

# SCALING UP RENEWABLE ENERGY DEPLOYMENT IN AFRICA

IMPACT OF IRENA'S ENGAGEMENT



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# ENERGY TRANSFORMATION IN AFRICA

**Since 2000, Africa has been experiencing rapid economic growth and improving social conditions.** Average real gross domestic product reached 3.6% in 2017 and is projected to rise to around 4% in 2018 and in 2019 (African Development Bank, 2018). Six African economies are expected to feature among the top ten fastest growing economies in 2018 (World Bank, 2018). Given the continent's large and growing population, energy demand is expected to be nearly double by 2040.

**Endowed with substantial renewable energy resources, Africa is in a position to adopt innovative, sustainable technologies and to play a leading role in global action to shape a sustainable energy future.** Supply unreliability is a concern holding back economic development, with most countries facing frequent blackouts and often relying on expensive and polluting solutions. Clean, indigenous and affordable renewable energy solutions offer the continent the chance to achieve its economic, social, environmental and climate objectives. Sustainable development and use of the continent's massive biomass, geothermal, hydropower, solar and wind power have the potential to rapidly change Africa's current realities.

**Renewables provide the chance to leapfrog to a sustainable, prosperous future for all.** Increasing access to reliable, affordable and clean energy resources is a key priority, particularly in sub-Saharan Africa. Around 600 million people in Africa still have no access to power, representing 48% of the continent's population of nearly 1.2 billion (Organisation for Economic Co-operation and Development International Energy Agency, 2017).





**The Sustainable Development Goal on energy (SDG7) is incorporated in the social, economic and sustainability goals of Africa's Agenda 2063.** Sustainable energy is at the forefront of the development plans of African nations, recognising its central role in achieving all SDG targets and mitigating and adapting to climate change. Out of the 53 African Nationally Determined Contributions (NDCs), 45 contain quantified renewable energy targets (International Renewable Energy Agency/IRENA, 2018). These acknowledge the abundant opportunities offered by Africa's vast renewable energy to put the continent on a clean development path.

**Africa could meet nearly a quarter of its energy needs from indigenous and clean renewable energy by 2030.** Modern renewables amounting to 310 gigawatts (GW) could provide half the continent's total electricity generation capacity. This corresponds to a sevenfold increase from the capacity available in 2017, which amounted to 42 GW. A transformation of this scale in Africa's energy sector would require average annual investment of 70 billion US dollars (USD) to 2030, resulting in carbon-dioxide emissions reductions of up to 310 megatonnes per annum (IRENA, 2015).

**Accelerated deployment of renewables creates jobs and brings health benefits.** The renewable energy sector today employs 10.3 million people worldwide. With far-sighted industrial policies and targeted skills development, millions of new jobs can be created in Africa. Doubling the share of renewables by 2030 would create additional economic value by increasing global gross domestic product by up to 1.1%. This would signify a 3.7% improvement in global welfare and jobs for over 24 million people in the renewable energy sector (IRENA, 2016c). This would enable further economic benefits such as improved healthcare services, especially in the most remote areas. It would also further support the empowerment of women, who represented 35% of the renewable energy labour force in 2016 (IRENA, 2016b) and whose role will become more prominent, notably through the productive use of renewable energy.



# INTERNATIONAL CO-OPERATION TO ACCELERATE AFRICA'S ADOPTION OF RENEWABLES

**IRENA's engagement with Africa on renewables dates back to the Agency's formation nearly a decade ago.** In July 2011, IRENA convened a high-level consultative forum in which African nations along with development partners formulated renewable energy priorities. A Ministerial Communiqué entitled "Renewable Energy for Accelerating Africa's Development" highlighted Africa's significant potential for renewable energy and addressed the emerging issues related to climate change mitigation and adaptation. To utilise this potential, it underlined the importance of IRENA's strategic presence in Africa and its co-operation with African partners. Over the years, this has been pursued through the development of the Clean Energy Corridors, a key component of IRENA's engagement and its effort to promote regional market integration.

**Clean Energy Corridors in Eastern, Southern and West Africa are helping African countries scale up renewable power generation and cross-border electricity trade.** The Clean Energy Corridors in Africa aim to support efforts to meet the continent's fast-growing electricity needs through accelerated development and optimal use of the region's abundant renewable energy resources. The Corridors largely focus on utility-scale development of renewables-based electricity with a cross-border trade dimension to benefit from resource efficiency and economies of scale. Clean Energy Corridors were first established within the Eastern Africa Power Pool and the Southern African Power Pool, and then extended to the West African Power Pool.



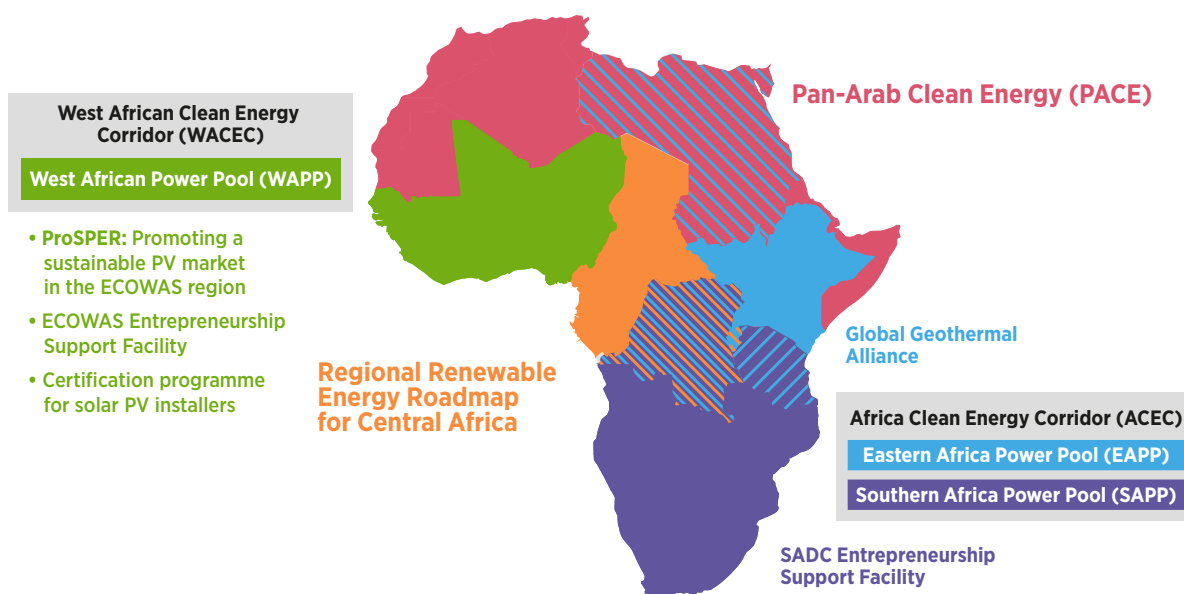
**Regional collaboration with North and Central Africa is being strengthened.** The Pan-Arab Clean Energy (PACE) initiative provides a regional action plan to scale up renewables in power systems across the Arab region. Its implementation is complemented by IRENA’s country-level support, such as through the recent launch of the Egypt Renewable Energy Outlook. The objective is to strengthen an investment framework that will enable cost-effective provision of up to a quarter of Egypt’s total final energy supply from renewables in 2030. IRENA also collaborates with the Economic Community of Central African States (ECCAS), supporting the development of a renewable energy roadmap for the sub-region. The roadmap provides a set of specific actions to strengthen enabling policies and regulatory, institutional and financial structures for renewable energy deployment at regional and national levels.

IRENA’s regional work has created a strong framework for building technical knowledge and capacity, and for creating investment environments that are more conducive to renewables in a growing number of countries. This success can be attributed to several key factors described below.

**IRENA’s regional initiatives rest on high-level political commitment and support.** IRENA’s work consistently emphasises local leadership and guidance, along with strong ownership by all involved. The implementation of the Africa Clean Energy Corridor (ACEC) is guided by the Ministerial Communiqué that endorsed the ACEC Action Agenda in January 2014 and contributed to the development of Africa’s flagship climate action programme, the Africa Renewable Energy Initiative (AREI).

The West Africa Clean Energy Corridor (WACEC), enjoying broad regional political support, was adopted by the Council of Ministers for the Economic Community of West African States (ECOWAS) as an annex to the ECOWAS Treaty in December 2016. This was then endorsed by the Summit of ECOWAS Heads of State and Government in June 2017.

Map 1: IRENA’s regional engagement in Africa



ECOWAS = Economic Community of West African States

Disclaimer: Boundaries and names shown on this map do not imply any official endorsement or acceptance



In March 2017, the African Union recommended the integration of the Clean Energy Corridors into national renewable energy and climate change agendas. The PACE initiative was adopted by the League of Arab States, while the Central Africa roadmap, which was technically validated in November 2018, is set to receive the endorsement of Central African Heads of State. IRENA has also pursued strategic, results-oriented partnerships with various African organisations and development partners active in the field of renewables, aiming to leverage existing efforts, avoid duplication and maximise long-term impact.

**Strong linkages to regional programmes and initiatives help benefit from synergies and complementarities.** From the outset, all efforts have been fully aligned with the Program for Infrastructure Development in Africa (PIDA), and since March 2018, IRENA holds observer status with the PIDA steering committee. Through this participation, IRENA has engaged with the African Union and the New Partnership for Africa's Development (NEPAD) in the formulation of the next phase of PIDA's programme. This next phase is intended to harness Africa's vast renewable energy potential through continental infrastructure planning to 2030, beyond the current emphasis on hydropower and geothermal resources. Given the full alignment of respective objectives, IRENA also closely co-ordinates its work on the Clean Energy Corridors with the AREI.

The African Union recommends that national energy and climate plans should reflect IRENA's Clean Energy Corridor initiatives

### Box 1: Resource assessment using IRENA's Global Atlas for Renewable Energy

Featuring data from a consortium of more than 50 international research institutions, *the Global Atlas for Renewable Energy* forms the world's largest collection of recent and accurate public maps of renewable energy resources. The Global Atlas plays a central role in IRENA's activities in Africa.

Based on wind and solar information in the Global Atlas, zoning maps have been drawn of all 21 ACEC countries. For the ACEC region, the zoning exercise revealed an aggregate economic potential of up to 3 834 GW for wind, 15 334 GW for solar PV and 5 282 GW for solar CSP (Wu et al., 2015). This study considered quantitative assessments of renewable energy resources as well as several parameters underpinning investment decisions, such as topography, distance to the grid and load centres, transport infrastructure and protected areas. National stakeholders have been trained in the use of the methodology and maps so that they can later re-run the model with new or updated data to get refreshed zoning results. IRENA also assessed the electricity generation potentials of solar and wind using GIS satellite maps from the Global Atlas to support long-term energy planning. Under the resource assessment pillar of the WACEC, IRENA developed its Suitability Analysis using the Global Atlas. The Suitability Analysis helps identify areas that would be suitable for grid-connected and off-grid solar and wind projects. This exercise was carried out at the regional level in West Africa and uncovered total technical potential of up to 128 GW for on-grid wind, 171 GW for off-grid wind, 1 451 GW for on-grid solar PV and 1 830 GW for off-grid solar PV (IRENA, 2016a).

When trying to establish the renewable energy potential for a large region, suitability analysis and zoning are two distinct but complementary geospatial tools available. Although their goals are similar, the former is a quicker first-cut approach. Results take the form of map pixels representing suitable areas that can be sensibly aggregated to estimate the potential. The methodological approaches of these two tools, especially concerning considerations on the impact of grid availability, area clustering, costing information and major differences in size and overall resource potential of a particular region, explain the difference in the technical potential output for the two sets of regions.

To support renewable energy investments and financial decisions prioritised by the African countries, IRENA developed its Site Appraisal service. This is a financial pre-feasibility analysis to provide a benchmark tariff to help guide the interactions between governments and project developers. In this way, local authorities and prospective project developers acquire a clearer understanding of the economic feasibility and investment needed to develop the sites.

The Site Appraisal service has been used so far to evaluate 92 solar PV and wind project sites in Cabo Verde, Comoros, Eswatini, Mali, Mozambique, Nigeria, Sudan, Togo, Zambia and Zimbabwe. Together, these amount to 2 262 megawatts (MW) of solar PV and 1 184 MW of wind projects.



# IMPACT ACHIEVED ON THE GROUND

Concrete outcomes and impact have been attained on the ground. IRENA's initiatives are tailored to regional and country-specific needs and priorities. They are implemented through three core work streams, namely resource assessment and zoning, national and regional energy planning, and enabling frameworks for investment. These are complemented by cross-cutting capacity building and awareness-raising activities. The resulting work has brought about a range of valuable and tangible outcomes.

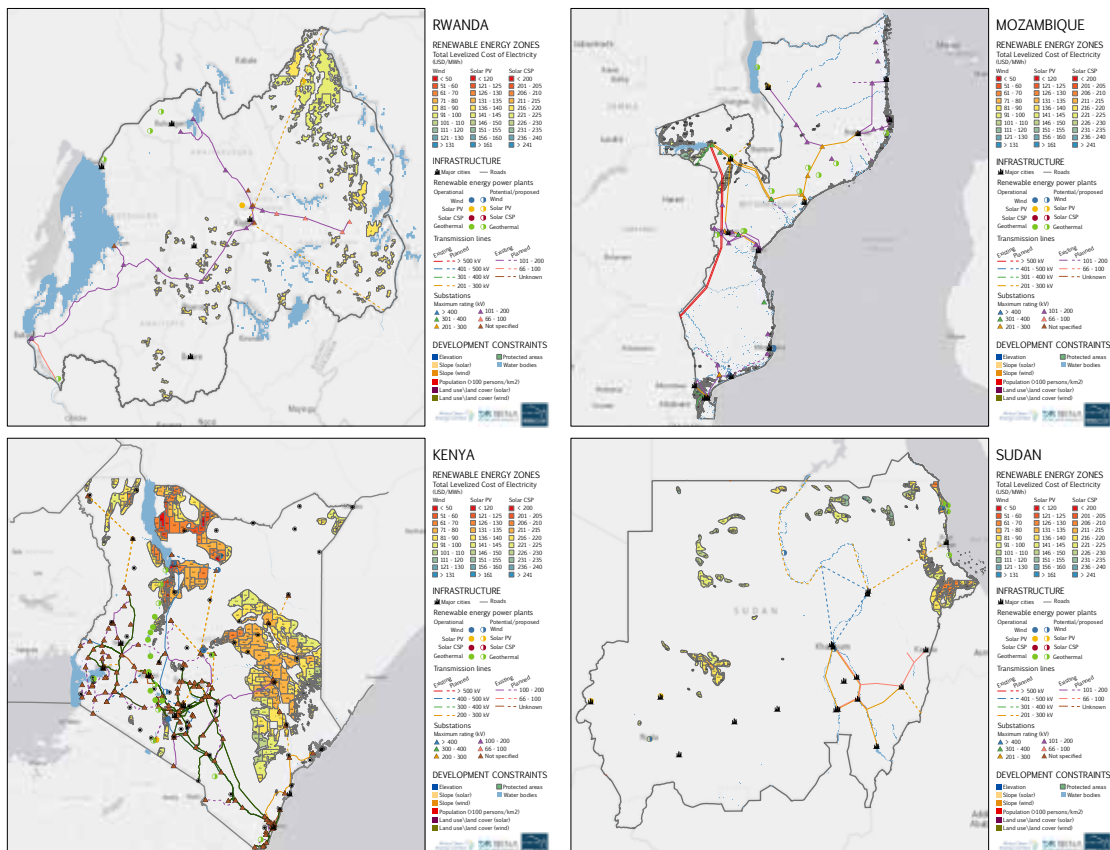
» **Mapping out resource-rich and cost-effective areas for solar and wind development.**

Renewable energy resource assessment and zoning analysis has identified high resource potential and cost-effective power generation zones for utility-scale wind, solar photovoltaic (PV) and concentrated solar power (CSP) development across East, Southern and West Africa. Based on this work, the financial viability and bankability of 92 solar PV and wind project sites have been assessed in ten African countries so far (see box 1).

» **Integration of least-cost investment options into national and regional planning.**

The outcomes of resource assessments have provided essential input into long-term planning processes at regional and national levels. IRENA's energy system planning model is configured to support long-term power generation expansion plans at continental, sub-regional and national levels. This allows decision-makers to assess least-cost investment options in light of a specific policy goal, such as increased renewables penetration, reduced import dependency and improved electricity affordability.

## Zoning maps highlight promising solar and wind sites



Source: IRENA and LBNL (n.d.)

IRENA's input has been indispensable in the development of power-system plans. For example, IRENA helped to update the WAPP master plan by supporting the collection of reliable data on renewable energy potential and costs, as well as through a regional planning report for West Africa. At the national level, IRENA supported the development of the Eswatini Energy Masterplan 2034 launched in October 2018 (see box 2). This included a comprehensive programme of national training, development of the national energy planning model and technical support on the development of the Masterplan report. A similar national support programme is currently under way in Sierra Leone to support the elaboration of a national energy masterplan to 2040.

» **Investment frameworks more conducive to renewables.**

Supporting countries in strengthening their policy, regulatory, technical and financial frameworks is a key priority. Through a country-led, multi-stakeholder RRA process facilitated by IRENA, 14 African countries have assessed the suitability of their existing conditions for sustained deployment of renewable energy and identified key actions to accelerate deployment.

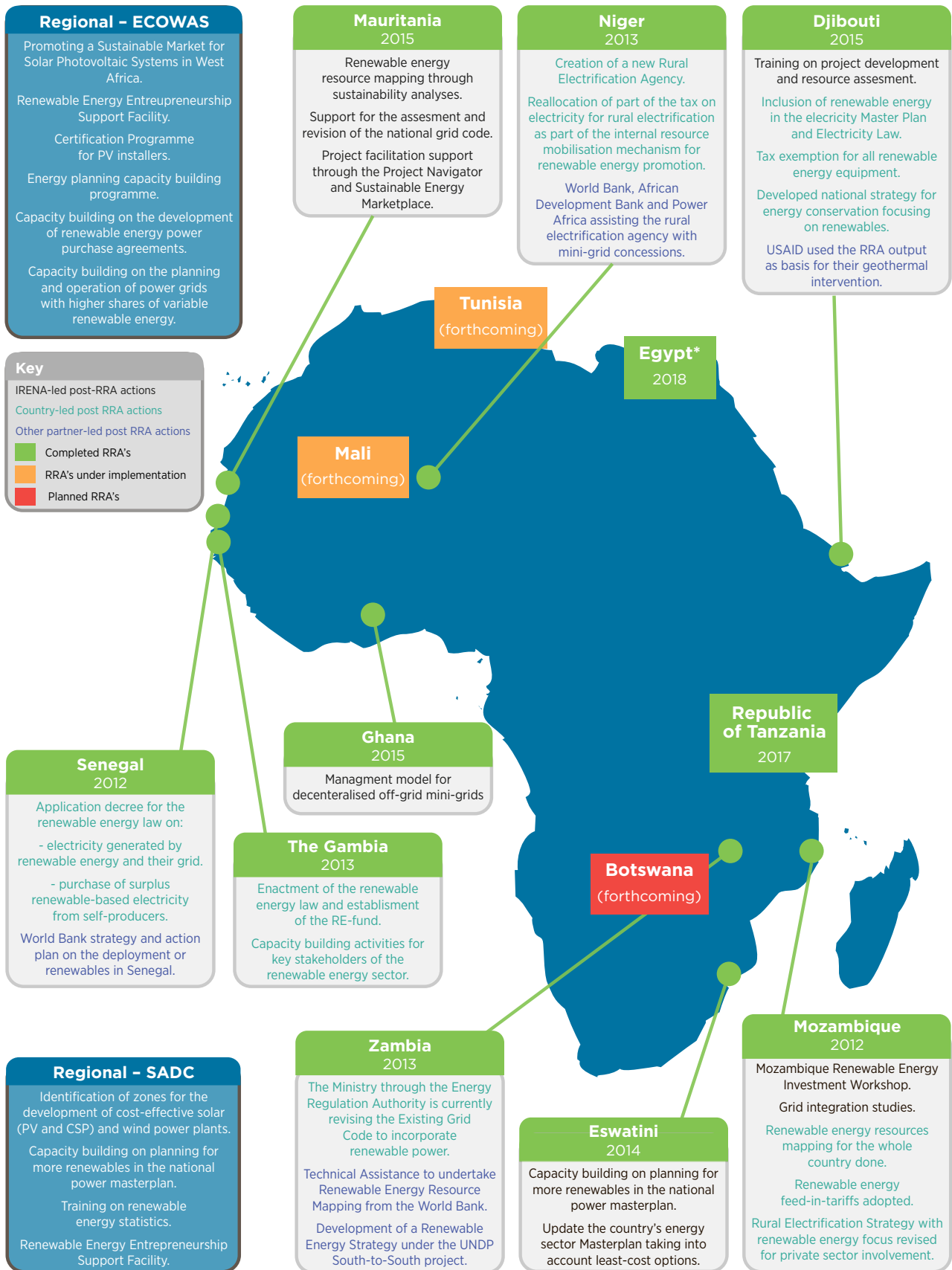
IRENA's continuous engagement with countries during the post-RRA implementation phase, as well as the prompt formulation of assistance by development partners on the basis of RRA recommendations, have played a significant role in creating investment conditions that are more conducive to renewables in Africa.

### Box 2: Eswatini energy masterplan to 2034

The Renewables Readiness Assessment (RRA) for Eswatini featured long-term energy planning among its priority areas of action (IRENA, 2014). IRENA and the Government of Eswatini subsequently launched a two-year capacity building programme for energy planning. This included a comprehensive national training programme, technical support for development of the national planning model and advising on the draft Masterplan. The Eswatini Energy Masterplan 2034 was developed by a national working team with members from key stakeholder institutions. It provides national decision-makers with a quantitative basis for planning the energy sector developments, particularly by identifying and addressing country-specific barriers in the supply of energy. Launched in October 2018 upon its endorsement by the Cabinet, the Energy Masterplan 2034 defines a national energy sector pathway that balances the affordability of energy with a move towards a sustainable energy supply future.



Map 2: Renewables Readiness Assessments, technical assistance and their impacts in Africa



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\* Renewable Energy Outlook, combining the RRA with REmap analysis





» **Local capabilities enhanced across the renewable energy value chain.**

Capacity building is a central priority in African countries. Over the years, IRENA has provided numerous services targeting policy makers as well as other energy stakeholders who have to play a part in accelerating renewables deployment. IRENA pays particular attention to the areas where it can add most value. For example, in recognition of the essential role of reliable data, energy statisticians across Africa have been trained in the collection, processing and dissemination of renewable energy data as well as the construction of national renewable energy balances. Regional activities are adjusted to specific needs while aiming to capitalise on experiences and best practice for the benefit of the Agency's wider membership.

In the Southern African Development Community (SADC) region, IRENA first organised a Renewable Energy Training Week in November 2015. This training helped regional and national regulatory authorities assess their existing planning processes vis-à-vis global best practices for empowering regulatory roles to provide greater investment certainty and ensure timely project delivery. The recent IRENA report on renewable energy auctions in sub-Saharan Africa summarised the implementation practices in auction design and impacts from the recent processes undertaken in South Africa, Uganda and Zambia to support peer-to-peer learning and exchange of experiences on the continent.

In West Africa, IRENA's capacity development focus corresponds to the region's ambition for greater solar and wind deployment. It includes grid planning and operation with variable renewables, as well as for devising power purchase agreements for renewable power. Two different courses of regional training have been provided to national stakeholders from 14 WAPP countries. Firstly, training on grid integration of variable renewable energy took place in May 2018, complemented by a study tour in China hosted by IRENA and the State Grid Corporation of China. Secondly, two rounds of training on renewable energy power purchase agreements were held in 2018. Follow-up activities have been drawn up for both components for the next phase of programme implementation.

## Capacity building is aligned with regional ambitions to boost solar and wind deployment



» **Improved project bankability and easier access to finance.**

IRENA has a suite of tools and methodologies to support development and access to financing for renewable energy projects. The IRENA Project Navigator has provided training at sub-regional and national levels to support the development of bankable renewables projects. IRENA's Sustainable Energy Marketplace had, by December 2018, actively promoted and facilitated access to finance for 79 projects in 24 African countries, which were seeking total investment of more than USD 3 billion. The IRENA/ ADFD Project Facility, which mobilises funds from the Abu Dhabi Fund for Development (ADFD), has provided concessional loans for eleven transformative, scalable renewable energy projects with clear development impact potential in ten African countries.

» **Amplified off-grid impact.**

Regional capacity building in West Africa has helped to strengthen development, management and financing for off-grid solar solutions. Through follow-up programmes in the region, IRENA has supported:

- Improvements to the skills of renewable energy professionals through a regionally harmonised certification system recognised in all ECOWAS countries and currently being piloted for certification of off-grid solar PV technicians in Ghana and Senegal.
- Capacity development of over 80 small and medium-sized renewable energy developers to help them improve their business operations and raise over USD 1 million from local financial institutions. The programme is now being replicated in the SADC region (see box 4).

### Box 3: Project facilitation platforms

IRENA has supported the development of bankable renewable energy projects and easier access to suitable financing through a range of largely web-based project facilitation tools. Notably, these include IRENA's Project Navigator and Sustainable Energy Marketplace tools.

The Project Navigator's online platform provides comprehensive, easily accessible and practical information, tools and guidance to assist in the development of bankable renewable energy projects. The Navigator introduces a project life cycle process structured into several distinct phases and designed to support the progressive development of renewable energy projects. At this stage, technical concept guidelines are available for onshore wind, solar PV, woody biomass, small hydropower, mini-grids and solar home systems. The Navigator, soon to be available in French too, will continue to be used to support the development of bankable renewables projects across the continent.

The Africa platform within IRENA's Sustainable Energy Marketplace is an online matchmaking platform between project developers, financial institutions, and service and technology providers. Initially covering the ACEC countries, it was announced at the South Africa International Renewable Energy Conference (SAIREC) in October 2015. Currently, the Sustainable Energy Marketplace provides access to over 60 financing instruments and 119 service and technology providers.

**IRENA ADFD**  
Supporting Energy Transition

**PROJECT NAVIGATOR**

**Global Atlas**  
FOR RENEWABLE ENERGY

**SUSTAINABLE ENERGY MARKETPLACE**



#### **Box 4: Renewable Energy Entrepreneurship Support Facility**

In partnership with the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE), and the International Institute for Water and Environmental Engineering (2ie), IRENA established the ECOWAS Renewable Energy Entrepreneurship Support Facility in 2015. The facility aims to enhance and strengthen the capacity of small to medium-sized entrepreneurs in the renewables sector.

Through capacity building, technical advisory and mentorship support, over 80 enterprises from all 15 ECOWAS member countries have so far been assisted over three annual cohorts. Approximately USD 1 million in debt financing was accessed through the project proposals submitted to local funding institutions. The facility also contributed to the creation of the Regional Solar PV Professionals Association.

In conjunction with the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE), IRENA is replicating the initiative in southern Africa. Established in 2017, the facility has attracted nine partners comprising funding institutions, business incubation centres and technical training centres. With particular focus on gender and youth development, the first call for applications for entrepreneurs that will be supported through the facility was launched in 2018 and will be followed by additional calls in 2019.



» **A stronger role in Africa for geothermal energy.**

While Kenya has been the centre of geothermal development so far, new projects for geothermal power generation and direct heat utilisation are planned in the region. However, the large geothermal potential remains mostly untapped, notably along the East African Rift System. Ten African countries and five regional African organisations have become members or partners in the Global Geothermal Alliance, a global platform facilitated by IRENA to promote development in this key sector through enhanced dialogue, co-operation and co-ordinated action.

## Resource and market assessments are a priority for the Global Geothermal Alliance

For the Global Geothermal Alliance, resource and market assessment are a key priority action area. In this respect, Ethiopia has been identified as a pilot country to apply international guidelines and promote standardisation in the way resource assessment is conducted, reviewed and reported. Further IRENA work aims to overcome barriers relating to high upfront costs, investment risks, policy uncertainty, shortage of skilled professionals and environmental concerns. The ongoing market assessment in East Africa should provide scope for future regional co-operation on geothermal energy, including for direct utilisation to boost food security.

### Box 5: The International Off-grid Renewable Energy Conference and Exhibition



The International Off-grid Renewable Energy Conference (IOREC) is the global collaborative platform convened biennially by IRENA for sharing experience and best practices in deploying off-grid stand-alone and mini-grid renewable energy solutions ([iorec.irena.org](http://iorec.irena.org)). Africa has hosted two IORECs – one in Ghana in 2012 and one in Kenya in 2016.

Each IOREC has emphasised that modern energy access is central to achieving the SDGs. They have all concluded that governments should consider the entire spectrum of opportunities available from off-grid renewable energy solutions to expand affordable, reliable and sustainable access to households, support livelihoods, enhance delivery of essential services (e.g. health) and strengthen gender equality. National electrification strategies should mainstream off-grid renewable energy solutions and facilitate co-operation between actors. To ensure private sector involvement in energy access, the policy and regulatory framework should provide the right set of incentives and risk coverage to private investors. It should alleviate the barriers that block financing in the sector.

The fourth IOREC that concluded in Singapore in 2018 was followed by the International Conference on Renewable Energy Solutions for Healthcare Facilities. Participants stressed the urgent need for increased co-operation between energy and health sectors at all levels, from strategy and planning to policies, budgeting, procurement and implementation. There is a particularly strong need for innovation in delivery and financing models, and dedicated financing schemes by banks and financing institutions. Innovation should also be encouraged and promoted in the design of suitable and efficient medical devices appropriate for rural areas. Implementing the right ecosystem for accelerating off-grid renewable energy deployment requires efforts to develop the necessary human capital by building capacity across the off-grid value chain and supporting local entrepreneurship.



IRENA's regional work has established the framework to boost technical capacity and create conducive investment conditions for renewables



# LEVERAGING PARTNERSHIPS FOR IMPACT

**IRENA pursues strategic, results-oriented partnerships with various African organisations and development partners active in the field of renewables.** These aim to leverage existing efforts and resources but also to establish regional dialogues, support the creation of sufficient enabling frameworks, reinforce capacities with a view to learning from best practices globally, and release renewable energy potential in the optimal manner, taking local conditions into account.

In implementing its mandate in Africa, IRENA has collaborated extensively with regional partners. These have included the Africa Union Commission (AUC), the African Development Bank (AfDB), the Africa Renewable Energy Initiative (AREI), the Common Market for Eastern and Southern Africa (COMESA), the Economic Community of Central African States (ECCAS), the Economic Community of West African States (ECOWAS), the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE), the ECOWAS Regional Electricity Regulatory Authority (ERERA), the League of Arab States (LAS), the New Partnership for Africa's Development (NEPAD), the Regional Centre for Renewable Energy and Energy Efficiency (RCREEE, covering the Arab region), the Regional Electricity Regulators Association of Southern Africa (RERA), the Southern Africa Development Community (SADC), the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE), the Southern African Power Pool (SAPP) and the West African Power Pool (WAPP).

Development partners and various IRENA members have also played a significant role, with valuable support coming from, among others, the German Agency for International Cooperation (GIZ), Lux-Development, Power Africa, Sustainable Energy for All, the European Union, the Government of Norway, the Government of Wallonia, the International Atomic Energy Agency, the State Grid Corporation of China and the United Arab Emirates.





# OUTLOOK FOR IRENA'S ENGAGEMENT ACROSS AFRICA

The African continent has embarked on a development path that will lead to a 100% increase in its energy demand by 2030. Since 2015 this is driven by its increasing population and growing economy. Given the continent's abundant resources, renewable energy has a crucial role to play to supply this exponential growth in energy demand and offer modern services to the population with no access to energy today. IRENA will continue facilitating and supporting this process through its well-established regional and country work in Africa, by further strengthening enabling frameworks to promote investments and by cultivating the associated knowledge and technical capabilities.

IRENA's involvement in the region is already considered a critical factor in the acceleration of Africa's transition to more reliable, affordable and sustainable energy systems thanks to the tangible impact of its work. IRENA will enhance co-operation and co-ordination with the AREI and PIDA, and continue aligning its work with other relevant continental initiatives and programmes to scale up renewables uptake in the continent's long-term energy plans.

Technical advice and capacity building will be deepened and extended, in order to support the utilisation of the region's renewable energy potential to meet and go beyond current targets. This can be achieved through creating the conditions for cross-border renewable electricity trade, and by conducting refined resource assessments that prioritise the viability of project-specific areas and investment potential. A broader portfolio of such technical assistance will also address pressing and emerging issues relating to energy statistics, policy mechanisms and project facilitation.

Existing country-specific assessment tools, such as the RRA and REmap, will remain key to providing longer-term vision for renewable energy deployment. At the same time they will identify major bottlenecks that warrant policy attention and will provide practical recommendations to resolve them. Such country-level engagement will inform the Agency's regional programmes to fine tune its scope in light of emerging country needs and priorities.

IRENA will continue to pay particular attention to energy access to create decentralised renewable energy solutions for supplying modern energy services to half the African population. This remains an essential task for sustainable development and prosperity. IRENA will prioritise maximising social and economic benefits of renewables-based energy access to advance agriculture and food security, improve human health, promote inclusion of women, enhance refugee settlements and reduce poverty.



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