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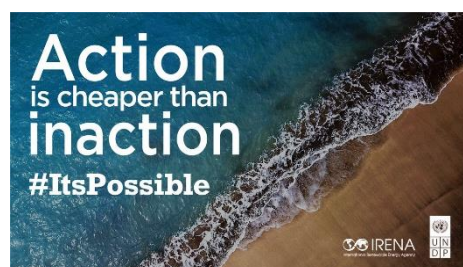
**Annual Report of the Director-General
on the Implementation of the
Work Programme and Budget for 2018-2019**

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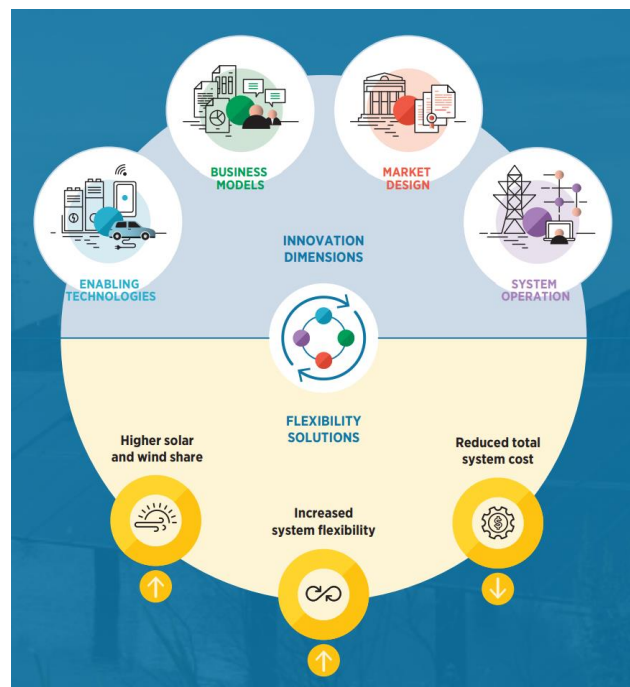
I. Introduction

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 October 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 cooperation 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 the global energy systems, as requested by Members in the Medium-term Strategy for 2018-2022. This mission is of high relevance as countries are actively pursuing pathways that effectively channel the energy transition to deliver a future energy system that is secure, sustainable, affordable, and inclusive.
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 reduction. Current national plans and investment patterns, however, show a stark mismatch with the pathway to hold the line at 1.5°C. In the report, *Transforming the energy system – and holding the line on rising global temperatures*, IRENA analyses current plans and how 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.
4. 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 climate-proof systems and flow into an energy system that prioritises renewables, efficiency, and associated infrastructure. With USD 15 trillion added to the total investment, the global energy system in 2050 could be largely climate-proof. Building such a future 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.
5. Significant progress in deployment of renewables has been made to date. According to the latest IRENA renewable energy generation statistics, 171 gigawatts (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 gigawatts (GW), constituting over 33% of the total power-generating capacity. Increased renewable generation can be in great part attributed to the declining costs of key



renewable energy technologies, especially in solar and wind. 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 fossil-fuel option, without financial assistance. 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. As the ongoing energy transition is not a fuel replacement, but a transformational change of the current system, it is important to have an inclusive process that leaves no one behind.

6. While change is underway, it is not happening fast enough. Achieving an energy system that meets global development and climate objectives requires acceleration of deployment and rapid innovation in technologies and business models that spans many sectors and facets of the economy. IRENA's report, *Innovation landscape for a renewable-powered future*, shows that in a scenario compatible with the Paris Agreement, variable renewable energy (VRE) technologies, particularly solar PV and wind power, play a central role in the energy transition. VRE capacity continues to lead, 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 will have far reaching implications for the configuration and operation of both energy systems and the roles of all actors involved.



The transformation of the power sector requires innovation across the whole sector

7. 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*. 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. As one of the UN-appointed co-custodians (together with IEA, UNSD, World Bank and WHO) for the tracking of SDG 7, IRENA was the lead author of the renewable energy chapter of the *Tracking SDG 7: Energy Progress Report 2019*, released in May 2019.
8. 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. 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.
9. As the Agency’s direction is shifting close to the ground, it is forging partnerships to realise change at the pace and speed necessary for the energy transition. With this in mind, and to further solidify a supporting network, IRENA is developing Memoranda of Understanding (MoUs) with key organisations. MOUs will enhance cooperation with international organisations and governments and ramp up efforts to promote the accelerated development and deployment of renewables and promote its 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.



IRENA Director General speaks at the UN Climate Summit, New York City, September 2019, along with H.E. Mr. Ibrahim Mohamed Soli President of Maldives, H.E. Mr. Allen Michael Chastanet, Prime Minister of Saint Lucia, H.E. Mr. Tommy Esang Remengesau Jr., President of Palau, and H.E. Ms. Mia Amor Mottley, Prime Minister of Barbados

10. 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

11. 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

12. 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 showed that renewable energy, electrification, and energy efficiency form the basis for long-term decarbonisation and low-carbon development with positive socio-economic outcomes. It concludes that the energy transition can enable economic growth, create jobs, and improve overall social welfare. GET 2019 edition is complemented by a background report, a web-based digital story, an online interactive dashboards and regional data for key REmap energy indicators. The background report, *Global Energy Transformation: The REmap Transition Pathway*, 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.

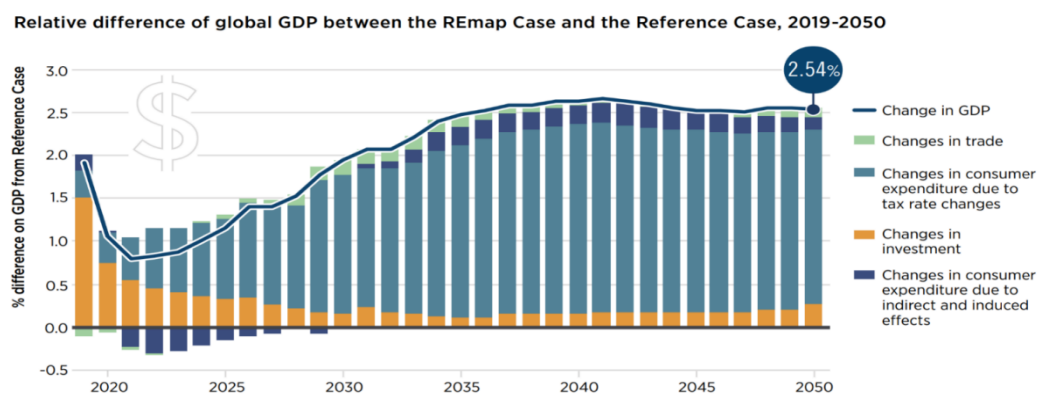


Figure 1: Compared to the Reference Case, the REmap Case boosts global GDP by 2.5% in 2050. The dominant factor is changes in consumer spending due to tax rate changes².

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

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.

13. Based on the *GET 2019* analysis, two technology roadmaps: *Global Energy Transformation: Future of the Wind Market* and *Global Energy Transformation: Future of the Solar PV Market* are currently under development and will be published by the end of 2019. The roadmaps explore the prominent role of wind and solar PV technologies in accelerating the global transition to 2050 and provide more details on the deployment pathways of wind and solar PV with insights on cost reductions, technology trends and other aspects that touch on the need to prepare future grids to integrate rising shares of wind and solar PV power.
14. 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). 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 Program 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.
15. 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.
16. 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 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



Figure 2: First Regional Workshop: Renewable Energy Roadmap and flexibility analysis for Central America, Panama, September 2019

and Central and South East Europe, respectively supported by voluntary contribution 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.

17. IRENA continues to disseminate best practices in **long-term planning** and modelling to represent high shares of VRE, as highlighted from 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. 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.
18. IRENA also continues to translate its analysis into consumable information for its stakeholders through, in part, 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 **Clean Energy Ministerial (CEM) Campaign** on ‘Long-term Energy Scenarios for Clean Energy Transition’ (*LTES campaign*) has led to a broadened community where Campaign Members from 11 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 – which together have reached over 400 expert attendees. To expand engagement beyond CEM countries, IRENA launched a ‘**Long-term Energy Scenarios Network**’ (LTES-Net) to support exchange of best practice. 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.



Figure 3: “Long-term Energy Scenario (LTES) Campaign: 2019 International Forum” in Berlin, Germany, 10-12 April 2019

19. To provide Members with more detailed analysis of key emerging issues related to energy transformation, IRENA also develops targeted **Analytical Briefs**. 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*. An analytical

³ Brazil, Canada, Chile, Denmark, Finland, Germany, 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).



brief is also under development on the challenges and solutions to support 100% VRE-based operation in power systems. The report will discuss the meaning, relevance, and technical solutions of 100% renewable energy and 100% VRE concepts in the context of achieving policy and climate change goals to establish a bridge between the technical and policy worlds. It will build on the recently released white paper from the IRENA Coalition for Action that mapped global 100% renewable

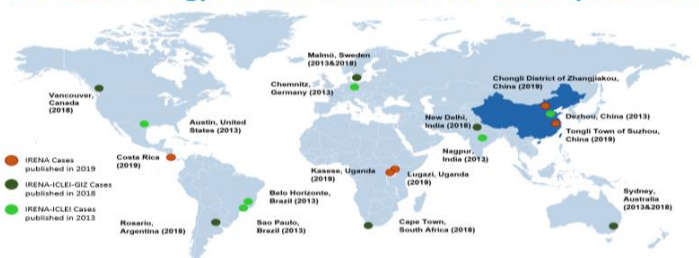
energy targets and case studies at regional, national, city, and island levels. This work is linked to and complemented by an IRENA project to explore how systemic innovation solutions can assist countries in achieving high or 100% renewable power objectives, work of which is supported by a voluntary contribution from the Government of Sweden. This work includes a series of workshops to exchange experiences, challenges, and good practices between high ambition countries. A study will also be developed on the potential role of innovations solutions in Sweden's plan to achieve 100% renewable power by 2040.

20. 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 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).
21. 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. Analysis reveals the national needs and contexts that shape and influence municipal-level action in the three selected countries and examines opportunities, challenges, and successes in the case study cities. It presents conditions common to all cities while also highlighting location-specific circumstances.⁵
22. IRENA has undertaken 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

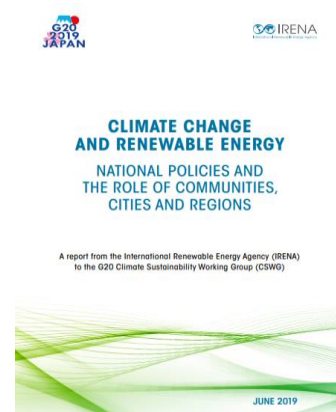
⁵ This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

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 systems⁶.

Renewable Energy and Cities: Case Studies and Policy Guidelines



23. 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*. 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.



24. To support the transformation of power systems with higher shares of renewables, IRENA developed enabler models in its official power system software DigSILENT PowerFactory. This software allows the analysis of the impact of VRE sources and identifies probable enabler solutions that may be used to overcome the technical constraints of VRE. These tools are provided to Members for modelling the grid and conducting stability assessment studies.

Access Solutions

25. 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.

⁶ 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.

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. IRENA is currently carrying out an analysis of the global financing landscape for off-grid renewable energy and the socio-economic impacts of universal energy access.

26. 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 IOREC. 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 SDG7 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.
27. 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 Energy Sector Management Assistance Program (ESMAP), Sustainable Energy for All (SEforAll), UNDP, UN Foundation, UK Aid, WHO) held in Nairobi, Kenya, in April 2019, and the "Decentralised Health and Sustainable Energy Conference" (organised in partnership with IKEA Foundation, SELCO Foundation, and UN Foundation, among others), held in Bangalore, India, in December 2018.

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. It presented key findings and recommendations from 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.



⁷ <https://iorec.irena.org/>

Accelerating Innovation

28. Engagement of stakeholders is of high relevance for all aspects of IRENA's work; also exemplified in the field of innovation. IRENA launched the report titled *Innovation Landscape for a Renewable-Powered Future: Solutions to integrate variable renewables* in Brussels, Belgium in February 2019 at an official launch event hosted by the European Commission. The report contains a first-of-a-kind mapping and toolbox of innovations to support countries in their strategies to transform their power sectors. The report showcases how synergies between different innovations in business models, market designs, enabling technologies, and system operations are 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. Since, the report was widely disseminated.
29. The report shows that a paradigm shift involving the re-design of power system setups making them fit for a renewable energy-based energy system is needed. Building on its assessment of the transition implications for electricity markets, results of which are found in *Adapting Market design to high shares of Variable Renewable Energy* (May 2017), IRENA continues to provide insights on the transition requirements. In this context, the Agency is finalizing the policy brief on *Power system setup for an integrated and renewable energy-based energy system* that frames some of the concepts and challenges to be addressed to align power system structures with renewable energy systems.
30. IRENA continues to analyse auctions globally and disseminate lessons learned and best practices in their design and implementation. The latest report, *Renewable Energy Auctions: Status and Trends Beyond Price*, 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. 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).
31. 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 from voluntary contributions from the Government of Germany.⁸ The World Bank Group requested IRENA to share knowledge on EV smart charging with its global staff. In response, IRENA conducted a virtual workshop with World Bank staff on the analysis in June 2019. After the release of IRENA's report *Innovation Outlook: Smart Charging for Electric Vehicles*, the Government of Luxembourg has 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 gathered for the first time ever key stakeholders from all sectors involved such as car manufacturers, electricity market players and e-mobility actors fostering intersectoral cooperation networks.

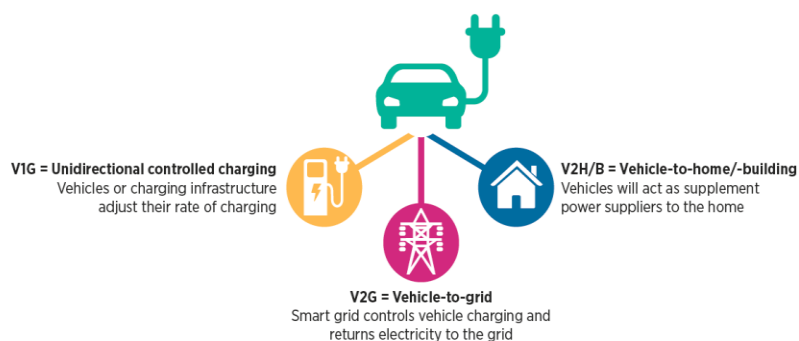
⁸ This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

32. 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 identifies best practices in the adoption of policies to transition to renewable heating/cooling in different contexts (e.g., fossil-fuelled to renewable based district heating and cooling, gas grid to modern renewables for space and water heating, traditional biomass to modern renewables for space heating and cooling, water heating and cooking, the energy poverty context, etc.). The findings of the report will be presented at the tenth IRENA Assembly.

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 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.

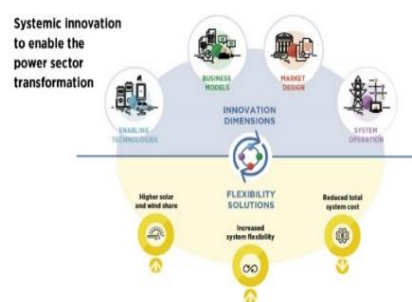


IRENA's report, *Innovation*

Outlook: Smart Charging for Electric Vehicles, 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 Landscape for a Renewable-Powered Future

Decarbonising the global power sector in line with Paris Agreement objectives will require an 85% share of renewable energy in total electricity generation by 2050, according to *GET 2019 edition* estimates. By then, variable renewables would account for 60% of the total power generated globally. Moving to a new phase where the massive, but cost-effective, scale-up of renewable power is crucial, the power sector transformation is strongly accelerated by innovation trends in digitalisation,



decentralisation, and electrification of end-use sectors. Thus, understanding and learning from experiences from leading countries in VRE integration is crucial to replicate and enhance innovation that can accelerate this transformation.

IRENA's report, *Innovation Landscape for a Renewable-Powered Future: Solutions to integrate variable renewables*, contains the most in-depth assessment of the power sector transformation to date. It guides countries on how to build solutions to transform their power system fostered by synergies between different 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.

33. In January 2018, IRENA and the Climate Policy Initiative (CPI) launched their first joint report, *Global Landscape of Renewable Energy Finance 2018*, 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). Building on this, new analysis is being undertaken on mobilising institutional capital for renewable energy. Institutional investors (i.e. pension plans, insurance companies, sovereign wealth funds, and endowments/foundations) are estimated to hold well over USD 100 trillion of assets yet have directly financed only about 1.5% of new renewable energy projects. Analysis 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 will contain analysis on barriers to greater participation of institutional investors and provide actionable recommendations to policymakers to tap into this important capital pool.
34. Decentralised renewables hold great importance for 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 and will inform 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.
35. IRENA presented innovative solutions for the investments in transmission infrastructure that can support variable renewable energy by the private sector at a workshop organised by the Africa Renewable Energy Initiative (AREI) in Cairo, Egypt, on 21-22 August 2019.

IRENA Innovation Day Uruguay and Thailand

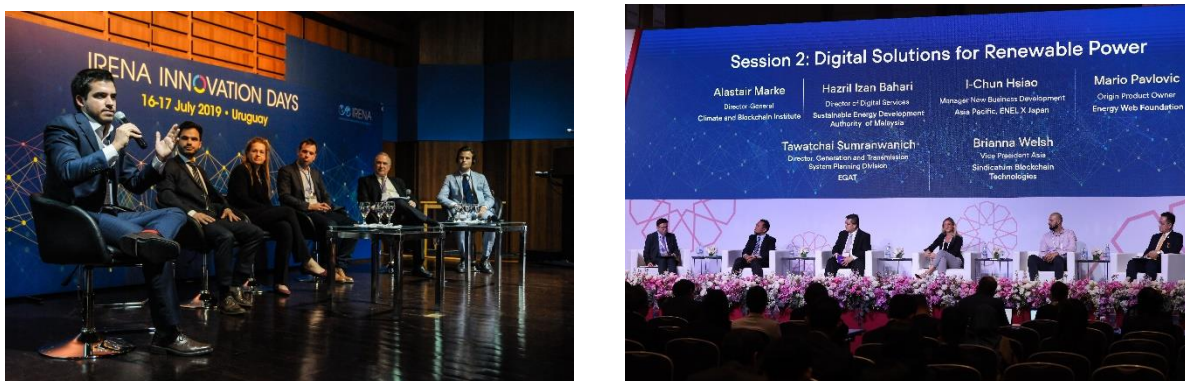


Figure 4: Innovation Day, Uruguay (left) and Thailand (right)

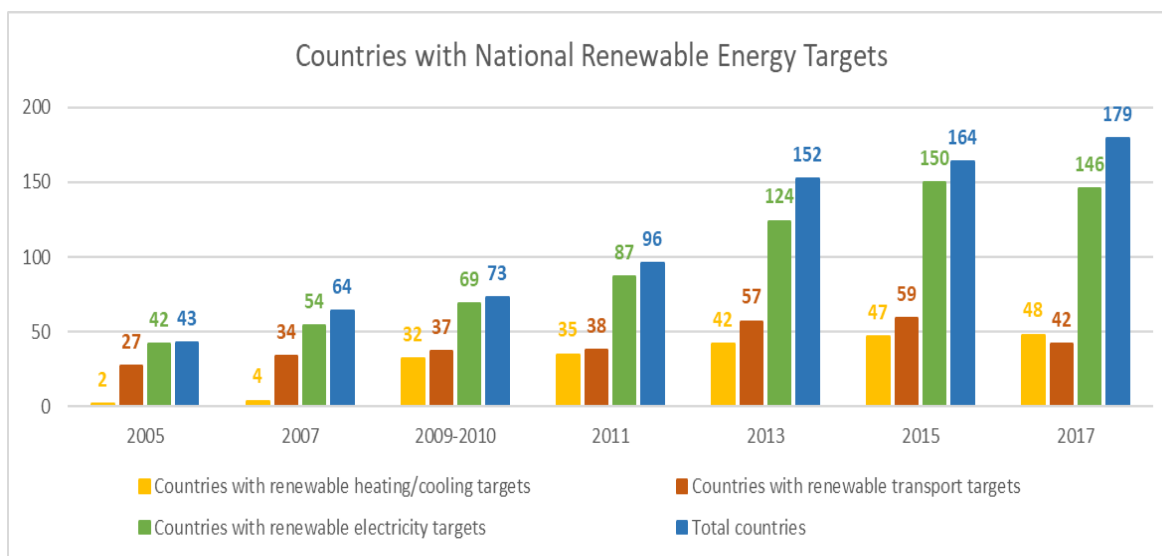
The accuracy of IRENA’s analyses investment trends, identifies unutilised opportunities and helps lower investment barriers through its many practical initiatives and platforms. After the release of IRENA’s report, *Innovation Landscape for a renewable-powered future*, some Members have requested the Agency to organise region-focused events on the implementation of this innovation toolbox tailored to their context. In response, the Agency is organising a series of regional IRENA Innovation Days. Two Innovation Days have been conducted in 2019: Uruguay for the South American region and Thailand for the Southeast Asia region.

The Innovation Days have connected more than 150 stakeholders each, including industry experts and policy-makers, showcased emerging technology-driven innovations, and inspired and informed the broader and faster uptake of innovation solutions that can help deliver a renewable-powered future. These events followed a similar format to and build on the two IRENA Innovation Week organised in 2016 and 2018 in Bonn, but with a focus on sharing insights and experiences of the particular needs of countries in the region.

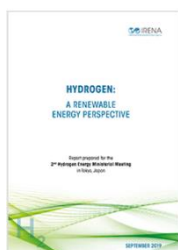
Knowledge Hub

36. 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 will contribute to the Agency’s discussions in preparation for and during the 2019 Climate Action Summit hosted by the UN Secretary-General, and COP25 in Chile.

37. Examining additional opportunities for strengthening such targets, IRENA has started working on two studies on 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. IRENA's research 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.



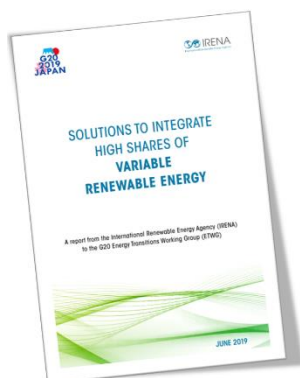
Hydrogen



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.

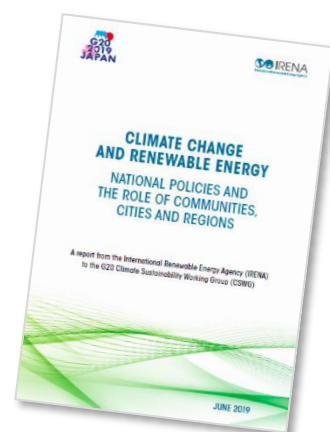
In this context, IRENA prepared a report for the 2nd Hydrogen Energy Ministerial Meeting in Tokyo, Japan which examines the potential of hydrogen fuel for hard-to-decarbonise energy uses, including energy-intensive industries, trucks, aviation, shipping and heating applications. But the decarbonisation 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.

Agency engagement with G20 in 2018-2019



The Agency continues to engage with G20 Presidencies. As part of this engagement, IRENA was requested by the 2019 Japanese G20 presidency to conduct analysis on solutions to integrate high shares of variable renewable energy. The resulting report, *Solutions to Integrate High Shares of Variable Renewable Energy*, summarises the current state and outlook of solutions to integrate high shares of VRE resources, such as solar and wind, in power systems and outlines the means by which innovative solutions can increase power system flexibility across the whole value chain. Japan also requested IRENA to document the innovations and best practices for the integration of VRE. Experiences all point to a more even distribution of flexibility across the power sector, not focusing solely on supply as was done in the past.

Following a request from the Ministry of Foreign Affairs of Japan, IRENA produced a report entitled *Climate Change and Renewable Energy: National Policies and the Role of Communities, Cities and Regions* in June 2019 and participated in the discussions of the G20 Climate Sustainability Working Group (CSWG) and the G20 Energy Transition Working Group (ETWG), held in Nagano and Toyama, respectively, in April 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 and underlines that empowering stakeholders constitutes an effective and important action to accelerate the energy transition.



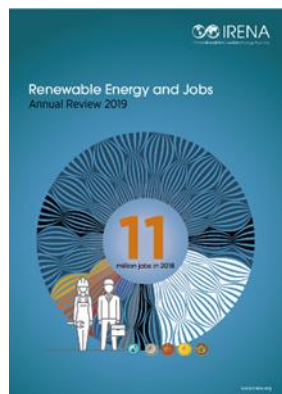
G20 Energy and Environment Ministers called on IRENA for further support to:

- Identify innovative solutions for accelerating renewable energy and energy transitions;
- Integrate of high shares of variable renewable energy;
- Explore of energy efficiency and renewable energy synergies, and impact of energy efficiency on renewable energy;
- Examine strategies for sustainable bioenergy and other forms of renewable energy deployment;
- Increase cooperation on renewable energy; and
- Explore how hydrogen enables clean energy future pathways.

III. Global Voice of Renewables

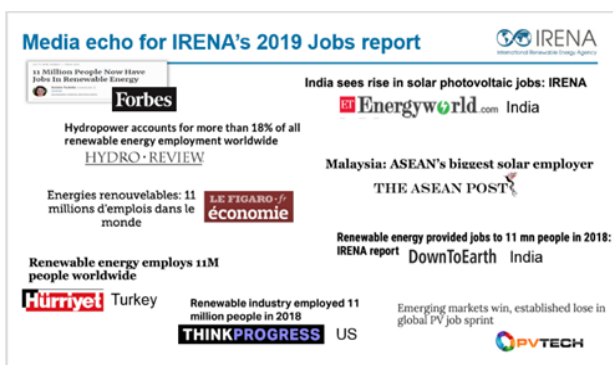
38. As a voice of renewables at the global, regional, and local levels, IRENA works to influence the global energy discourse. Backed by an extensive body of work, IRENA is engaging with its widening global network to communicate the role of renewables in the transformation of the global energy system and amplify their impact.

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*, 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.



Realising Socio-economic Benefits

39. 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.
40. As input to the Ninth Session of the IRENA Assembly, the Agency published a brief titled *Measuring the socio-economic footprint of the energy transition: The role of supply chains*. Insights were derived 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.

41. Complementing its global analysis on socio-economic impacts of renewable energy, IRENA is finalising a report titled *Maximising local benefits of large-scale renewable energy deployment: Insights from sub-Saharan Africa*. The report examines key lessons learned and best practices that can be drawn from regional case studies. With a focus on community-level benefit delivery, the report explores four overarching study lenses: community participation, job creation, skills development, and gender equality. It 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 field visits to wind and solar project sites in the study's region, analysis fills an important knowledge gap and supports policy-making towards a just, fair, and inclusive energy transition.



Figure 5: Plenary panelists
 “Mapping the Transition,” CEEW “Energy Horizons” conference
 New Delhi, India, 19 July 2019

42. 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.

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 6: Promoting affordable and renewable energy for all: The contribution of trade and quality infrastructure to the green transition, Geneva, July 2019

Promoting affordable and renewable energy for all: the contribution of trade and quality infrastructure to the green transition



The ongoing global transition to clean energy, with renewables at its core, calls for closer links between economic growth, environmental sustainability and trade to multiply the benefits worldwide. In this context, the World Trade Organization (WTO) requested IRENA to share its knowledge on how to develop sound quality control and standardisation frameworks to foster global trade of renewable energy technologies. During the July 2019 Global Review of Aid for Trade Conference, IRENA co-organised the event "Supporting Economic Diversification and Empowerment for Inclusive, Sustainable Development Through Aid for Trade" with the WTO.

The session "Promoting affordable and renewable energy for all: The contribution of trade and quality infrastructure to the green transition" drew upon the IRENA report entitled *Boosting solar PV Markets: The Role of Quality Infrastructure*. The session included discussions on how Aid for Trade, enabled by a sound quality infrastructure, can support countries to seize the benefits of the energy transition and opportunities in growing trade in renewable energy. Discussions with a large group of trade negotiators explored how countries can access affordable and reliable renewable energy goods and services, diversifying their economies, and fostering innovation and investment in sustainable energy systems.

Informing Markets

43. IRENA's data and statistics are a trusted reference 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 in fact solar accounted for over half of all funding in 2016.

44. IRENA continues to work with countries to improve their national renewable energy statistics through training and the dissemination of technical information. The latest training workshop was held for West African countries in February 2019 in collaboration with the Energy Commission of Nigeria and Economic Community of West African States (ECOWAS) Centre for Renewable Energy and Energy Efficiency (ECREEE). Two more training workshops are planned for the last quarter of 2019 in Caribbean and Pacific islands.
45. 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*. Data from the reports were made available online and to stakeholders for use as their official statistics (e.g., the IEA and REN21). 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 and wind technologies to 2030 in G20 countries, a report on which is forthcoming. IRENA has also used the cost data to analyse the evolution of energy sector subsidies in the energy transformation, based on the REmap cases to 2050 (report forthcoming).

Amplifying Impact

46. IRENA continues to strengthen its communication and outreach activities. 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.
47. IRENA's website visitors grew by 60% in 2018 and a further 29% in 2019, with the website registering over 1.1million 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 publication pages were accessed by 35% of all irena.org users and have been downloaded about 1.3 million times in the biennium to date.
48. IRENA has continued using social media 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

49. 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 analyses, support peer-to-peer exchange and transfer of knowledge and provide targeted advice.

Regional Action Agenda

50. 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 brings together outcomes from different IRENA areas of work, including policy, data and statistics, finance, costs, benefits, potentials, tools, technology brief and roadmaps, and country support.
51. The fifth Renewable Energy Market Analysis focused on Southeast Europe (SEE) (release forthcoming). 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.
52. 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 implement regional agendas and plans for Africa, Central Asia, Latin America, South and Southeast Asia, South East Europe, and Middle East and North Africa.

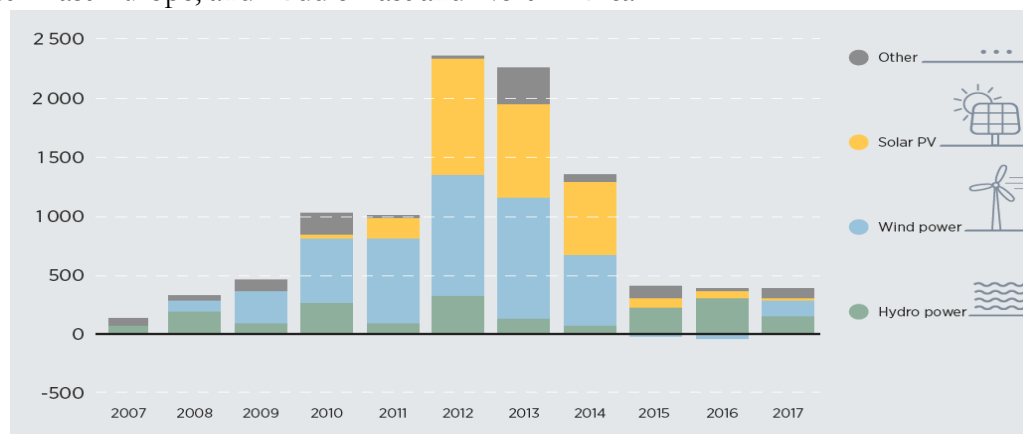


Figure 7: Renewable energy additional capacity, SEE countries, 2007-2017

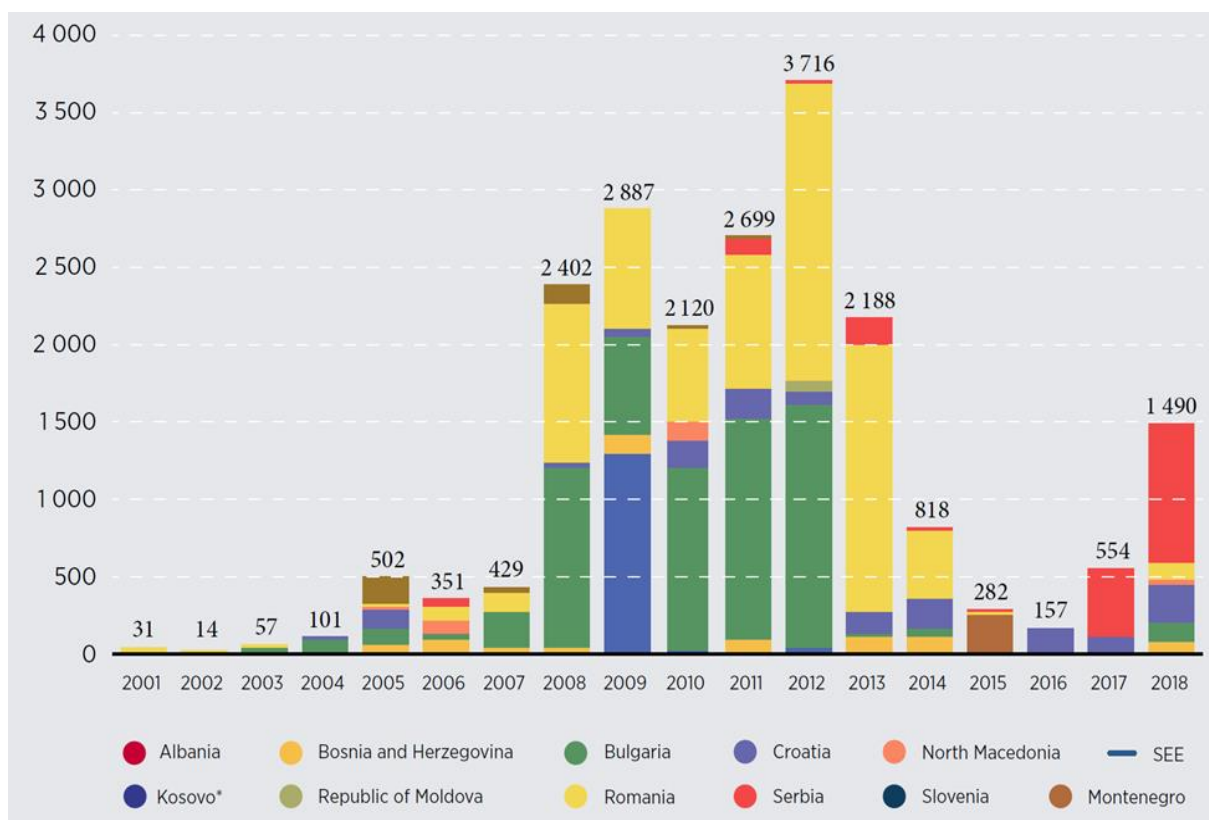


Figure 8: Investment in renewable energy by year and country, SEE, 2001–2018 (USD million)

53. **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. Specifically, inputs focus on the assessment of planning and prospects for variable renewable energy in Eastern and Southern Africa, including country-level resource assessment, 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 that will be finalized this year and will also provide inputs to the update of EAPP and SAPP master plans.
54. The "Second Ordinary session of the African Union Specialised Technical Committee on Transport, Transcontinental and Interregional Infrastructure, Energy and Tourism" (STC-TTIIET), held in Cairo in April 2019, recommended the 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.

55. The Agency is also engaging at a continental level through its membership in the Steering Committee of the Programme for Infrastructure Development in Africa (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 its previous 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, where IRENA suggests potential solar PV and wind capacity and transmission infrastructure projects to be considered under the PIDA process.
56. 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.
57. Following the validation by regional Ministers of energy and environment of the *Economic Community of Central African States (ECCAS) Renewable Energy Roadmap* in November 2018, IRENA has been working closely with the ECCAS Secretariat to organise a Ministerial meeting for the adoption of the Roadmap, which will pave the way to follow-up activities by development partners and IRENA in the region. The Roadmap 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. An ECCAS Ministerial Meeting has been jointly organised by ECCAS, IRENA, and the Gabon government for end 2019 in Libreville where it is expected that the governments of the 11 countries of the region will approve the Roadmap. The event will precede a two-day expert meeting.

IRENA site assessment service

Through IRENA's Site Assessment Service, support has been provided to Eswatini, Mali, Morocco, Nigeria, Sudan, Togo, Zambia, and Zimbabwe to assess the technical and financial pre-feasibility of 95 sites earmarked for solar PV and wind energy project 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 feasibility 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 9: Assessed sites in Africa

58. Upon invitation from the European Commission, IRENA has been involved in the process of the Africa-Europe High-level Platform for Sustainable Energy Investments (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. IRENA is a member of the working group on business models for sustainable investments. Building on input from meetings held in Brussels in April, July and September 2019 and well as in Conakry in June 2019, the working groups will provide recommendations to be adopted by the High-level platform in Johannesburg in November 2019 during the Africa Investment Forum.
59. IRENA also supports the African Renewable Energy Initiative (AREI), hosted by the African Development Bank, and contributed significantly to the workshops held in Chad, the Republic of Guinea and Egypt. The AREI Initiative 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 its analysis and expertise to workshops, themes of which are set by AREI member countries. The Initiative most recently adopted 78 new projects illustrating the end of AREI's Phase I and marking the achievement of the 10 GW by 2020 objective a year ahead of schedule.
60. **Central Asia.** As guided by the Astana Communique on "Accelerating the Uptake of Renewables in Central Asia", IRENA advanced the implementation of the regional action plan through various activities. Most recently, the Agency organised a regional workshop on "Long-Term Capacity Expansion Planning with a High Share of Renewables" in March 2019 in Astana, Kazakhstan. Participants discussed the range of tools and methodologies available to specifically address the improved representation of VRE in long-term planning. Activities benefit from the Agency's expertise in resource assessments and the data coverage of Global Atlas through a geospatial analysis project that will help the central Asian region find suitable zones to plan and develop renewable energy projects.

61. Furthermore, the Agency signed a partnership agreement with the International Green Technologies and Investments Centre (IGTIC) Kazakhstan with the intent to closely work together in the dissemination of information and best practices of renewable energy development and deployment in Kazakhstan and the Central Asia region more broadly.



Figure 10: “Central Asia Workshop on Long-Term Capacity Expansion Planning with a High Share of Renewables”, Astana, Kazakhstan, 14-15 March 2019

62. **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 in Panama, power system operations, and simulation software for VRE integration.
63. 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 training in partnership with GIZ and in collaboration with the Regional Operator Entity (EOR) of Central America for national and regional power system operators. The four-day course featured deep technical discussions on the underlying concepts and parameters of VRE models for grid studies and their specific applications in Central America. A follow-up workshop is under preparation to address challenges and support the capacity building issues identified during the training developed in 2018.
64. 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) during 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 the 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.
65. In December 2018, IRENA participated in the Council of Ministers of Energy of the Central American Integration System (SICA) to present the work that has been 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 the Ministers of Energy of SICA countries to renew the IRENA-SICA Memorandum of Understanding (MoU),

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.

66. Under the scope of the Regional Action Plan for Latin America, the “Regional Workshop on Accelerating Renewable Energy Investments in Latin America” was held on 10-11 September 2019 in Bogota, Colombia. The workshop 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 to accelerate the development of renewable energy projects in Latin America.
67. With a view to supporting the efforts of the countries of Latin America in undertaking the transformation of their energy sector, IRENA 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. This event will take place on 7-8 October 2019 in San Jose, Costa Rica under the framework of the pre-COP meetings.
68. Continuing its support of the regional action agenda, IRENA provides a platform for transfer of knowledge through capacity building workshops. IRENA conducted the workshop “Grid integration and planning technical workshop for the Clean Energy Corridor of Central America”, in El Salvador in December 2018, which was attended by 24 participants from 6 countries. The participants learned how to simulate their power system using the software PSSE and shared best practices on coordinating the operation of the interconnection of the Central America Corridor. A post-training survey was conducted by IRENA with results indicating a higher level of satisfaction of the participants from previous workshops.
69. **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, who 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.
70. During ICIMOD’s high-level workshop “Sustainable Access to Clean Energy for Hindu Kush Himalaya Region” (February 2019), IRENA discussed priority areas for regional collaboration. As a follow-up to the workshop, ICIMOD and IRENA are currently undertaking a scoping exercise to design a targeted regional initiative for promoting renewable energy in the mountain communities of Hindu Kush Himalayas. The initiative will advance the understanding of energy needs in mountain economies and communities and strengthen the economic value chains and the opportunities offered by on- and off-grid renewable energy solutions. It will leverage the work undertaken by ICIMOD in implementing the value chain approach and associated policy

and financing needs, as well as IRENA's work in developing the linkages between renewable energy and livelihoods. The ongoing scoping exercise will lead to a Regional Action Plan, which will act as a call for action for delivering tailored renewable energy solutions for mountain communities that host diverse economic value chains. A regional consultation workshop is planned in Kathmandu, Nepal in November 2019 to discuss the draft action plan with key stakeholders, including government ministries, energy sector practitioners, development partners and other regional stakeholders.

71. **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 ASEAN Renewable Energy Subsector Network 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" in Brunei Darussalam in August 2019. This work is supported by voluntary contributions from the Government of Denmark and Government of Japan.
72. 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. The Agency will continue to participate in energy events of ASEAN Member States, such as the SIEW in October 2019 and Indonesia EBTKE Conex in November 2019.
73. The Danish Ministry of Energy, Utilities and Climate has provided IRENA 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, 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 Renewable Energy Sub-sector Network (RE-SSN) and the ASEAN Centre for Energy (ACE). 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.

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74. **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* report, the latest edition of the series, were presented in addition to preliminary results from Central and South East Europe REmap analysis conducted in the framework of the CESEC initiative.
75. 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.
76. 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* 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.
77. In close cooperation with the European Commission and the Energy Community, IRENA is carrying out a regional 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.
78. In support of the regional action agenda, IRENA provides a platform for sharing best practices and transfer of knowledge through capacity building workshops wherein the operation of power systems with high shares of renewables, the technical constraints to it and practical solutions to the same area discussed. The workshop, “Southeast Europe workshop on planning and operating systems with higher shares of variable renewable energy,” in Austria in November 2018 was organised by IRENA in collaboration with the European Union Energy Secretariat, where system operators were able to discuss and share their experiences in integrating VRE and guidance was provided on the technical constraints of incorporating VRE and mitigation solutions for the same.

79. **Middle East & North Africa.** Following an extensive consultation process, IRENA assessed existing gaps to the implementation of the Pan Arab Clean Energy Initiative (PACE) as outlined in the Agency's Work Programme and Budget 2018-2019. Results indicated the region would benefit from additional detailed resource assessments, particularly for solar and wind. IRENA thus focused on improving resource assessment practice in the Arab region, with solutions to streamline early stage solar and wind market planning by leveraging in-house expertise and its vast access to high quality resource datasets. Work also benefited from IRENA's Global Atlas geospatial analysis which identifies the most suitable areas for solar and wind project planning and subsequent development. Results will increase awareness and clarify market opportunities for new solar and wind generation capacity, including the identification of potentials, such as regional maps, to further renewable energy development. Dissemination of information is conducted in part through sub-regional technical trainings. The project is supported by a voluntary contribution from the Government of Norway.

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. Workshop discussions yielded a wealth of information about current practices and challenges, along with key priorities for the integration of VRE in long-term energy planning and modelling.



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 the 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 sukuk in mobilising investment for renewables.

Collaborative Platforms

80. **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 partners⁹.
81. 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 consultations with experts, formed the basis of the IRENA publication entitled *Accelerating geothermal heat adoption in the agri-food sector: Key lessons and recommendations*¹⁰, launched in January 2019. This work is supported by the Government of France and the Government of Iceland.
82. In support of the scale-up of renewable energy sources in district heating and cooling in cities, IRENA is developing a guidebook for policy-makers to improve knowledge and build capacity. The project is being conducted in partnership with the Aalborg University and in collaboration with a group of practitioners from GGA members and partners. The guidebook will provide insights on options and tools available to facilitate the integration of low-temperature renewable

⁹ **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.

¹⁰ <https://www.irena.org/publications/2019/Jan/Accelerating-geothermal-heat-adoption-in-the-agri-food-sector>

sources such as geothermal energy into district heating and cooling. This project is supported from voluntary contributions from the Government of Germany.¹¹

83. 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 a follow up, IRENA is developing 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.
84. IRENA is one of the founding partners of the Climate Investment Platform (CIP), together with UNDP, the Green Climate Fund (GCF) and SEAll, with strong support of Denmark. 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. IRENA is also one of the founding partners of the Solar Risk Mitigation Initiative (SRMI), together with ESMAP (World bank Group), Agence Francaise de Developpement (AFD), and the International Solar Alliance (ISA). SRMI will support policies that facilitate investment in solar energy, develop risk mitigation products and innovative tools to attract investments in solar projects.

Renewable Energy: A Gender Perspective



IRENA’s *Renewable Energy: A Gender Perspective* was presented at the Ninth Session of the IRENA Assembly during a special evening event on “Gender in the Energy Transformation”. Report findings were shared at the First Regional Conference of Women in Power Sector Professional Network in South Asia (WePOWER) event hosted by the World Bank Group Nepal. Results were also presented in side events on the topic at the Astana World Economic Forum 2019, as well as in several events at the BETD 2019. The Agency co-organising a dedicated gender event at CEM10 in Vancouver, Canada and at the EU Sustainable Energy Week (EU SEW) 2019 in Brussels, Belgium.

¹¹ 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.

85. **SIDS Lighthouses Initiative.** Since 2014, IRENA has consolidated its work with SIDS under the umbrella of the SIDS Lighthouses Initiative (LHI), comprising 36 SIDS¹² and 24 development partners¹³. Five new partners have recently joined the Initiative: Denmark, the Caribbean Electric Utility Services Corporation, the Organisation of Eastern Caribbean States, the Pacific Islands Development Forum, and the Solar Head of State.
86. On 27 September 2019, a High-Level Breakfast Meeting on Pathways and Partnerships was held to leverage the energy transition for climate resilience and sustainable development co-benefits in SIDS. The breakfast was attended by 20 SIDS at both the ministerial and the technical levels¹⁴ and representatives of 17 development partners¹⁵. The UNSG's Special Envoy for the 2019 Climate Action Summit reiterated the UN Secretary-General's commitment to SIDS renewable energy transition to address climate change, accessing finance and implementing and reviewing of SIDS NDCs that will culminate at COP25 in Santiago with concrete follow-up plans.
87. SIDS highlighted the importance of closing the financing gap for SDGs and NDCs whilst taking into account the unique situation of SIDS due to its size and vulnerabilities and that it is a matter of survival. Whilst most SIDS have transitioned significantly to renewables in the power sector, a lot more has 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 reiterated the importance of strengthening their resilience to adapt to the extreme climate change effects through the uptake of renewables in relating to, among others, early warning systems and power supplies for emergency services. Development partners made a commitment to increase their financial support and make climate action a central part of its development cooperation. Multilateral banks have adapted its rules for SIDS to easily access finance, not only for energy but for whole infrastructure development, addressing land issues through improved regulatory frameworks and strengthening local capacity through regional centers of excellence in renewable energy and energy efficiency in close collaboration and partnerships with SIDS and development partners at regional and international levels. The event was co-organized 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-OHRLS).

¹² 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

¹³ 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

¹⁴ 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

¹⁵ Austria, Denmark, Germany, Norway, CARICOM, GIZ, IRENA, Pacific Community (SPC), Rocky Mountain Institute – Carbon War Room, SEforAll, Solar Head of State, UNOHRLS, UNDESA, UNIDO and the World Bank

88. Building on results achieved to date and taking into consideration the evolution of the energy context in SIDS, a consultation process was undertaken with partners to identify the priority areas and targets of the next phase: SIDS Lighthouses Initiative 2.0 (LHI). Following the launch of LHI 2.0 at a High-Level Roundtable held in September 2018 alongside the UN General Assembly, the new priority areas were further discussed during the SIDS Ministerial meeting held on the margins the Ninth Session of the IRENA Assembly in January 2019. The event brought together SIDS Heads of State and Government, Ministers, officials and development partners to discuss activities relating to the new LHI priority areas that support accelerated efforts for an affordable, resilient, and renewables-based energy future for SIDS. As input to the meeting, IRENA prepared a brief entitled *SIDS Lighthouses Initiative: Progress and Way Forward*, that provided an overview of the progress achieved in the first four years of the LHI and highlighted key developments in 2018 that paved the way for its second phase.

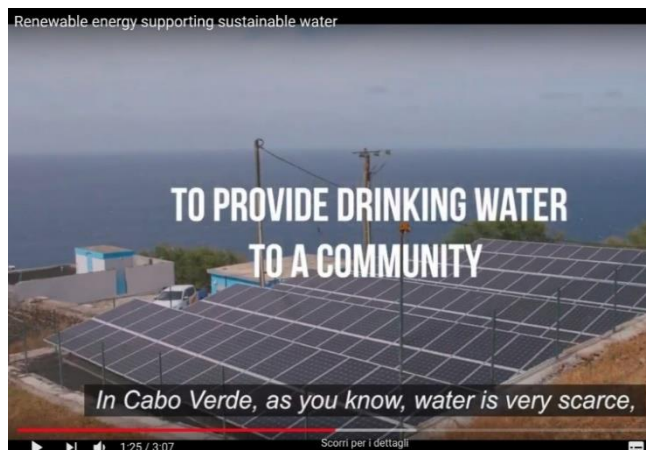


Figure 11: Videos highlighting role RE technologies can play on SIDS LHI's website

89. 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.

90. IRENA is also working to increase awareness and reinforce links between renewables and food, water, and health in line with new 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 website¹⁶.

91. In November 2018, IRENA partnered with the Kingdom of the Netherlands and the Aruba Centre of Excellence (COE) for the Sustainable Development of SIDS in organising the regional workshop, "Renewable Energy in SIDS: How to Strengthen Resilience & Accelerate Renewable Energy Deployment in the Caribbean", held in Aruba. IRENA's Site Assessment Service has supported technical and financial pre-feasibility of nine sites earmarked for solar PV energy project development in Comoros and Nauru. This service provides a benchmark tariff and allows local authorities to have a clearer understanding of the technical and economic feasibility of the sites in pipeline for development (for more information on site assessment services see box under Network Hub, Regional Action Agenda).

92. Building knowledge and capacity in project development and facilitation and renewable energy financing, IRENA has participated in several Project Navigator and renewable energy financing workshops in the Pacific and Caribbean regions, in collaboration with partners. Most recently,

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¹⁶ <https://islands.irena.org/>

IRENA worked with the Pacific Community (SPC) and the University of the South Pacific (USP) to develop a ministerial paper entitled *Capacity Building on Sustainable Energy in the Pacific* presented at the Pacific 4th Energy and Transport Minister's Meeting in September 2019 in Samoa.

93. 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. IRENA is also working with SPC and CARICOM to organise regional workshops on renewable energy statistics collation, analysis and interpretation and setting national and regional renewable energy targets.
94. 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

95. 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 to over 90 members including private sector, industry associations, civil society, and research organisations. The Coalition continues to promote increased public-private dialogue and further engagement in IRENA's work by various stakeholders. Most recently, a number of 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.
96. The IRENA Coalition for Action members continue to produce analytical work under its various Working Groups. Based on a series of webinars, the Business and Investors Group have developed country-specific white papers on Algeria, Colombia, Jordan, Morocco, 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.
97. 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 EU SEW, RE-Source, and during the NY Climate Week amongst others. To inform an in-depth and updated overview of the current status of corporate sourcing options by country, IRENA has further developed a corporate sourcing of renewable energy survey targeting Members (forthcoming). This work is supported in part through a voluntary contribution by the Government of Germany.

98. 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. The forum was attended by members of parliament from 27 countries and the European Union. A session focusing on the energy access gap in Africa facilitated the exchange of experiences and best practices with parliamentarians from around the world and among peers from African countries.
99. The Agency is continuing to work at 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.
100. 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. 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, including representatives of LDCs and SIDS. The deadline for the submission of applications was 15 October 2019.

V. Source of Advice and Support

101. 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.



Figure 124: At the margin of the UN Youth Climate Summit, IRENA's Director-General Francesco La Camera met with youth delegates in New York

Project Support and Facilitation

102. 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 Germany¹⁷.

103. 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 particular 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.



Figure 13: Southeast Europe regional workshop on RE project development and financing, June 2018, Serbia

104. 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.
105. 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,

¹⁷ 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.

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.

106. IRENA has kept the **Global Atlas for Renewable Energy** (Platform) operational over the course of the biennium as it continues to provide renewable energy data required in resource and infrastructure planning. Users of renewable energy resource information are still able to access maps on the platform contributed by expert institutions and private companies worldwide. Most recently, the Agency upgraded the platform and is working on the new version (Global Atlas 4.0), to feature the latest 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.
107. 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, Collaborative Platforms for SIDS specific site assessment information). In addition, IRENA’s geospatial suitability assessments contributed to regional market analysis reports. Recent market analyses conducted for Southeast Asia and Gulf Cooperation Council (GCC) benefitted from the assessments of the technical potential for on-grid solar and wind project development in the regions using IRENA’s suitable areas assessment algorithms.

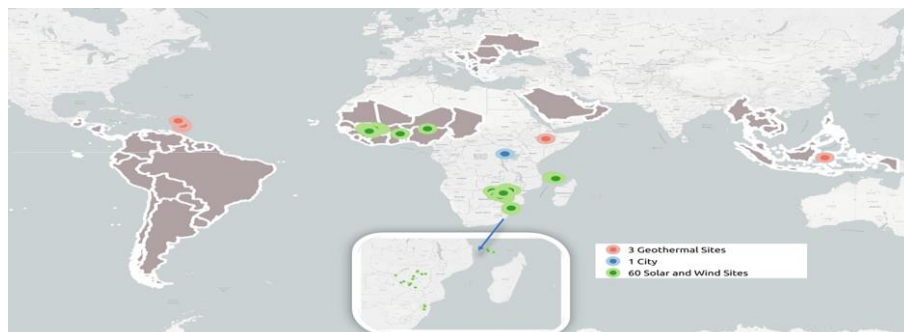


Figure 14: Global Atlas Site Appraisal Service

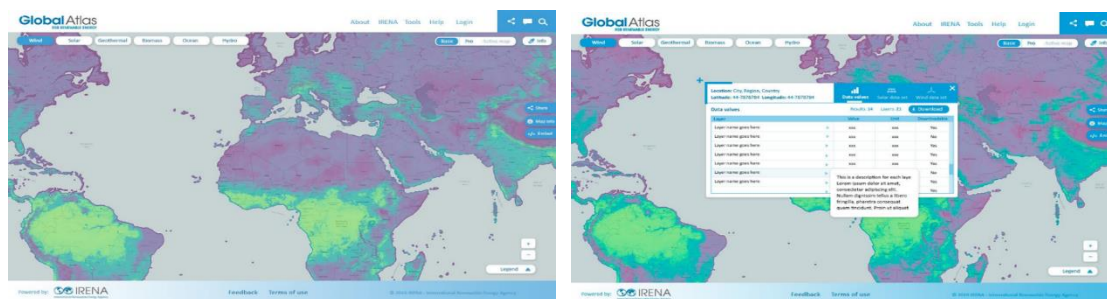
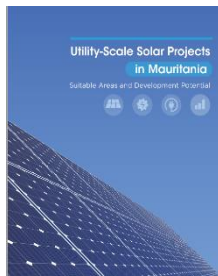
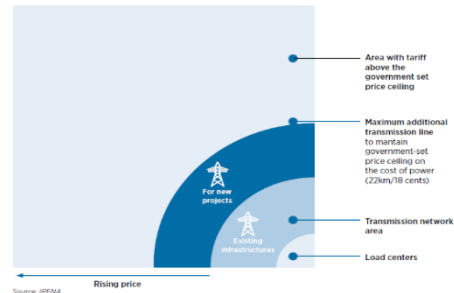


Figure 15: Global Atlas 4.0 Design Blue Print

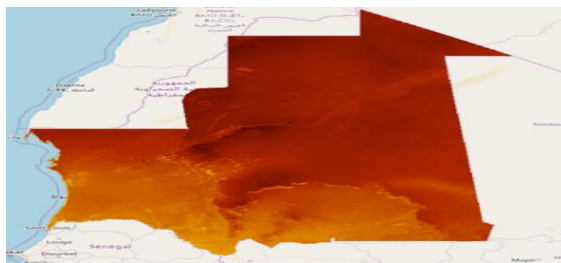
Capacity building through Project Development Support. The case of Mauritania.



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 suitability analysis for on-grid solar and wind projects, the mapping of highly suitable

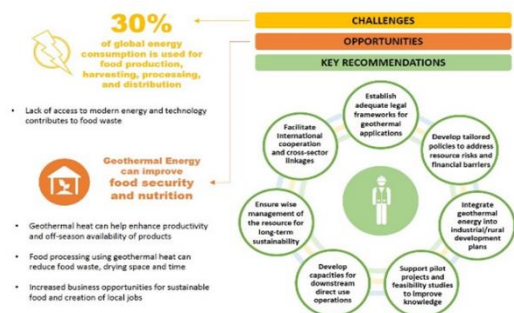


areas for renewable energy project planning and its subsequent development. The solar variant has been completed and submitted to the country, while the wind version is ongoing. This analysis will assist the local Ministry to select new areas for renewable energy technology development and support the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



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. Where the resource potential exists, geothermal heat can reduce food waste and greenhouse gas emissions and boost economic development.



Several geothermal applications in food processing and agriculture require low temperatures and can therefore be deployed in areas where geothermal resources would not be suitable for power generation. However, despite its promising potential and increasing interest from policy-makers and key stakeholders, direct use of geothermal heat in food-related applications across the world is still limited.

In this framework, the Agency’s publication *Accelerating geothermal heat adoption in the agri-food sector: Key lessons and recommendations* seeks to increase awareness, share experiences and lessons, and provide recommendations for expanding geothermal heat use in the agri-food sector. This publication has been developed within the framework of the Knowledge Sharing Platform of the Global Geothermal Alliance.

SolarCityEngine

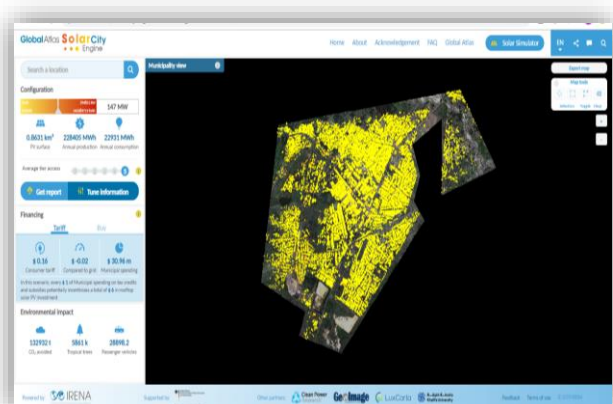
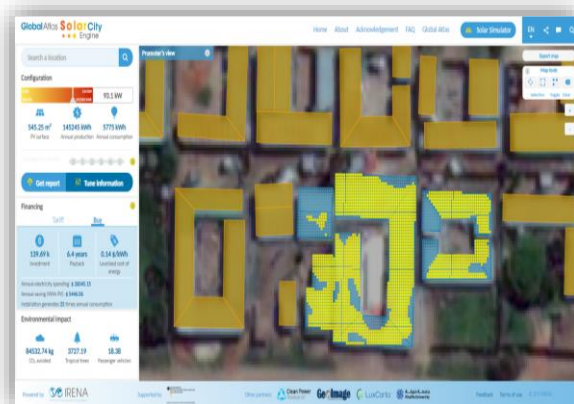
In May 2019, IRENA released The Global Atlas - SolarCityEngine to support home owners, businesses, and municipal authorities in cities to assess the prospects to meet electrical energy demand from rooftop solar PV installations. The SolarCityEngine is the first of these solutions to be built and deployed 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) with implementation in Zhangjiakou city (China) 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.¹⁸



108. 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 (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. This project is supported from voluntary contributions from the Government of France.



Figure 16: Regional Geothermal Resource Data Gathering UNFC Classification and Training Workshop, Castries



¹⁸ 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.

109. 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 248 sustainable energy projects (translating into 5.4 GW of installed capacity and USD 12 billion worth of investment opportunities), 184 financing instruments, 227 service providers and 92 technology providers. The projects on the platform include 95 solar, 59 bioenergy, 35 hydropower, 20 wind, and 39 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).

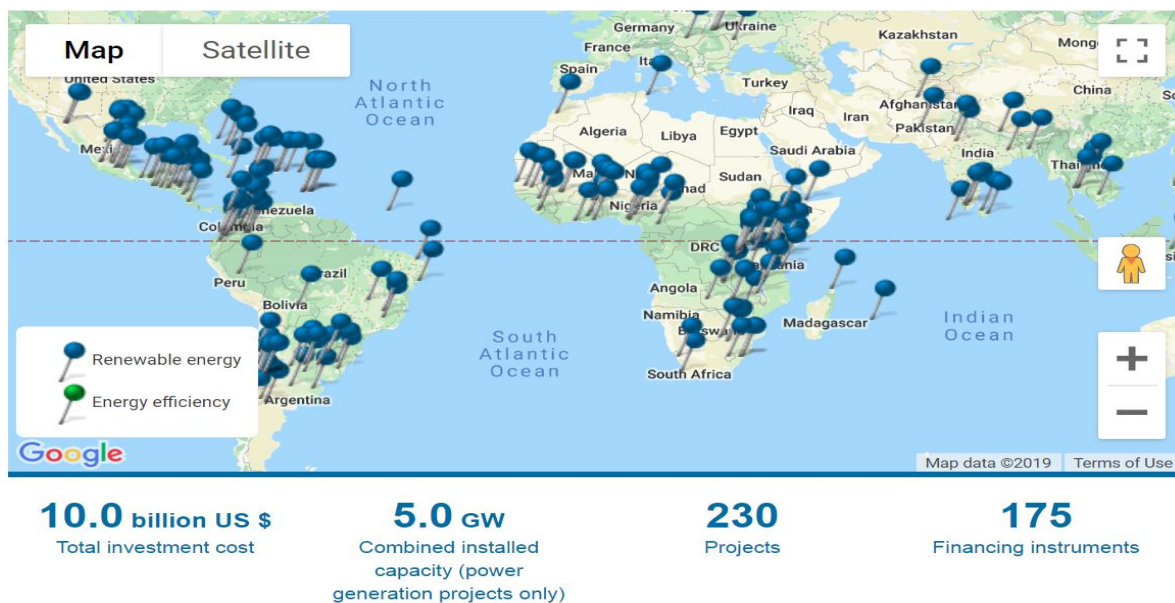


Figure 17: IRENA's Sustainable Energy Marketplace

110. In 2019, IRENA has supported 25 project owners by improving their business proposals and investor pitches. In April 2019, IRENA hosted its first virtual project finance matchmaking event in Latin America where 12 project developers presented a total of 21 projects 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.

Renewable Energy Solutions Lab

111. IRENA is supporting the United Nations High Commission on Refugees (UNHCR) to address 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. The IRENA inputs will serve as a blueprint for electricity supply in situations of displacements and for UNHCR feeding into the energy strategy and vision of UNHCR for addressing the energy requirements in humanitarian response. This work is supported by voluntary contributions from the Government of the Walloon Region of Belgium.

112. 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. 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. Capacity building activities for the first cohort of entrepreneurs are in preparation. IRENA is also supporting the establishment of a regional certification scheme for off-grid PV installers in the 15 Member States of the ECOWAS region. Two pilot examinations for certification of solar PV installers were held in Senegal and Ghana in January and June 2019 respectively. This work is supported by voluntary contributions from the Government of the Walloon Region of Belgium.

Local Solutions and Tailored Advice

113. IRENA's extensive knowledge products, tools, and methodologies provide a sound basis for tailored advice to countries and IRENA's engagement on the ground. Its various frameworks, such as RRAs, resource assessments, planning, and socio-economic models, provide countries with clear recommendations on how to achieve their ambitions. IRENA's work on policy assessments and socio-economic benefits is integrated into regional policy workshops for Central Asia, Southeast Asia, South East Europe, and four regions in Africa as part of the Africa Renewable Energy Initiative (AREI).



Figure 18: Eswatini Energy Masterplan 2034 launch in Ezulwini, Eswatini, 25 October 2018

114. 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.

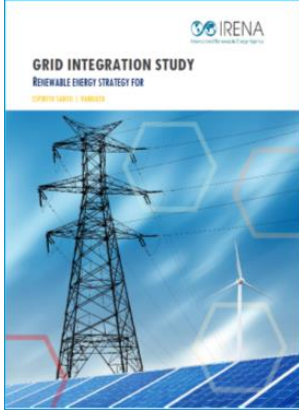
115. IRENA and the Ministry of Economy and Infrastructure launched the RRA for the Republic of Moldova on 19 February 2019 in Chisinau. The launch brought together around 70 experts from various institutions for the presentation of the report and discussion on potential follow-up activities building on its recommendations. 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.
116. The RRA processes for Mali, Azerbaijan, Bhutan, and Tunisia have recently been completed and the reports are under finalisation with launches planned for the final quarter of 2019. The RRA for Bhutan is being supported by a voluntary contribution from the Government of Japan.
117. IRENA and the government of El Salvador held the “RRA Expert Consultation Workshop” in December 2018, which gathered stakeholders across the country's public and private sectors, industry, civil society, and academia to introduce the RRA process and discuss challenges and opportunities for the development of renewables in El Salvador. Discussion outcomes provided substantive inputs for the RRA Validation Meeting in October 2019. This work is supported by a voluntary contribution from the Government of Norway.



Figure 19: RRA El Salvador Expert Consultation Workshop
San Salvador, El Salvador, 3-4 December 2018

118. The Renewable Energy Outlook (combined RRA-REmap analysis) for Lebanon is currently under peer review with a planned launch for end 2019. To date, two workshops were organised in Beirut: A Multi-Stakeholder Workshop (5-6 March 2019) and a Validation Workshop (8-9 May 2019). The workshops were attended by key representatives from relevant energy stakeholders, i.e., different national institutions, companies and banks, responsible for driving renewable energy deployment in Lebanon.
119. 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 and provides 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 first RRA workshop for a multi-stakeholder is in preparation. 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.
120. 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. In the case of South Africa, the analysis and report have been completed and are currently being approved by the Ministry of Energy.

121. 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.
122. IRENA continues to provide advice on the integration of high shares of renewable energy in power systems to achieve renewable energy targets. Upon request from Members, IRENA assesses shares of renewables that may be incorporated in the system. This is achieved by creating network models and conducting country specific grid assessment studies, in collaboration with local stakeholders. 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 advises 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.
 
123. 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, principle 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 operational changes in the system. The capacity of the system to host 65 MW corresponds to almost 40% of the peak demand verified in 2017.
124. Finally, the Agency is finalising the study *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, recommendations will be given on which operational measures are required.

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. Total allocated loans by ADFD today 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.

Three projects selected in the sixth cycle were announced in January 2019. These are:

- Guyana Hinterland Electrification Programme (5.2 MW Solar PV-Grid Tied Farms)
- Liberia - River Gee Mini-Hydropower Project (2.1 MW)
- Togo - Blitta (formerly Dapaong) Solar PV Project (30 MW)

As part of the seventh cycle, IRENA has received a total of 95 applications from 48 eligible developing countries. Of submitted projects, a total of 40 have been shortlisted with request to submit a full proposal.

IRENA/ADFD Facility projects advancing with construction that will be commissioned and generating electricity in 2019

10 MW grid-connected solar PV project in Cuba

All four of the solar parks of the 10 MW project were connected to the grid by May 2019. As a result of the reduction in solar PV costs, the capacity has expanded from 10 MW to 15 MW, all covered under the original loan amount of USD 15 million from ADFD. 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 in the Maldives

The project includes the construction of waste to energy plant at two islands of Addu and Vandhoo in the Maldives. The first plant is completed and is handling waste from 40 surrounding islands and has a generation capacity of 500kW providing electricity to the residents and resorts on Vandhoo Island. 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”.

Seychelles - Ile de Romainville Solar Park

This government-driven project being implemented by the Public Utilities Corporation (PUC) involves the construction of a 5 MW solar PV plant that will be integrated into an existing wind farm located 500m offshore 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. The installation of the power plant is expected to be completed and commissioned in 2019.



Solar Park in Sierra Leone: The project was put forward by the Ministry of Energy 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 national power reliability for over 190,000 electricity consumers in Freetown while mitigating greenhouse gases. Construction is underway with completion expected by end of 2019 and commissioning in 2020.

VI. International Co-operation and Strategic Engagement

125. 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.
126. 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 and was the only representative of International Organisations (together with the World Bank) to address the United Nations Secretary-General's Climate Summit in the United States. The Director-General also spoke at national and regional energy-related events including the Africa Renewable Energy Forum in Guinea, the 2nd Belt and Road Forum for International Cooperation in China, the 2019 EU Sustainability Week in Belgium, the 37th ASEAN Ministers on Energy Meeting and Associated Meetings (AMEM) in Thailand, the World Energy Council in the UAE and the Russia Energy Week. He also took part in the UN Convention to Combat Desertification (UNCDD) COP in India and the BMWi-IEA: Global Conference on System Integration of Renewable Energy in Germany.

127. 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 United Nations Framework Convention on Climate Change (UNFCCC), the UN Convention to Combat Desertification (UNCDD), the UN Department for Economic and Social Affairs (UNDESA), the UN Development Programme (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-OHRLS).
128. 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 Nationally Determined Contributions (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 coordination 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.

129. 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.
130. Continuing to lead 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 is also working 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.
131. Members continue to be encouraged to accredit Permanent Representatives and to facilitate engagement through regular meetings and discussions. Since the beginning of 2019, seventeen new Permanent Representatives have been accredited to the Agency and some other Members are in the process of finalising accreditation procedures. There are currently 50 PRs accredited to IRENA, including Costa Rica, Maldives, Mozambique, Somalia, South Africa and Ukraine that have been newly accredited.

Governing Body Meetings

132. 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.
133. The Assembly was followed by the World Future Energy Summit (WFES) which featured a number of 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 cooperation as drivers of up-scaling renewable energy deployment in the context of achieving the SDGs and decarbonising the economy.
134. The Seventeenth Meeting of the IRENA Council and related meetings, held from 25 to 26 June 2019 in Abu Dhabi, welcomed the participation of 270 delegates from 99 States and the European Union. Plenary discussions, side events, workshops, and Committee meetings

provided delegates with the opportunity to discuss current topics on the global energy transition 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. Preparations for the Eighteenth Meeting of the Council and the Tenth Session of the Assembly are underway.

135. 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. In addition to the organisation of the Ninth Session of the IRENA Assembly and related meetings in January 2019, the Agency has hosted over 55 events in 25 countries across 6 regions to date.
136. 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 Least Developed Countries (LDCs) and Small Island Developing States (SIDS) in all IRENA's governing body meetings, including: Assembly, Council, and Committees. In 2019, the FDCR supported the participation of 92 delegates from 46 countries in different meetings of the governing bodies.

Efficient, Transparent and Innovative Management

137. 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

138. 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.
139. IRENA has intensified its outreach to identify partners that could 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 the course of 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 utilization.
140. 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.

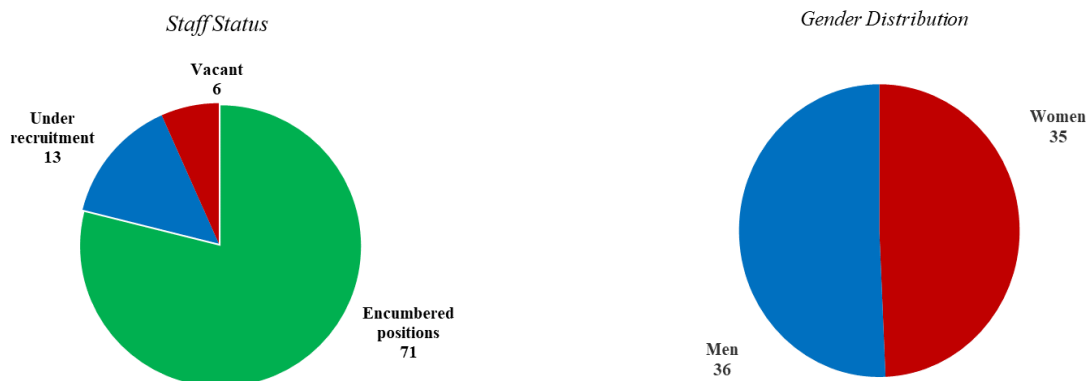
In 2019, the focus was on the creation of empirical baseline and analysis the first self-evaluation process, as requested by Members in the Medium-term Strategy (MTS) 2018-2022. The outcome of this work is annexed to this report.

141. 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 upcoming Council meeting; 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.
142. 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

143. 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.
144. **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.

145. **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 other process and document 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).
146. **Human Resources.** Human resources spanned 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 resources 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. 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. During the period from 1 January 2019, 43 vacancies (core and project) were announced and over 4,200 applications received. Out of 90 core posts, 84 are filled or under recruitment (71 filled and 13 under active recruitment) and six are vacant. The 71 staff are from 42 nationalities out of which 49% are women and 51% are men.



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

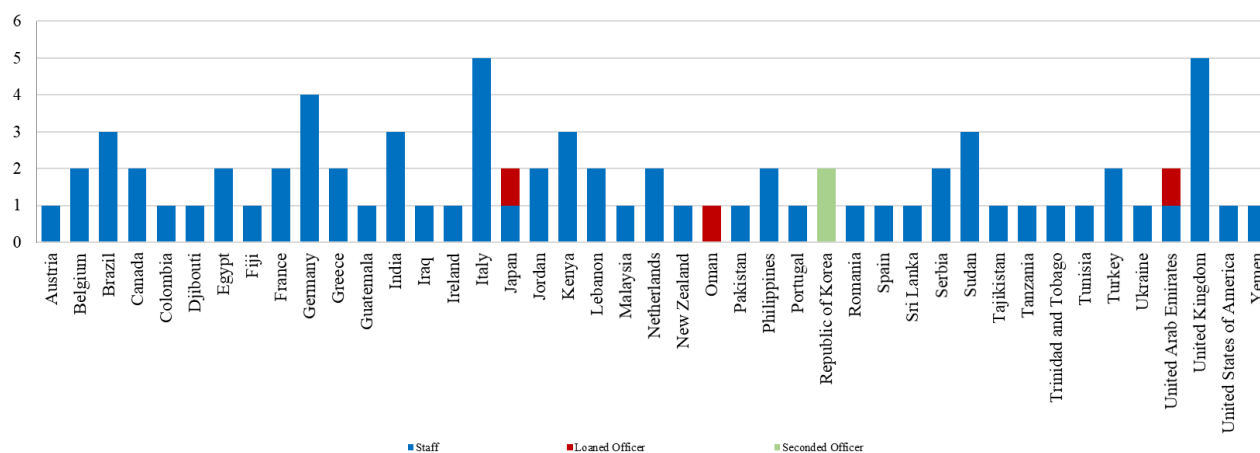
Level	Approved	Filled or Under Recruitment
ASG	1	1
D-2	1	1
D-1	5	5
P-5	17	16
P-3/4	37	36
P-2/1	3	2
Sub-total Professional and above	64	61
General Services	26	23
Total	90	84

Loaned Personnel as of 30 September 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 September 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)

147. **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 September 2019 to reflect the requirements until the end of the year. As of 30 September 2019, more than 450 procurement contracts for goods and services have taken place totalling USD 4.3 million.
148. **General Services and Travel.** Travel support and services were provided to staff, delegates and participants in conferences and workshops. As of 30 September 2019, the Agency facilitated participation in 36 workshops and 3,300 travel services. 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 and procedures are in progress, or 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 of 30 September 2019	
		Commitment and Expenses	Proportion of 2018- 2019 Biennium Budget
Assessed Contributions (Core Budget)	43,130	39,478	92%
Core Non-Assessed UAE			
UAE Support	5,000	4,342	87%
Governing Body Meetings	3,200	3,074	96%
IT Infrastructure Support	920	920	100%
Subtotal	9,120	8,336	91%
Core Non-Assessed Germany			
Innovation and Technology Centre	10,200	9,951	98%
Subtotal	10,200	9,951	98%
Core Non-Assessed Other			
Core Non-Assessed Other	1,704	978	57%
Subtotal	1,704	978	57%
Total Core Non-Assessed	21,024	19,265	92%
Grand Total	64,154	58,743	92%

Core Non-Assessed Contributions

as of 30 September 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 Core Non-Assessed Contributions	19,320,000	19,320,000

Other Voluntary Contributions

Contributor	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	86,313	-
UN-ESCWA	32,000	32,000
World Bank (IBRD)	13,438	-
Subtotal	16,504,562	13,244,835

Fund for Developing Countries Representatives

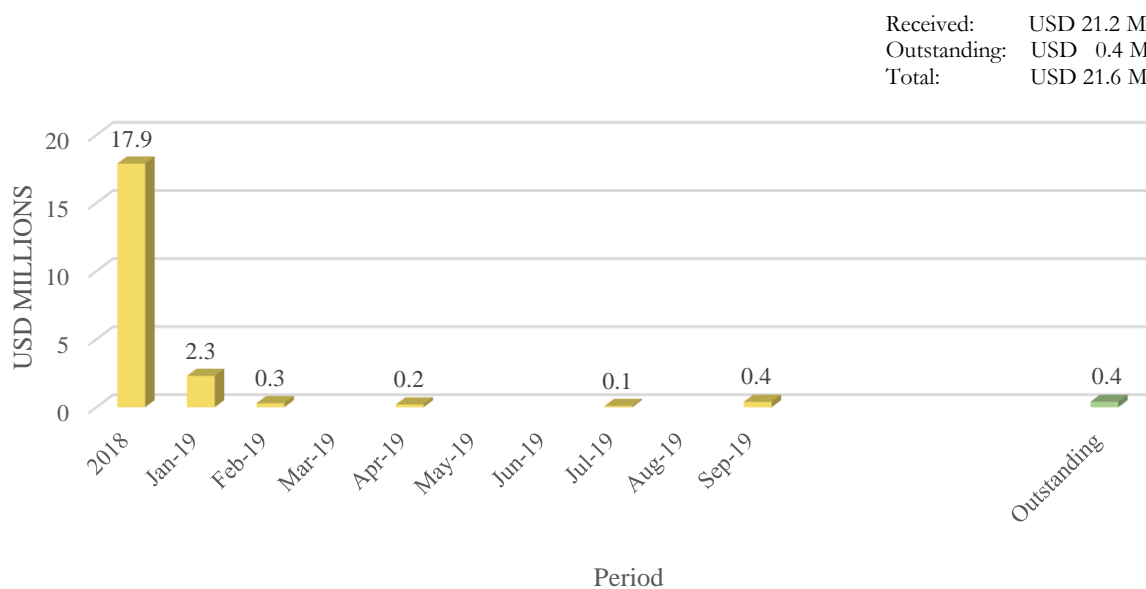
Donor	2018-2019	
	Committed	Received
Belgium (Flanders)	20,524	20,524
Belgium (Walloon)	13,137	13,137
Germany	70,283	70,283
United Arab Emirates (UAE)	300,000	300,000
Subtotal	403,944	403,944

Total Other Voluntary Contributions	16,908,506	13,648,779
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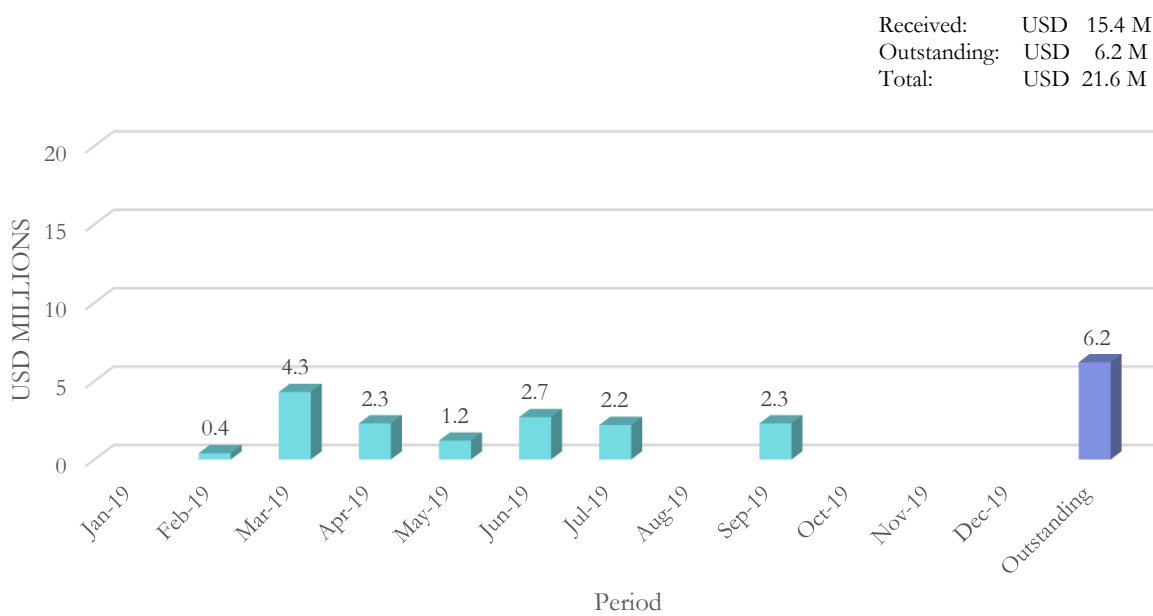
Multi-Year Voluntary Contributions pledged before 2018

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

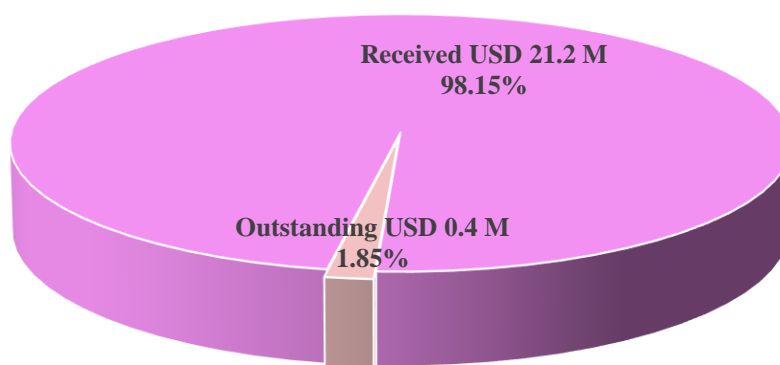
Received and outstanding assessed contributions for 2018 core budget (as of 30 September 2019)



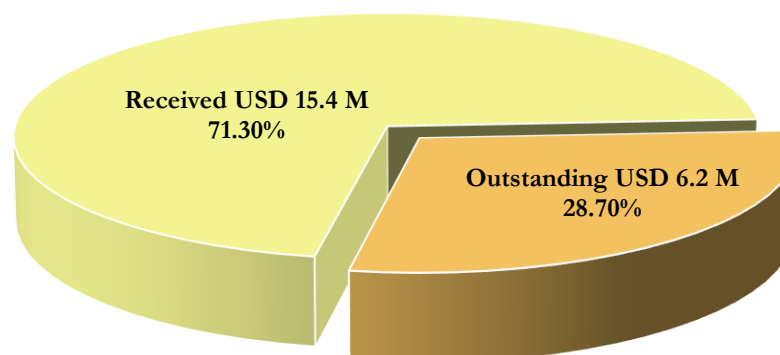
Received and outstanding assessed contributions for 2019 core budget (as of 30 September 2019)



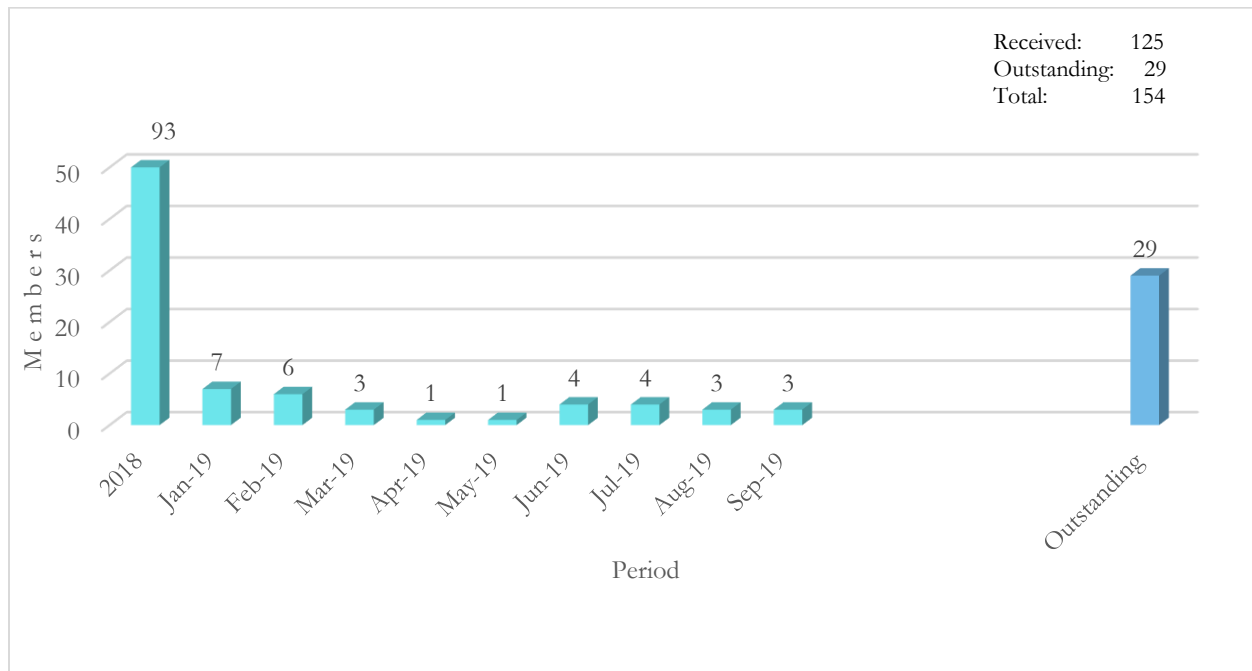
Status of contributions to the 2018 core budget (as of 30 September 2019)



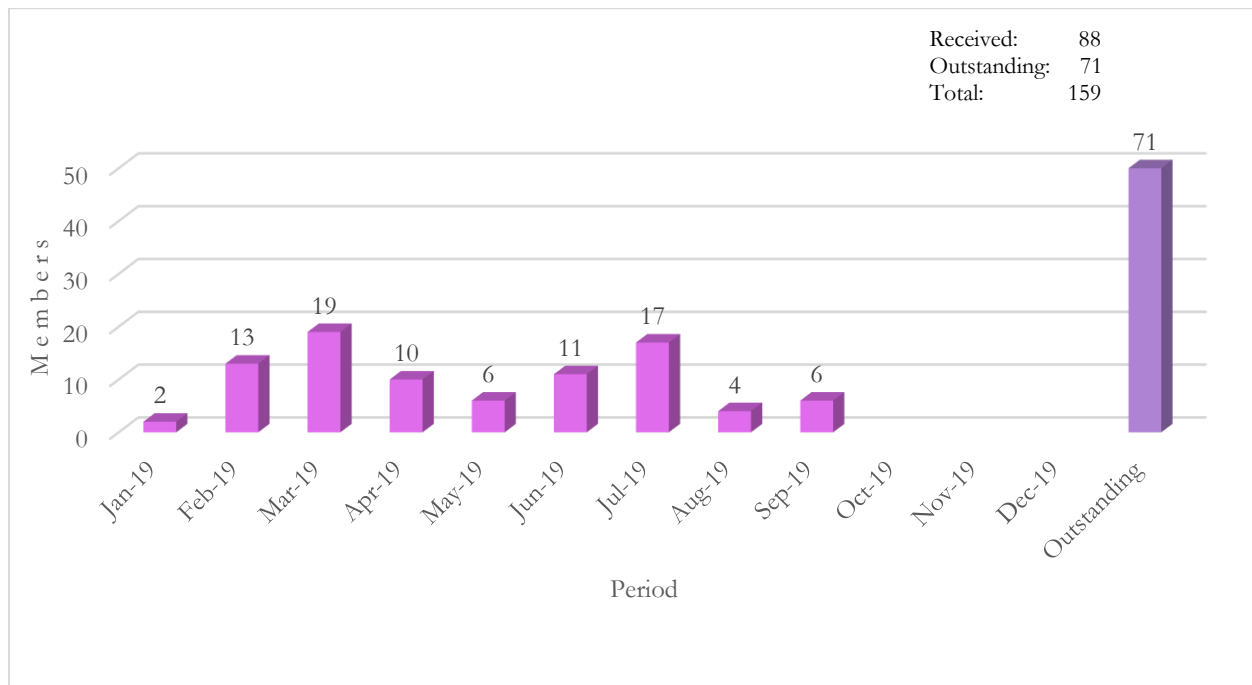
Status of contributions to the 2019 core budget (as of 30 September 2019)



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



Number of Members with received and outstanding contributions to the 2019 core budget (as of 30 September 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 ¹⁹	Remarks
REmap Global report	Completed	<ul style="list-style-type: none"> - The <i>Global Energy Transformation: A Roadmap to 2050</i>, launched at Berlin Energy Transition Dialogue, 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>Global Energy Transformation: Future of the wind market</i>, in development. - <i>Global Energy Transformation: Future of the solar PV market</i>, in development.
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 (Q4 2019).
Report on long-term planning with high share of VRE	In progress	- Expert workshop in planning for Q4 2019. A report will subsequently be prepared based on workshop proceedings.

¹⁹ **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).

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> (draft near finalization). - Analytical brief on <i>System integration cost</i>: draft discussed with experts in September 2018 and June 2019 (draft near finalization). - 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 coordination 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 IRENA 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	<ul style="list-style-type: none"> - 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.
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	<ul style="list-style-type: none"> - <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 biojet?” May 2019. - <i>Innovation Outlook for Electric Vehicles</i>, May 2019.
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>, January 2018. - <i>Global Landscape of Renewable Energy Finance</i> (Planned date of completion Q1 2020). - <i>Mobilising Institutional Capital for Renewable Energy</i> (Q4 2019). - Analytical work on off-grid renewable energy financing landscape.
Design of risk mitigation facilities	In progress	<ul style="list-style-type: none"> - IRENA expert workshop in Nairobi, Kenya, January 2018. - Risk Assessment and Mitigation platform: IRENA has completed the concept development and advanced the IT development. +20 registration forms have been collected from insurers / guarantors. The platform is planned to be launched 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	- 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 (planned for Q4 2019)
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>The Global Energy Transformation: A Roadmap to 2050</i> , launched at Berlin Energy Transition Dialogue, April 2019.
Report on renewable energy targets and policies	In progress	- <i>National Renewable Energy Targets: A Global Quantified Estimate</i> (Q4 2019).
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.
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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	Status¹	Remarks
Quantitative analysis of socio-economic benefits	Completed	- <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
Report on best practice to maximise local benefits from renewable energy projects	In progress	- <i>Maximising local benefits of large-scale renewable energy deployment: Insights from sub-Saharan Africa</i> (Q4 2019).
Report on leveraging local capacity (selected technologies)	Completed	- <i>Renewable Energy Benefits: Leveraging Local Capacity for Offshore Wind</i> , May 2018.
Jobs annual review 2018	Completed	- 2018 edition of the <i>Renewable Energy and Jobs - Annual Review</i> , May 2018.
Jobs annual review 2019	Completed	- 2019 edition of the <i>Renewable Energy and Jobs - Annual Review</i> , June 2019.
Analytical framework for the renewable energy components in NDCs	In progress	- 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).

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> (Q4 2019).
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)	In progress	- <i>Nurturing Offshore Wind Markets: Good practices for international standardisation</i> , May 2018. - <i>Implementing quality infrastructure for smart mini-grids</i> (Q4 2019).
Technical guides on data collection	Completed	- <i>Measurement and estimation of off-grid solar, hydro and biogas energy</i> , Dec 2018 - <i>Lessons learned from pilot testing the IRENA biogas survey in 6 countries</i> , Nov 2019.
Technical guides on quality infrastructure for emerging renewable energy technologies	In progress	- <i>Impact of extreme weather conditions on onshore wind and PV systems</i> (Q4 2019).
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	- West Africa Renewable Energy Statistics Training Workshop, Abuja, Nigeria, February 2019.

Training on the implementation of quality infrastructure	Completed	- 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	- Periodic e-bulletin and publication briefs issued. - Selective, targeted translation of press releases, promotional materials (e.g. IRENA/ADFD 7 th 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	In progress	- 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	- 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	In progress	<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 (Q4 2019).</i>
GCC regional market analysis	Completed	<ul style="list-style-type: none"> - <i>Renewable Energy Regional Market Analysis: the GCC Region</i>, January 2019. - 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"> - Region adjusted: Suitability assessment support provided to eight countries in Africa and in two Small Island Developing states (SIDS). - Suitability analysis of solar and wind development areas completed for Mauritania. - Suitability analysis 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 (Q2 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, MENA, 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 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. - Grid integration and planning technical workshop for the Clean Energy Corridor of Central America, 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. Meeting for Ministerial Adoption of the Roadmap is in planning. - 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 (Q1 to Q4 2019). - Study paper on modern bioenergy in Africa at the 27th European Biomass Conference and Exhibition, Lisbon, May 2019.
Collaborative platforms		Core resources: USD 1,299,000
<i>Output: Multi-stakeholder approaches to renewable energy deployment are supported by IRENA.</i>		
Deliverable	Status¹	Remarks
Annual progress report on SIDS Lighthouses initiative	Completed	- <i>SIDS LHI: 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. - Organization of, and contribution to, various events, workshops and capacity building activities with focus on RE in SIDS, including: <ul style="list-style-type: none"> o Organization of the “Caribbean Workshop on Renewable Energy in Small Islands Developing States: How to strengthen resilience and accelerate renewable energy deployment” (Aruba, November 2018);

		<ul style="list-style-type: none"> ○ Support to the “International Renewable Energy Conference: Bridging the knowledge gap on climate financing in small island states” (Cabo Verde, November 2018); and ○ Support forthcoming workshop on “Design of Bankable Power Purchase Agreements in Pacific SIDS”. <ul style="list-style-type: none"> - 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. - Ministerial paper <i>Capacity Building on Sustainable Energy in the Pacific</i> in partnership with the Pacific Community (SPC) and the University of the South Pacific (USP), September 2019. - 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. - GGA website upgrade including compilation of country and regional geothermal profiles for member countries (ongoing).
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.
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 (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	- 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.
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 of Action web platform	Completed	- New Coalition for Action website, April 2018.
Coalition for Action co-ordination	Completed	- renewables4development (May 2018) and renewables4climate (November 2018) communication campaigns. - <i>Scaling Up of Renewable Energy Investment in Ghana and Vietnam</i> , January 2019. - <i>Towards 100% Renewable Energy</i> , (white paper), January 2019. - <i>Community Energy Finance</i> , (white paper), Autumn 2019. - <i>Scaling Up of Renewable Energy Investment in Algeria, Jordan, Morocco, Mozambique, Senegal and Tunisia</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). - Participation in Parliamentary Meeting on the occasion of COP24 (organized jointly by the Inter-Parliamentary Union and the Polish Sejm), December 2018. - Legislators Forum, Abu Dhabi. January 2018, January 2019.

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 currently undergoing peer review.
Functional Global Atlas Applications	Completed	<ul style="list-style-type: none"> - Suitability analysis and site appraisal methodologies operational and in use. - Blue print 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 module on competitive technical requirements for EPC tender	Completed	<ul style="list-style-type: none"> - Technical guidelines for the development of climate resilient renewable energy projects (ongoing, Q4 2019). - Technical guidelines for the development of project models for renewable energy projects (ongoing, Q4 2019). - Technical project development support to increase the quality of project proposals (ongoing, Q4 2019).
Sustainable energy Marketplace global coverage	Completed	<ul style="list-style-type: none"> - The Sustainable Energy Marketplace covers all countries in Sub-Saharan Africa, Latin America, Asia, South East 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) (under development)

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"> - Technical Guidelines for Mini-grid Applications, Residential PV Projects, and Biogas (French) (completed). - Technical Guidelines for Geothermal Power Projects, Utility Scale PV Projects, and Mini-grid Applications (Spanish) (completed). - Technical Guidelines for Geothermal Power Projects, Utility Scale PV Projects (French) (Q4 2019). - Technical Guidelines for Biogas, Residential PV, and Woody Biomass (Spanish) (Q4 2019).
Dissemination of standardised contract templates	Not Complete	<ul style="list-style-type: none"> - Will be initiated following the peer review.
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"> - Contribution to the webinar series with the USAID-led network <i>Women in African Power</i>, Q2 2018. - Workshop on the development of bankable solar PV projects, Singapore, Q2 2018. - Capacity building workshop on the development of bankable solar energy projects in Egypt and the Middle East region, Q4 2018.

		<ul style="list-style-type: none"> - Capacity building workshop on the development of bankable solar energy projects in the Indian Ocean SIDS, Q4 2018. - Capacity building workshop on the development of bankable off-grid projects in Pacific SIDS, Q4 2018. - Regional energy forum on sustainable energy in the Southwest Indian Ocean islands, Q2 2019. - Capacity building workshop on the development of bankable renewable energy projects in the Caribbean SIDS, Q4 2019. - Capacity building workshop on the development of bankable renewable energy projects in Sub-Saharan Africa, Q3 2019. - Capacity building workshop on the development of bankable renewable energy projects in ASEAN, Q3 2019. - Training webinar on the development of climate resilient renewable energy projects in SIDS, Q4 2019. - Training webinar on the development of heating and cooling projects in Cities, Q4 2019. - Training webinar on project modelling for bankable proposals in SIDS, Q4 2019. - Capacity building Webinar on Training-of-Trainers (ToT) module for SIDS Project Stakeholders, Q4 2019.
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	Status¹	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	Ongoing	<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 (Q4 2019). The call was launched on 19 September 2019 and the deadline for applications is 15 November 2019.
Two workshops for entrepreneurs, financing institutions and incubation centres	In progress	- 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	- 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	Status¹	Remarks
Five country processes for renewables-based transition	Completed	- RRA Mali, September 2019. - Post RRA support for Mauritania. Solar suitability analysis completed. Wind analysis is ongoing. - REmap Nigeria (forthcoming). - RRA Pakistan, April 2018, RRA Panama, May 2018. - REmap South Africa (forthcoming). - Renewable Energy Outlook (REmap/RRA): Egypt, Cairo, October 2018. - Renewable Energy Outlook (REmap/RRA): Lebanon, October 2019. - RRA process completed for Azerbaijan and Tunisia. Reports under finalisation. - RRA process ongoing for Albania and Botswana.

Power system flexibility assessment for countries upon request	Completed	- FlexTool case study applications in Columbia, Jordan (RRA component), Panama, Thailand and Uruguay.
National master plans supported in Africa	Completed	- 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	- 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	Status ¹	Remarks
Strategic management of the Agency and thought leadership and coherence of the message on renewables in the global discourse on energy.	Completed	- 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	- Programme and Strategy Committee, Administrative and Finance Committee, and 16 th and 17 th Council and related meetings. - Ongoing interaction on programmatic and governance issues with the Permanent Representatives and Headquarters-based representatives of the Membership.
Effective communication and outreach to Members to ensure the flow of information and active engagement.	Completed	- 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	Status ¹	Remarks
Substantive support and efficient servicing of meetings of the governing bodies is ensured.	Completed	<ul style="list-style-type: none"> - Ninth session of the Assembly and related meetings, January 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 92 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	- 67 vacancies (core and non-core) announced and over 6,400 applications received. - Out of 90 core posts, 84 are filled or under recruitment (71 filled and 13 under active recruitment).

		- The 71 staff are from 42 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	- 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	- Annual Agency-wide procurement plan. - Travel and mission planning.
The use of ICT tools and services to improve organisational effectiveness and staff productivity.	Completed	- 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. - A brief analyzing progress towards the implementation of renewable energy targets in the NDCs. - A brief assessing the progress towards the implementation of renewable energy targets in the NDCs. - 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 cooperation with IRENA, and published by UNDESA in 2019.

		<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.
Denmark	REmap Southeast Asia and two REmap country analysis	- Renewable energy roadmap and analysis for the Southeast Asia region, as well as a detailed REmap analysis for two countries in the region.
European Commission	REmap for Central and South East 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.	<ul style="list-style-type: none"> - 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 ²⁰	Energy Solutions for Cities of the Future	<ul style="list-style-type: none"> - 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.

²⁰ International Climate Initiative (IKI) of the German Government.

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
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</i> (Q4 2019).
Japan	Bioenergy	- 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	- 4 th IOREC Conference, Singapore, (31 October-1 November 2018) - Contribution to the organisation of the International Conference on Renewable Energy Solutions for Healthcare Facilities, 2 November 2018.

Norway	Voluntary core contributions in support of WPB and MTS	<ul style="list-style-type: none"> - Renewable energy roadmap and analysis 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 ²¹	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. - Renewables in the Building Sector: Heat Pump Costs and Performance.
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"> - Visions of Sustainability at the Venice Biennale, May 2018.

²¹ International Climate Initiative (IKI) of the German Government.

Japan	Quality of renewable technologies	- Solar PV costs in Japan: Opportunities for Cost Reduction.
Japan	NDC/climate related work, especially for market mechanisms	- A study on the role of market-based mechanisms (e.g. carbon markets, taxes and credit trading schemes) in meeting NDC renewable energy targets.

Network Hub		
Contribution	Project	Selected Outputs
Denmark	Long-term energy planning	- 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	- 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	The Global Geothermal Alliance	- 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 ²² , Japan, Netherlands, Norway, UAE	Support for IRENA’s SIDS Lighthouses Initiative	- High-Level Roundtable on SIDS Lighthouses Initiative 2.0, September 2018.

²² International Climate Initiative (IKI) of the German Government.

		<ul style="list-style-type: none"> - 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. - 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. - Webinars on renewable energy systems for SIDS. - Pacific workshop on Power Purchase Agreements. - Pacific workshop on Renewable Energy Statistics. - Caribbean workshop on Renewable Energy Statistics. - Caribbean regional workshop for the capacity building of national banks and financial institutions for bankers. - Videos series on energy, health, food and water nexus.
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, and o RECs conference in Amsterdam.

Germany ²³	Energy Solutions for Cities of the Future	- Capacity building and Guidebook on the integration of low temperature renewable energy sources in district heating and cooling networks in the urban setting (Q4 2019).
Japan, Sweden	Biomass related analysis	- 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	- Suitability analysis of solar and wind development training workshops in MENA.

Source of Advice and Support		
Contribution	Project	Selected Outputs
Belgium (Government of the Walloon Region), Japan, Norway	Project facilitation / Voluntary core contribution in support of WPB and MTS	- 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.

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

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 ²⁴	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. - 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 ²⁵	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.

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

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

		<ul style="list-style-type: none"> - 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 developed. - Two policy guidelines to provide sectoral policy instruments for cities are being developed. - 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 ²⁶ , 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 - RRA Republic of Moldova, February 2019.

²⁶ International Climate Initiative (IKI) of the German Government.

		<ul style="list-style-type: none"> - Post RRA for 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.
Norway	Voluntary core contributions in support of WPB and MTS	- Grid integration studies and power system operation support for the island of Loganville (Vanuatu), Viti Levu (Fiji) and Dominican Republic.
Norway	Voluntary core contributions in support of WPB and MTS	- Regional project facilitation technical training workshop on the development of bankable solar energy projects in the region, Brunei Darussalam, August 2019.
UAE	IRENA/ADFD Project Facility	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - Global Commission on the <i>Geopolitics of Energy Transformation</i> launched, January 2018, four meetings of the Commission completed. - The Report <i>A New World: The Geopolitics of the Energy Transformation</i> launched at the margins of the Ninth Assembly, January 2019. Ongoing dissemination