended the inaugural meeting on the margins of the Africa Investment Forum in Johannesburg, November 2019 - Consultative Workshop on Renewable energy solutions for enterprise development in Hindu Kush Himalayas jointly held with ICIMOD in Kathmandu on 20 November 2019

Collaborative platforms		Core resources: USD 1,299,000
<i>Output: Multi-stakeholder approaches to renewable energy deployment are supported by IRENA.</i>		
Deliverable	Status ¹	Remarks
Annual progress report on SIDS Lighthouses initiative	Completed	- SIDS LHI: <i>Progress and Way Forward</i> , January 2019.
SIDS knowledge sharing platform	Completed	<ul style="list-style-type: none"> - SIDS Lighthouses website revamped and updated with more information, publications, videos, etc. - Webinars on renewable energy in SIDS (ongoing). - Development of videos on nexus between renewable energy and water, food, health. - Ongoing social media campaign with focus on renewables in SIDS. - Organising and contributing to various events, workshops and capacity building activities with focus on RE in SIDS, including: <ul style="list-style-type: none"> o Organising the “Caribbean Workshop on Renewable Energy in Small Islands Developing States: How to strengthen resilience and accelerate renewable energy deployment” (Aruba, November 2018); o Support to the “International Renewable Energy Conference: Bridging the knowledge gap on climate financing in small island states” (Cabo Verde, November 2018); o Workshop on “Design of Bankable Power Purchase Agreements in Pacific SIDS” (Fiji, November 2019). - Update of country profiles for SIDS and relevant update on the LHI website (ongoing). - Ongoing tracking of renewable energy capacity installed and key initiatives and projects in SIDS. - Contribute to Review of the SIDS Modalities of Action (S.A.M.O.A) Pathway.
GGA knowledge sharing platform	Completed	<ul style="list-style-type: none"> - Regional workshop on Geothermal Financing and Risk Mitigation, Kenya, February 2018. - Event “Geothermal Direct Utilisation and Food Security” , April 2018

		<ul style="list-style-type: none"> - Capacity Building on the Integration of Low-Temperature Renewable Energy Sources into District Heating and Cooling Systems, Belgrade, Serbia, December 2019. - Geothermal Market Assessment in East Africa (under finalisation) - GGA website upgrade
SIDS Lighthouses Facilitation	Completed	<ul style="list-style-type: none"> - Consultation with LHI partners on the next phase of the Initiative (completed). - New phase of Initiative and new priority areas of SIDS Lighthouses launched during UNGA, September 2018. - Ministerial Meeting on SIDS Lighthouses, January 2019. - New partners in 2018-19: Denmark, Caribbean Electric Utility Services Corporation, Organisation of Eastern Caribbean States, the Pacific Islands Development Forum, and the Solar Head of State. - UNCAS SIDS Initiative
GGA co-ordination	Completed	<ul style="list-style-type: none"> - New members/partners in 2018-19: Ethiopia, Germany, Japan, Portugal, Asian Infrastructure Investment Bank, Caribbean Electric Utility Services Corporation, Centro Mexicano de Innovación en Energía Geotérmica [Mexican Center for Geothermal Energy Innovation (CeMIEGeo)], Chinese Renewable Energy Industries Association, Geothermal Canada, Organisation of Eastern Caribbean States, United Nations Industrial Development Organization, and University of Geneva. - GGA meeting on “Global Geothermal Alliance: Enhancing Dialogue and Cooperation”, January 2019.
Creation of GGA Practitioner Group	Completed	<ul style="list-style-type: none"> - GGA Geothermal Clusters workshop: <i>Strategies for future collaboration</i>, Iceland, April 2018. - Group of practitioners established to advise on guidelines for integration of low temperature renewable energy resources into district heating and cooling networks. - Virtual meeting of the GGA practitioners’ group on district heating and cooling, October 2019.

Multi-stakeholder engagement		Core resources: USD 1,695,000
<i>Output: Engagement of a broad range of stakeholders is supported through IRENA communications and events.</i>		
Deliverable	Status¹	Remarks
Coalition for Action web platform	Completed	- New Coalition for Action website, April 2018.
Coalition for Action co-ordination	Completed	- <i>Scaling Up of Renewable Energy Investment in Algeria, Colombia, Jordan, Mozambique, Senegal, Tunisia, and Viet Nam</i> , January 2020. - <i>Towards 100% Renewable Energy, A Utility Perspective</i> (white paper), January 2020.
Communication and outreach to parliamentarians	Completed	- Co-operation with the Inter-Parliamentary Union (IPU) and parliamentary stakeholders on the implementation of the SDG7. - Public-private dialogue between legislators, members of the Coalition for Action and government representatives initiated.
Tailored information for parliamentarians	Completed	- The Review for Parliamentarians (three issues per year, total of six issues in the biennium). - Legislators Forum, Abu Dhabi. January 2019, January 2020.

Source of Advice and Support

Objective: Support country level decision-making to accelerate the renewables-based transformation of national energy systems, advance strategies to diversify energy sources, reduce global emissions and achieve sustainable development.

Project support and facilitation		Core resources: USD 2,460,000
<i>Output: Tools, platforms and partnerships are provided to support renewable energy deployment.</i>		
Deliverable	Status ¹	Remarks
Design and development of standardised contract templates	Completed	- The standardised contract templates are being finalised with due consideration to the comments received during the external review
Functional Global Atlas Applications	Completed	- Spatial Suitability and site assessment methodologies operational (completed). - Blue print and technical requirement documentation of the new Global Atlas (Global Atlas 4.0). (completed). - Development of the Agency's strategy to support hydropower resource assessment commenced in May 2019. - Pilot project to add geothermal datasets to the Global Atlas in progress.
IRENA Project tracker dashboard	Completed	- Project Navigator project workspace updated. - Project Navigator project tracking tools added to the platform.
Project Navigator module on competitive technical requirements for EPC tender	Completed	- Project Navigator technical guidelines for the development of bankable renewable energy projects includes construction requirements (EPC).
Sustainable energy Marketplace global coverage	Completed	- The Sustainable Energy Marketplace covers all countries in Sub-Saharan Africa, Latin America, Asia, Southeast Europe, and Small Island Developing States. - Workshop to increase of investment levels on renewable energy in Lebanon, September 2019. - Workshop on the project facilitation tools in GCC region (Q4 2019). - Risk assessment and mitigation platform (RAMP) (went online in Q4 2019)

Project collection and screening	Completed	<ul style="list-style-type: none"> - A platform-wide review to enhance project quality (completed). - 32 new projects registered in Cote d'Ivoire, Madagascar, Guinea, Mali, Cameroon, Pakistan, Thailand, Costa Rica, Lao, Serbia, India, Philippines, Ukraine, Brazil, Ghana, Indonesia, Bangladesh, Barbados, Guatemala, El Salvador, increasing the total to 230 projects. - 17 new financial instruments registered; increasing the total to 175 (offered by 69 financial institutions).
Project Navigator modules in French	Completed	<ul style="list-style-type: none"> - 6 Technical Guidelines translated in French for Biogas; Geothermal Power Projects; Mini-grid Applications; Residential PV Projects, Utility Scale PV Projects; and Woody Biomass (completed). - 6 Technical Guidelines translated in Spanish for Biogas; Geothermal Power Projects; Mini-grid Applications; Residential PV; Utility Scale PV Projects and Woody Biomass (completed).
Dissemination of standardised contract templates	Not Complete	<ul style="list-style-type: none"> - Will be initiated once the contractual suite is finalised.
Marketplace regional platforms	Completed	<ul style="list-style-type: none"> - Asia Regional Platform launched at the Asia Clean Energy Forum, Manila, Philippines, June 2018. - South East Europe Regional Platform launched at the International Forum on Energy for Sustainable Development in Kiev, Ukraine, November 2018. - SIDS Platform for the Pacific region presented at the ADFIP Annual Meeting in Fiji, November 2018.
Capacity building workshops on project development	Completed	<ul style="list-style-type: none"> - Project Navigator workshops on bankable renewable energy projects (Singapore Q2 2018, Egypt and MENA Q4 2018, Indian Ocean SIDS Q4 2018, Pacific SIDS Q4 2018, Caribbean SIDS Q4 2019, Sub-Saharan Africa, Q3 2019, ASEAN Q3 2019) - Project Navigator Training webinars on the development of bankable renewable energy projects (2018, 2019) - Regional energy forum on sustainable energy in the Southwest Indian Ocean islands, Q2 2019 supported by Project Navigator.

Renewable energy solutions lab		Core resources: USD 775,000
<i>Output: Information and capacity building provided on renewable energy solutions for sustainable livelihoods.</i>		
Deliverable	Status ¹	Remarks
Three policy briefs on nexus-related topics	Completed	<ul style="list-style-type: none"> - <i>Water Use in India's Power Sector - Impact of renewables and cooling technologies to 2030</i>, January 2018. - SEA case studies on <i>Off-grid Renewable Energy Solutions to Improve Livelihoods</i>, June 2018. - <i>Renewable Energy and Gender</i> report, January 2019.
Southern African Development Community (SADC) Renewable Energy Entrepreneurship Support Facility	CompletedOngoing	<ul style="list-style-type: none"> - First call for applications for SADC-based entrepreneurs to submit requests for assistance under the Facility, May 2018. - Second call for applications completed in November 2019. Preparation for the trainings for the first cohort ongoing.
Two workshops for entrepreneurs, financing institutions and incubation centres	In progress	<p>Adjusted to one workshop</p> <ul style="list-style-type: none"> - A Consultative Meeting on the implementation of the SADC RE Entrepreneurship Support Facility, October 2018 in Windhoek, Namibia. The workshop brought together 25 participants from RE incubation centres, financial institutions, private sector and government departments within the SADC region.
Direct mentoring	Completed	<ul style="list-style-type: none"> - Contribution to the establishment of a regional certification scheme for the improvement of sustainable energy skills in the 15-member states of ECOWAS. - First pilot certification examination (in French) for off-grid solar PV technicians in Senegal, January 2019 and second pilot examination (in English) in Ghana, June 2019. - Regional workshop, marking the conclusion of the piloting phase, to discuss lessons learned from pilot exams and the inclusion of additional competencies for certification. Dakar, Senegal, September 2019.

Local solutions and tailored advice		Core resources: USD 2,757,000
<i>Output: Advice and capacity building provided to countries about the options for accelerated deployment of renewable energy.</i>		
Deliverable	Status ¹	Remarks
Five country processes for renewables-based transition	Completed	<ul style="list-style-type: none"> - RRA Azerbaijan, November 2019 - RRA Mali, September 2019. - RRA Pakistan, April 2018 - RRA Panama, May 2018 - REmap Nigeria (forthcoming). - REmap South Africa (forthcoming). - Renewable Energy Outlook (REmap/RRA): Egypt, October 2018. - Renewable Energy Outlook (REmap/RRA): Lebanon, December 2019. - RRA process completed for Tunisia. Reports under finalisation (launch forthcoming). - RRA process ongoing for Albania and Botswana. - Post RRA support for Mauritania. Solar suitability analysis completed. Wind analysis is under finalization.
Power system flexibility assessment for countries upon request	Completed	<ul style="list-style-type: none"> - FlexTool case study applications in Columbia, Jordan (RRA component), Panama, Thailand and Uruguay.
National master plans supported in Africa	Completed	<ul style="list-style-type: none"> - Support to Eswatini for the preparation of a national Energy Masterplan, October 2018. Support to Sierra Leone for the preparation of a national Energy Masterplan.
Grid integration and power system operation support upon request	Completed	<ul style="list-style-type: none"> - Grid integration studies for the Dominican Republic (forthcoming), Fiji (forthcoming) and Vanuatu. - Stakeholder consultation workshop in Vanuatu on the outcomes and analysis of the grid integration studies, in November 2018. - Other activities supported by VC.

International Co-operation and Strategic Engagement

Objective: Provide leadership in global agenda-setting on energy transformation and ensure active Member participation in the delivery of the programme of work.

International co-operation and strategic management		Core resources: USD 5,018,000
Outputs	Status¹	Remarks
Strategic management of the Agency and thought leadership and coherence of the message on renewables in the global discourse on energy.	Completed	<ul style="list-style-type: none"> - 160 Members and 23 Signatories and States in Accession. - 50 Permanent Representatives (PRs) accredited to IRENA. - Global engagement on energy transition, sustainable development, and climate action.
Regular Member interaction and co-operation on programmatic and governance issues.	Completed	<ul style="list-style-type: none"> - Programme and Strategy Committee, Administrative and Finance Committee, and 15th, 16th and 17th and 18th Council and related meetings. - Ongoing interaction on programmatic and governance issues with the PRs and Headquarters-based representatives of the Membership.
Effective communication and outreach to Members to ensure the flow of information and active engagement.	Completed	<ul style="list-style-type: none"> - Member communication survey undertaken. - New Member Bulletin format to showcase RE developments in Member countries. - New publication emails for Members. - Communication initiatives implemented, including a quarterly. - Updates to the IRENA Member Portal to make it more user-friendly.
Governing body meetings		Core resources: USD 3,200,000
Outputs	Status¹	Remarks
Substantive support and efficient servicing of meetings of the governing bodies is ensured.	Completed	<ul style="list-style-type: none"> - Tenth session of the Assembly and related meetings, January 2020. - Ninth session of the Assembly and related meetings, January 2019. - Eighteenth meeting of the Council and related meetings, November 2019 - Seventeenth meeting of the Council and related meetings, June 2019. - Planning and organisation of governing body meetings consolidated and streamlined. - Documents available electronically on the IRENA Meeting Mobile Application. - FDCR: Since beginning of 2019, FDCR has supported participation of 101 delegates from 46 countries in different meetings of the governing bodies.

Efficient, Transparent and Innovative Management

Objective: Ensure quality and accountability in programme planning and implementation and the associated management of financial, human and information technology resources to achieve impact in the programme of work and medium-term strategy.

Strategic Management		Core resources: USD 4,448,000
Outputs	Status¹	Remarks
Accountability and transparency in the management of the Agency and its resources.	Completed	- Ongoing review of business processes and improvements in reporting to Members.
Resource diversification strategies and plans developed and operationalised.	Completed	- Engagement with potential partners. - Secured additional contributions. - Development of communication materials based on the WP and MTS. - Co-ordination and development of substantive and contractual arrangements for VCs. - Regular reporting to contributors.
Evaluation system to monitor progress and improve performance over successive programmatic cycles introduced.	Completed	- Qualitative and quantitative data collection to establish baselines completed. Preliminary monitoring framework in development - Completed self-evaluation as per MTS requirements
Effective review, oversight and legal support with timely implementation of related recommendations.	Completed	- Continuous legal support and advice on the application of IRENA regulations, rules and procedures. - Review of contracts for the procurement of goods and services, memoranda of understanding and voluntary contribution agreements. - Supplementary agreement with the Government of the UAE concerning IRENA's occupancy of its headquarters in Abu Dhabi.
Administration and Management Support		Core resources: USD 12,172,000
Outputs	Status¹	Remarks
Effective workforce planning and efficient staff recruitment maintained, with due regard for geographical representation and gender balance.	Completed	- 78 vacancies (core and non-core) announced and over 8,300 applications received. - Out of 90 core posts, 85 are filled or under recruitment (77 filled and 8 under active recruitment).

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		<ul style="list-style-type: none">- The 77 staff are from 43 nationalities out of which 49% are women and 51% are men.
Effective utilisation of resources through finance and budgetary management, in line with IRENA regulations and procedures.	Completed	<ul style="list-style-type: none">- Financial Statements for 2017 and 2018.- Unqualified external audit.
Efficient support to programme implementation, including procurement, travel and general services, compliant with IRENA rules, regulations and procedures.	Completed	<ul style="list-style-type: none">- Annual Agency-wide procurement plan.- Travel and mission planning.
The use of ICT tools and services to improve organisational effectiveness and staff productivity.	Completed	<ul style="list-style-type: none">- Implementation of the Oracle ERP followed by system stabilisation and enhancement.- New developments and enhancements in IRENA website and platforms.

Overview of Programmatic Activities Funded by Voluntary Contributions

Centre of Excellence for Energy Transformation		
Contribution	Project	Selected Outputs
Belgium (Government of the Walloon Region)	Nationally determined contributions: NDC Facility and NDC Partnership	<ul style="list-style-type: none"> - <i>National Renewable Energy Targets: A Global Quantified Estimate.</i> - Country-level review of RE in NDCs and support within the NDC Partnership. - Talanoa dialogue. - The briefing note <i>Renewable Energy in National Climate Action</i> published at COP24. - NDC progress paper for COP25 (December 2019) - A study on renewable energy for adaptation and building resilience.
Belgium (Government of the Walloon Region)	Off-grid application solutions and decentralised solutions in remote setting	<ul style="list-style-type: none"> - The International Conference on Renewable Energy Solutions for Healthcare Facilities, November 2018. - Support to the international conference “Clean Energy for Health Care” (in partnership with UN Foundation, WHO, SEforAll, UNDP, UK Aid, and ESMAP), Nairobi, Kenya, April 2019. - Support to the Decentralised Health and Sustainable Energy Conference (in partnership with SELCO Foundation, UN Foundation, IKEA Foundation and others), Bangalore, India, December 2018 - Partnership with WHO, UNDP and other actors in the framework of Health and Energy Platform of Action - Contribution to the preparation of the Action brief of the Health and Energy Platform of Action, prepared by WHO and UNDP in co-operation with IRENA, and published by UNDESA in 2019.
Denmark	REmap Southeast Asia and two REmap country analysis	<ul style="list-style-type: none"> - Renewable energy roadmap and analysis for the Southeast Asia region, as well as a detailed REmap analysis for two countries in the region.

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European Commission	REmap for Central and Southeast Europe (CESEC)	- REmap CESEC.
Denmark, Germany	Long-term energy planning	- Wider adoption of long-term model-based energy scenarios promoted by CEM Campaign.
European Commission	REmap European Union Study	- Renewable Energy Prospects for the European Union, Brussels, February 2018.
Germany	Role of investments and innovation in the global energy transition Global Energy Transformation (GET) Report 2019.	- 2018 edition of <i>Global Energy Transformation: a roadmap to 2050</i> , Berlin, April 2018. - 2019 edition of <i>Global Energy Transformation: a roadmap to 2050</i> , Berlin, April 2019.
Germany ²³	Energy Solutions for Cities of the Future	- Urban best practices, technology solutions, and economic aspects and global analytical report and case studies in selected cities in China, Costa Rica, and Uganda. - <i>Innovation Outlook: Smart Charging for Electric Vehicles</i> , May 2019 - Energy Transition Strategy for Zhangjiakou City of China - Energy Transition Strategy for Wuzhong District of Suzhou City, China - Technical Guidelines for Renewable Heating and Cooling Systems
Germany	Energy Transition	- Framework for storage valuation.
Germany	Renewable Energy Auctions	- Renewable energy auctions – update.
Germany, Japan	Roadmaps on RE grid and electricity storage and research work focusing on quality of renewable technologies	- Framework for storage valuation.
Japan	Research activities on RE and hydrogen	- Hydrogen from renewable power: Technology outlook for the energy transition, September 2018. - Follow up report on hydrogen presented at the second hydrogen ministerial, 25 September 2019

²³ International Climate Initiative (IKI) of the German Government.

Japan	Report for the Climate Sustainability Working Group at the 2019 G20 Osaka summit under the Japanese Presidency	- <i>Climate change and renewable policy – national policies and the role of communities, cities and regions.</i>
Japan	NDC / climate related work, especially for market mechanisms	- Market-based mechanisms research focused on Southeast Asia and Europe.
Japan	Quality of renewable technologies: Cost and reliability of renewable energy in harsh operating conditions	- <i>Impact of extreme weather conditions in PV and onshore wind (2020).</i>
Japan	Bioenergy	<ul style="list-style-type: none"> - Bioenergy co-operation group formed with participation of the Biofuture Platform, Global Bioenergy Partnership, IEA Bioenergy, SEforAll Bioenergy Hub, World Agroforestry Centre, World Bioenergy Association, and other multilateral bodies. - International Workshop: Sustainable Rural Bioenergy Solutions in Africa - <i>Sustainable Rural Bioenergy Solutions in Sub-Saharan Africa: A collection of good practices</i>, January 2019.
Norway	Voluntary core contributions in support of WPB and MTS	<ul style="list-style-type: none"> - 4th IOREC Conference, Singapore, (31 October-1 November 2018) - Contribution to the organisation of the International Conference on Renewable Energy Solutions for Healthcare Facilities, 2 Nov. 2018.
Norway	Voluntary core contributions in support of WPB and MTS	<ul style="list-style-type: none"> - Renewable energy roadmap (REmap) and grid flexibility analysis (Flextool) for the Central America region. - Country-specific flexibility assessments ongoing for Republic of Moldova as follow-up to the RRA analysis - Country-specific flexibility assessments ongoing for the Hashemite Kingdom of Jordan as part of the RRA process.
Sweden	Innovative solutions to enable 100% renewable electricity systems	<ul style="list-style-type: none"> - Detailed scoping work and data gathering. - Series of workshops to share country experiences.

Global Voice of Renewables		
Contribution	Project	Selected Outputs
Denmark	Long-term energy planning	<ul style="list-style-type: none"> - Socio-economic benefits of RE deployment. - The Clean Energy Investment Coalition. - <i>Transforming the Energy System – and holding the line on rising global temperatures</i>, September 2019.
Germany	Solar PV and onshore wind cost and outlook for competitiveness to 2025 for G20 countries	<ul style="list-style-type: none"> - Database of fossil fuel-fired power plant investment costs, efficiency and fuel costs. - Solar & Wind Cost Reduction Potential in G20 Countries to 2030 in G20.
Germany ²⁴	Renewables in buildings and industry: Heat Pump costs and performance, and flexibility potential to 2030	<ul style="list-style-type: none"> - Flexibility potential from power-to-heat and strategies to enable further VRE deployment in the power sector. - <i>Renewables in the Building Sector: Heat Pump Costs and Performance</i>.
Germany	Measuring renewable energy benefits	<ul style="list-style-type: none"> - Second edition of the report <i>Renewable energy benefits: Measuring the Economics</i>, January 2019.
Italy, UAE	Primal Sonic Visions	<ul style="list-style-type: none"> - <i>Visions of Sustainability at the Venice Biennale</i>, May 2018.
Japan	Quality of renewable technologies	<ul style="list-style-type: none"> - <i>Solar PV costs in Japan: Opportunities for Cost Reduction</i>.
Japan	NDC/climate related work, especially for market mechanisms	<ul style="list-style-type: none"> - A study on the role of market-based mechanisms (e.g. carbon markets, taxes and credit trading schemes) in meeting NDC renewable energy targets.

²⁴ International Climate Initiative (IKI) of the German Government.

Network Hub		
Contribution	Project	Selected Outputs
Denmark	Long-term energy planning	<ul style="list-style-type: none"> - Enhanced South-South co-operation on long-term energy planning. - Capacity-building on long-term planning and support for the development of a masterplan for Cameroon.
Denmark, Japan	Long-term energy planning / Support to the ASEAN region	<ul style="list-style-type: none"> - Workshop “Accelerating Investment in Southeast Asia” was conducted in conjunction with ASEAN Renewable Energy Subsector Network Annual Meeting, Vietnam, May 2019.
France, Iceland, Japan, Switzerland	Global Geothermal Alliance	<ul style="list-style-type: none"> - IRENA publication <i>Accelerating geothermal heat adoption in the agri-food sector</i>, January 2019. - Pilot project to inventory and classify geothermal fields in the Caribbean Islands, Ethiopia, Indonesia (in progress, jointly with World Bank and IGA). - Technical data gathering and classification sessions completed in: <ul style="list-style-type: none"> o Indonesia, March 2018, o Caribbean Islands, December 2018, and o Ethiopia, February 2019. - Geothermal Market Assessment report in East Africa.
France, Germany ²⁵ , Japan, Netherlands, Norway, UAE	Support for IRENA’s SIDS Lighthouses Initiative	<ul style="list-style-type: none"> - High-Level Roundtable on SIDS Lighthouses Initiative 2.0, September 2018. - High-level meeting on the margins of the S.A.M.O.A. Pathway review, September 2019. - Project Navigator Workshops for Pacific and Caribbean SIDS, 15-19 October 2018. - Pacific regional workshop for the capacity building of national banks and financial institutions, Suva, Fiji, 22-23 November 2018.

²⁵ International Climate Initiative (IKI) of the German Government.

		<ul style="list-style-type: none"> - Caribbean Workshop on Renewable Energy in Small Islands Developing States: How to strengthen resilience and accelerate renewable energy deployment, Aruba, 26-28 November 2018. - Workshop on capacity building for preparation of bankable concept notes for green climate fund and mobilisation of private sector finance, Male, Maldives, 28-31 January 2019. Tokyo, Japan 26 -30 November 2019. - Capacity building on the design of bankable power purchase agreements for the Pacific SIDS with the Pacific Power Association (PPA), International Finance Corporation (IFC) and the Pacific Center for Renewable Energy and Energy Efficiency (PCREEE), 25-29 November 2019, Nadi, Fiji. - Pacific Islands Renewable Energy Statistics Training, 22 – 24 October 2019 Nadi, Fiji - Caribbean Renewable Energy Statistics Training, 27 – 29 November 2019, Bridgetown, Barbados - Caribbean regional workshop for the capacity building of national banks and financial institutions for bankers Santo Domingo, Dominican Republic, 25-28 November 2019
Germany	Corporate Sourcing of Renewable Energy	<ul style="list-style-type: none"> - Thematic discussions on corporate sourcing of renewables and its enabling environment at the sixteenth meeting of the IRENA Council in November 2018. - Lead-author of corporate sourcing of renewables Chapter in the REN21 Global Status Report 2018. - Dissemination (keynote presentations) and outreach at: <ul style="list-style-type: none"> o EU Sustainable Energy Week in Brussels o REsource conference in Amsterdam o Accelerating Corporate Clean Energy Procurement in Emerging Markets event at the margins of the Climate Summit in San Francisco o RECs conference in Amsterdam.

Germany ²⁶	Energy Solutions for Cities of the Future	<ul style="list-style-type: none"> - Capacity Building on the Integration of Low-Temperature Renewable Energy Sources into District Heating and Cooling Systems, Serbia, December 2019. - Guidebook on the integration of low temperature renewable energy sources in district heating and cooling networks in the urban setting (Q1 2020).
Japan, Sweden	Biomass related analysis	<ul style="list-style-type: none"> - Sustainable Rural Bioenergy Solutions in Sub-Saharan Africa: A collection of good practices. - Sustainable harvest: Bioenergy potential from agroforestry and nitrogen-fixing wood crops in Africa. - Sugarcane bioenergy in Southern Africa: Economic potential for sustainable scale-up. - Bioenergy from boreal forests: Swedish approach to sustainable wood use.
Norway	Voluntary core contributions in support of WPB and MTS	<ul style="list-style-type: none"> - Suitability analysis of solar and wind development mapping, zoning and training workshops in the Arab region.

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Source of Advice and Support		
Contribution	Project	Selected Outputs
Belgium (Government of the Walloon Region)	Off-grid application solutions and decentralised solutions in remote setting	<ul style="list-style-type: none"> - IRENA/UNHCR collaboration for assessment of energy usage, RE solutions, and recommended delivery models in four refugee settlements in Ethiopia and Iraq (in progress). - SADC RE Entrepreneurship Support Facility regional meeting, Namibia, October 2018.
Belgium (Government of the Walloon Region), Japan, Norway	Project facilitation / Voluntary core contribution in support of WPB and MTS	<ul style="list-style-type: none"> - Site assessments in Comoros, Eswatini, Mali, Morocco, Nauru, Nigeria, Sudan, Togo, Zambia and Zimbabwe to evaluate the technical and financial pre-feasibility of 104 sites earmarked for solar PV and wind energy project development. - Development of the Agency's strategy to support hydropower resource assessment. - 27 investment-readiness assessments completed for renewable energy projects, and 1 virtual financial matchmaking event organised for the Latin America region (21 projects and 14 financial institutions were hosted). - Suitability mapping for wind / solar PV potentials in MENA.
Denmark	Long-term energy planning	<ul style="list-style-type: none"> - RE Outlook for Malaysia in progress.
France	The Global Geothermal Alliance	<ul style="list-style-type: none"> - Application of the UNFC-2009 geothermal specification applied on a pilot basis in Indonesia (March 2018), a cluster of Eastern Caribbean states (December 2018) and Ethiopia (February 2019) on a portfolio of selected geothermal fields as part of the training exercise. Draft reports of the classification for selected sites are currently under preparation together with maps of vertical subsurface thermal profiles generated for the pilot countries.
Germany ²⁷	Support for IRENA's SIDS Lighthouses Initiative	<ul style="list-style-type: none"> - Grid integration and power system operation support for Vanuatu, Fiji and Dominican Republic.

²⁷ As part of the International Climate Initiative (IKI) of the German Government.

		<ul style="list-style-type: none"> - Development of a Project Navigator Training-of-Trainers (ToT) module for SIDS Project Stakeholders (Q4 2019). - A five-day technical workshop on Project Navigator with contribution from international experts from the industry presenting applications of island renewable energy projects in SIDS to identify key enablers for the successful replication in the Indian Ocean Islands. November 2018.
Germany ²⁸	Energy Solutions for Cities of the Future	<ul style="list-style-type: none"> - Review of Urban Energy System Planning Tools as part of the knowledge framework for identifying renewable energy options for cities. - Developed database of cities with high renewable energy resource, targets and installed power plants as part of the knowledge framework for identifying renewable energy options for cities. - Innovation Outlook on Smart Charging for Electric Vehicles as part of the knowledge framework for identifying renewable energy options for cities. - A methodology report to support the demonstration of Solar City Rooftop Simulators in two cities from developing countries was released in January 2019. - SolarCityEngine, a rooftop solar PV simulator for the city of Kasese in Uganda has been built. Software to be launched. - Strengthening of the sector-coupling approach to facilitate the integration of variable renewable sources into the urban energy systems. - A 3-Dimensional rooftop footprint for the city of Zhangjiakou, China is being developed. Software of the simulator to be launched. - Case studies on cities' policies promoting renewable energy deployment in three countries (focused on two cities each in China, Costa Rica, and Uganda) are being completed for release in early

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		<p>2020, along with policy guidelines to provide sectoral policy instruments for cities.</p> <ul style="list-style-type: none"> - Training webinar on the integration of low-temperature renewable energy sources in district heating and cooling in cities (Q4 2019). - Technical Concept Guidelines for Renewable Heating and Cooling systems for Cities as part of the knowledge framework for identifying renewable energy options for cities. - Review of integration of renewable energy systems in urban forms as part of the knowledge framework for identifying renewable energy options for cities.
Germany ²⁹ , Norway	Voluntary core contributions in support of WPB and MTS	<ul style="list-style-type: none"> - Technical workshop on project development and financing for Caribbean and Pacific SIDS stakeholders during IPS Connect 2018, November 2018.
Norway	Voluntary core contributions in support of WPB and MTS	<ul style="list-style-type: none"> - Energy planning training courses in Sierra Leone, Aug-Sep 2018. - Support to Sierra Leone for the preparation of a national Energy Masterplan (ongoing). - Risk Assessment and Mitigation Platform (RAMP). - RRA Bhutan, December 2019 - RRA Republic of Moldova, February 2019. - Post-RRA engagement with Republic of Moldova: power system dispatch analysis for 2021, 2023 and 2030 conducted. - RRA El Salvador - RRA Jordan with FlexTool component (forthcoming). - Grid integration studies / site assessments in Mozambique. - Grid integration studies and power system operation support for the island of Loganville (Vanuatu), Viti Levu (Fiji) and Dominican Republic. - Regional project facilitation technical training workshop on the development of bankable solar energy projects in the region, Brunei Darussalam, August 2019.

²⁹ International Climate Initiative (IKI) of the German Government.

		- Additional suitability assessment underway through mapping, zoning and trainings for 22 Arab countries under the PACE initiative.
UAE	IRENA/ADFD Project Facility	- Sixth project cycle. - Seventh project cycle.

International Co-operation and Strategic Engagement		
Contribution	Project	Remarks
Denmark	Long-term energy planning	- Support for the UNSG Climate Summit energy track work.
Germany, Netherlands, Norway, UAE	Geopolitics of the energy transformation	- Global Commission on the Geopolitics of Energy Transformation launched in January 2018; four meetings of the Commission completed. - The Global Commission Report, <i>A New World: The Geopolitics of the Energy Transformation</i> , launched at the margins of the Ninth Assembly, January 2019. Ongoing dissemination