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INVESTMENT AND TECHNOLOGY PROMOTION OFFICE ITALY

SUSTAINABLE DEVELOPMENT GOAL 9
INDUSTRY, INNOVATION AND INFRASTRUCTURE

PROJECT

"Fostering international partnerships between companies and/or institutions operating in the energy and environment sectors" (ID 190065)

Progress Activity Report

January/February 2020 (2 months)

Content

Project Purpose

The overall objective of the project is to support commercialization and scale-up of sustainable energy and environmental technologies and projects in Small and Medium-sized Enterprises (SMEs) in the partner countries through promotion of investment and trade.

The project objective will be achieved by mentoring businesses and projects, helping them build capacity and by facilitating access to financing. The services offered will be tailored to specific markets and open avenues for SMEs to grow and upscale. At the same time, UNIDO will work with partners to establish and strengthen markets. The market intelligence gathered together with regional or global best practices and norms inform the shaping of the demand and market pull. This, in turn, will create demand for technology facilitation, innovation, commercialization, entrepreneurship and upscaling.

Therefore, the two main interrelated approaches of the project are:

1. **Providing technical assistance to identify and develop high-impact innovations and investment projects in SMEs in the sustainable energy and environment sector.**
    a. Baseline data gathering and analysis conducted
    b. Identify sustainable energy and environmental technology innovations and projects in SMEs in the seven partner countries
    c. Develop innovations and projects into a well-structured investment opportunity through dedicated expert coaching and mentoring
    d. Facilitate policy dialogues, knowledge creation and linkages between the sustainable energy and environmental technology projects and other international partners

2. **Facilitating investment, commercialization and trade opportunities through international partnerships and collaboration**
    a. Provide dedicated matchmaking services for SMEs with innovations and projects in the seven countries with potential partners and investors in Italy and elsewhere
    b. Offer curated networking opportunities among SMEs from the seven countries and Italy and other countries in similar fields to discuss product co-development, joint venture and investment, trade, and collaboration opportunities in a business-to-business context
    c. Facilitate knowledge exchange and transfer among policy makers from the seven countries and Italy to discuss best-practices and lessons is supporting energy and environmental technologies in SMEs

Introduction and next steps

From an operational point of view, **the project has started in January 2020** with the recruitment of the first National Investment Experts based in Rome.

The activities carried out in these two months mainly consisted in the **identification of the relevant national and local strategies** in energy and environment in each country and the **stakeholders mapping** with the aim of paving the way for the inception missions to be carried out, possibly, by the end of June. At the moment, also following the indication received by the main stakeholders involved in the project, the activities planned for Iran are in stand-by.

Please find below the possible dates for the mentioned **inception missions**:

- Gaborone, Botswana – 17/20 March 2020
- La Habana, Cuba – 8/15 June 2020 (in occasion of the international fair "Energias Renovables Cuba" (to be held from 10 to 12 June 2020)
- Addis Ababa, Ethiopia – 11/17 March 2020
- Nursultan and Almaty, Kazakhstan – 30 March/7 April 2020
- Nairobi, Kenya – 16/23 March 2020
- Lima, Peru – 21/29 April 2020

Botswana

Background

Botswana is a land locked country with a size of 582.000 km^2, a GDP of 18.6 bill US$ (2018), with a population of 2.25 million growing at a pace of ca. 2.5% in the past 10 years (World Bank, 2020). In 2018, only 38% of the population remains in the rural areas, of which 52% are women. Botswana has a predominantly dry climate with the Kalahari Desert covering about 70 percent of the country, and with an average annual rainfall of just over 400 mm. On the average, Botswana has a nearly universal access to clean water, education and health care.

At independence in 1966, most people in Botswana relied on mixed agriculture (crops and livestock), hunting and gathering wild foods and remittances from migrant labour in South Africa. Although the farming of sorghum, maize, millet and beans, along with small stock and cattle, are still important for subsistence and also commercial returns, Botswana's transition from one of the world's poorest countries (in 1966) to an upper-middle country (at present) is predominantly due to the discovery and commercialization, since the 1970s, of diamonds. Since then, diamond and valuable minerals mining activities have provided a strong backbone for economic development, as reflected by the world's highest economic growth rate of 8.7% from independence in 1966 to 2008. (FAO, 2018)

Due to the export of valuable minerals, Botswana has enjoyed strong and stable growth since independence, with sizable fiscal buffers and prudent policies playing a key role in shielding the economy against diamond market weakness and volatility. Despite this, more recently, the limitations of Botswana's diamond-led development model have become more apparent: growth is slower, inequality remains high and job creation is limited. After achieving strong growth of 4.5% in 2018, growth decreased to 4% in 2019 reflecting muted trends in global diamond mining and a less buoyant private sector. Economic growth is expected to remain stable (ca. 4%/year) in the medium-term, with the authorities' ability to implement both a new growth model focusing on export diversification strategies, as outlined in the National Development Plan 11 (NPD 11), and the much needed doing business reforms that will play a key role in economic performance (World Bank, 2020).

"Vision 2036" is Botswana's key agenda defining the country's aspirations and goals. It aims to transform Botswana from a middle-income to high-income country within 2036 by steering Botswana's economy away from the past and present resource-driven growth model to one based on high productivity, innovation and competitiveness. To deliver the "Vision 2036", Botswana will develop a comprehensive National Transformation Strategy (NTS) which will be executed via National Development Plans (NDPs), including District and Urban Development Plans. The "Vision 2036" agenda builds on the "Vision 2016", Botswana's first national vision (1996-2016). What is today clear is that many of the goals set in 1996 remain relevant considering the changes that will have to be implemented in order for Botswana to deliver the aspired prosperity – the transition to a high-income country. In order to do so, other than executing efficiently the actions deemed necessary, the "Vision 2036" balances the aspirations of prosperity against four programmatic pillars: sustainable economic development, human and social development, sustainable environment, and governance, peace and security; therefore aligning the "Vision 2036" agenda with both Africa's Agenda 2063 and the UN's Agenda 2030 SDGs.

Energy and Environmental National Strategies and Policies

Regarding the energy sector, "Vision 2036" recognizes that the key factors for sustainable energy (security) are availability, accessibility, safety, affordability and reliability. The "Vision 2036" agenda states that "Botswana will be energy secure, with diversified safe and clean energy sources, and a net energy exporter". According to the vision, the non-renewable resources will be complemented by the exploitation of renewable energies; an agenda that will be backed by policies and regulations that will facilitate private-public partnerships and investments in clean energy technologies and renewable energy sources. In the context traced by the "Vision 2036", the practical actions will be executed via National Development Plans (NDPs), including District and Urban Development. At present, the NDP11 (April 2017 to March 2023) is the document tracing the route to achieve the "Vision 2036" energy-related vision.

The Ministry of Minerals, Energy and Water Resources (renamed to Ministry of Minerals, Green Technology and Energy Security (MMGE) is responsible for providing the strategic direction for the energy sector in Botswana. The Department of Energy has the mandate for establishing the policy, legal and regulatory framework for the supply and demand-side management of energy in the country. The Botswana Energy Regulatory Authority (BERA) is an independent body that is mandated to oversee the economic sustainability of energy supply, setting tariff regulations and overseeing efficiency of supply. However, the government also provides guidance on their objectives in terms of energy provision and subsidy levels. The Botswana Renewable Energy Agency (BREA) promotes and coordinates the uptake of renewable energy in the country.

The Botswanan energy regulatory framework is composed by a backbone of three elements: the Electricity Supply Act, 1973 (amended in 2007); the Botswana Biomass Energy Strategy, 2009; and, currently, the National Development Plan, 2016 (valid for the 2017-2023 period). In addition, side regulations, codes, licenses, strategies and plans and tariff settings are set to adjust the energy market in relation to the necessities. Aside from national entities, Botswana is part of the South African Power Pool (SAPP).

The SAPP is governed by four agreements: the Inter-Governmental Memorandum of Understanding which enabled the establishment of SAPP; the Inter-Utility Memorandum of Understanding, which established SAPP's basic management and operating principles; the Agreement Between Operating Members which established the specific rules of operation and pricing; and the Operating Guidelines, which provide standards and operating guidelines. The SAPP has twelve member countries represented by their respective electric power utilities organized through SADC – which, in Botswana, is the Botswana Power Corporation (BPC). The SAPP mission is that of providing the least costly, environmentally friendly and affordable energy and increase accessibility to rural communities via the creation of a common and efficient Southern African electricity market that may sustain and propel the development of the region. This will be achieved via the construction of transnational power lines (such as the ZIZABONA interconnector) and regulatory streamlining.

Regarding national strategies complementing the NDPs, The Botswana Power Corporation and the Department of Energy are continuously undertaking energy efficiency campaigns through media and direct interactions with the public; walk about, earth hour commemorations, national exhibitions, and schools outreach campaigns. Through the demand side management initiatives, 50MW savings were realised, a bulk of which occurred during the peak of the regional power crisis in 2014. Relatively to the development of RES, the Government of Botswana has entered into an agreement with the World Bank to develop a renewable energy strategy. The goals of the strategy will be to unlock the country's potential, and to provide a firm basis for the scaling-up of the deployment of renewable energy technologies in the country's energy supply mix, especially of solar energy. The objective is to achieve a 20% energy saving during NDP11.

Regarding the sustainable management of natural and cultural resources, the NDP11' focus will be on the strengthening and/or development of policies and legislation to address threats to, as well as measures to

enhance the state of the environment. Specific areas will include land, water, energy, biodiversity and cultural resources, which are key to economic development.

Regarding infrastructure development, the NDP 11 development expenditure (inclusive of the Economic Stimulus Programme) is over P101.406 billion (ca. US$100 mill); the bulk of which will be used to fund various infrastructure projects in areas such as water, energy, tourism, agriculture, education and health. In addition, priority will continue to be given to the maintenance of existing infrastructure so as to preserve these national assets. There will also be investments in infrastructure projects by the private sector in general, and in particular through PPPs. In addition, in 2015 the Government has opened a Renewable Energy Fund Account with a 7.9 million Pula (bwp) grant from the Global Environment Fund as seed money. The fund is aimed at subsidizing renewable energy technologies for off-grid solutions especially for applications including solar water heating and water pumping. The Department of Energy is preparing modalities of operationalizing the RE Fund, with priority placed on installing Solar Water Heaters, Solar Home Systems and Water Pumping Systems.

Regarding Human Resource Development, the Human Resource Development Council, in line with its first five-year strategic plan (2016-2021), started developing human resource development sector plans to address the problem of skills mismatch and to produce a globally competitive human resource.

Overall, Botswanan officials stress that in order to develop the RE market, a better codified, clear and supportive regulative framework pertaining the Independent Power Producers (IPPs) participation in the Botswanan energy supply matrix and the renewable energy feed-in tariffs (REFIT) would be needed.

Current Energy Mix, Renewable Energy Sources potential and Environmental cutting-edge Technologies

In 2017, Botswana energy consumption was of ca. 2600 ktoe, composed by ca. 40% coal, 40% oil, 20% biofuels (mainly wood) and waste (IEA, 2020). Regarding the electricity mix, in 2016 99% of Botswana's electricity was sourced from coal, while refined petroleum products (oil, diesel, etc…) are imported – no reserves are available. Regarding the thermal energy mix, wood fuel accounts for ca. 30% of country's primary energy supply and 38% of total final energy consumption. Biomass supplies 46% household energy nationally, increasing to 77% at the rural level (UNEP, 2015). About 70.7 per cent and 40.5 per cent of households in urban and rural areas respectively use LPG for cooking. Regarding electrification rates, the country has recently made good progress through a large push for mini-grid and off-grid solutions in rural areas.
Energy consumption per capita in Botswana (in 2016, total of 2.688 TWh) in 2016 was 1.217 MWh, making it the 3rd sub-Saharan country (after South Africa and Mauritius) in terms of required energy intensity x capita – the average consumption in sub-Saharan Africa is (in 2016) 0.531MWh (IEA, 2018).

At this time (2020), the average resident in Botswana, using more than 200 kWh/month, is paying 88.28 thebe (1/100 of a pula (P), the currency of Botswana) per kWh, which is equivalent to US$ 0.0762/kWh (@ P11.59/US$). Compared with the average costs of electricity in the US, at $ 0.1273/kWh, and Germany, at $ 0.3140 $/kWh, it is clear that the low price of electricity is due to the heavy subsidies since the purchase price of electricity is consistently lower than the costs. It is also notable that the difference over the past few years has escalated, which is one of the main reasons that BPC has been running with an operating deficit.

The most significant threat to the market of renewable energies is the emphasis on coal fired production, particularly as it is locally available. Due to the scale of the electricity generation deficit, the current focus is on large-scale IPPs. Many of the policy commitments and reforms have not yet resulted in implementation, although the government appears to be committed towards building the market due to the challenges being

faced with the coal-fired generation. The framework for IPPs has been developed and the Renewable Energy Feed-in Tariff (REFIT) has been introduced. The government has also taken positive steps towards increasing the national tariffs to be cost-reflective. The REFIT was introduced in 2010 and up to 2014, 43.5 MW were expected to be installed based on biomass (12 MW), biogas (8.5 MW), landfill gas (3 MW), solar PV 5 kW to 25 kW (2 MW) and solar PV 25 kW to 1 MW (18 MW). The main potential exists for solar and biomass/ biogas projects, although models for how these technologies can provide off-grid have only been tested to a very limited extent.

Regarding the solar potential**:** Botswana has one of the highest levels of solar insolation worldwide, with direct normal irradiation (DNI) of 3,000 kwh/m2 /year. It is estimated that using less than 1 per cent of the country area, Botswana could meet its current electricity consumption (GOB, 2010). Global irradiation is highest in the west, averaging 2,350 kWh/m2 /year near Kang and around Kalahari Gemsbok National Park. The lowest potentials are on the north-eastern side of the country (IRENA, 2020).

Regarding the wind potential: wind average wind speeds are lower than 4 m/s, the minimum for wind energy to be viable. However, studies show that there may be superior wind speeds at higher altitudes. For instance, there are signs that at heights over 80 m, wind speeds have the potential to reach between 5-7 m/s. Kwai Pan has the highest winds speeds recorded to date, with wind velocities between 6 to 9 m/s (IRENA, 2020).

Regarding biomass potential: it would be preferable to shift from wood to more sustainable energetic mediums (LPG) in household uses. Regarding biomass destined to electricity production, the Botswana national Development Plan 2010-2016 accords priority to transforming agro-waste into biogas. It's worth mentioning a GEF-financed, UNDP-implemented project that will assist the Government of Botswana in meeting this priority through three project components: 1) institutional strengthening and capacity development; 2) the facilitation and establishment of biogas plants, and 3) the setting-up of utilisation and knowledge platforms. The outcomes of the project include the implementation of effective waste-management policies and guidelines with operational regulations: capacity to design and develop biogas projects in South-Eastern Botswana; the first best-practice public-private partnership established; reduction in greenhouses gas emissions (direct and indirect) of 1.65 tCo2e, and increased incomes through the use of small-scale biogas and bio-fertilizer, especially for women.

Stakeholders identified

- Ministry of Environment, Natural resources and Tourism (MENT)
- Ministry of Minerals, Energy and Water Resources (MMEWR)
- Botswana Investment & Trade Centre (BITC)
- Botswana Power Corporation
- Renewable Energy Association of Botswana (REAB)
- Botswana Chamber of Mines
- Business Botswana (former BOCCIM)
- Botswana Institute for Technology Research and Innovation
- Botswana Innovation Hub
- University of Botswana
- Botswana Development Corporation (BDC)
- Citizen Entrepreneurship Development Agency (CEDA)
- National Development Bank (NDB)
- Local Enterprise Authority

- Botswana Energy and Regulatory Authority (BERA)

International Organizations

- UNDP
- World Bank
- UNIDO Field Office in South Africa
- SACREEE (Southern Africa Centre for Renewable Energies and Energy Efficiency)

Cuba

Background

Cuba is the 138th largest export economy in the world and the 75th most complex economy according to the Economic Complexity Index (ECI). In 2017, Cuba exported $ 1.41 billion and imported $ 6.21 billion, with a negative trade balance of $ 4.8 billion. In 2017, Cuba's GDP was $ 96.9 billion and its per capita GDP was $ 8.43 million.

Cuba's main exports are: brown or beet sugar ($ 514 million), cigars ($ 264 million), nickel ($ 140 million), spirits and other spirits ($ 109 million) crustaceans ($ 78.1 million). The exports countries are: China ($ 379 million), Spain ($ 184 million), Germany ($ 82,3 million), Indonesia ($ 55,4 million) and Singapore ($ 52,4 million).

Cuba's main imports are: meat and chicken offal ($ 246 million), petroleum or bituminous mineral oils, excluding crude oil ($ 243 million), crude oil or bituminous minerals ($ 208 million), wheat and morcajo ($ 176 million) milk and cream ($ 164 million). The main origins of its imports are: China ($ 1.35 billion), Spain ($ 1.01 billion), Mexico ($ 356 million), Algeria ($ 353 million) and Brazil ($ 345 million).

Cuba is the 114th largest import economy in the world; in 2017, Cuba imported $ 6,21 milliard. Imports are guide from meat and chicken offal for 3.97% and petroleum or bituminous mineral oil for 70% (OEC).
In 1990, after the breakdown of the Soviet Union, Cuba faced a severe economic crisis due to the decline of oil imports from the Soviet Union, extreme weather conditions (hurricane) and the US embargo. However, the economic crisis has resulted as a starting point for a new ecological revolution (1993).

The revolution started through both the substitution of all electronic devices and the information campaigns aimed at teaching students, workers, families and communities about energy saving measures and renewable sources of energy. However, the goal of pursuing a sufficient energy saving was not reached, therefore in 2005 the Cuban government adopted more decentralized energy policies towards the development and financing of renewable energies.

Due to the challenges of the economic crisis and the subsequent ecological revolution undertaken, today Cuba represents an interesting case study in terms of renewable energies potential and the efforts made to be self-sustainable. In this framework, since 2006, Cuba has installed 1854 diesel and fuel oil micro-electrical plants and 4000 emergency back-up systems, upgraded over 120.000 electrical posts, and incorporated renewable sources of energy through the installation of 100 wind measuring stations, 180 micro-hydro systems, over 8000 independent solar electric systems in rural areas and 300 biogas plants, bioethanol and sugarcane biomass (Renewable Energy World - OLADE).

Energy and Environmental National Strategies and Policies

Since 2008, Cuba has been undergoing a political and economic transformation process. In this context, the Cuban government has engaged in a very ambitious plan to modify its energy matrix setting itself the goal of generating 24 % of its electricity in 2030 through renewable energy. The "Policy for the Perspective Development of Renewable Sources and Efficient Energy Use 2014 – 2030", is a strategy adopted by the

Cuban government to foster the adaptation and mitigation to the climate change and to lower the emission of carbon dioxide. The main objectives of the policy include the increase in the contribution of renewable energy sources in electricity generation (+24% of the total in 2030), the progressive replacement of fossil fuels, the diversification of the structure of fossil fuels and the increase in energy efficiency and savings. Likewise, the strategy's priorities are: the stimulation of investment and the research and development of the production of equipment.

According to this policy framework, the national entities are envisioned as the driving forces for the efficiency optimization and the investment plan calls for the installation of renewable sources of energy equipment. All the new constructions that have been undertaken under this policy and the investment processes include in their design the solutions of renewable sources and the rational use of energy, whenever the cost-benefit evaluation is in favour of that investment. It also provides tariff breaks, tax benefits and incentives to legal persons in order to stimulate investments related to clean technologies.

The prioritized programs correspond to the installation of bioelectric plants associated with the sugar industry and its completion with forest biomass, the assembly of wind farms, hydraulic energy with the maximum use of potentialities in small hydroelectric plants, the location of photovoltaic solar panels and solar heaters, and the use of agricultural crop residues and factory, livestock and urban waste, among others. The Minem (Ministry of Energy and Mines) promoted the consumers production of energy through sources of renewable energy for self-supply and the sale of surpluses.

In terms of tariffs and taxes, the foreign investments are highly prioritized and facilitated as the investors have the possibility to benefit from total or partial exemptions, both temporarily and permanently.
Legal entities that import raw materials, equipment, components, parts and pieces linked to renewable sources or the efficient use of energy, can also benefit from incentives in correspondence with current legislation.

In order to achieve a +24% generation of electricity from clean energy sources by 2030:

- ✓ Bioelectric plants associated with the sugar plants represent 14% (more than half).
- ✓ Wind energy, 6%, with the impulse of 13 projects that are currently being prepared or executed.
- ✓ Hydropower, 1%.
- ✓ Photovoltaic, 3%.

Current Energy Mix, Renewable Energy Sources potential and Environmental cutting-edge Technologies

Today, 85% of the power generation matrix in Cuba is made up of fossil fuel consumption. The remaining 15% is covered by renewable sources. Cuba relies heavily upon liquid fuels for electricity generation. Indeed, it has the 5th highest percentage of total energy derived from liquid fuels in the world. Specifically, of 19,366 GWh of gross electricity output in 2014, 61% was generated from fuel oil for centralized plants, 20% from fuel oil for distributed generators, 14% from natural gas, 4% from Independent Power Producer (IPP) oil including biodiesel from sugarcane biomass, and around 1% from other renewables.
It is expected that by 2030 the proportion of renewable energy in the national energy matrix will be at least 24%. It is necessary underline that Cuba's is a net importer of petroleum and that 38% of the fossil fuel currently used in the generation of energy is imported. In 2019, 687,000 MWh have been generated from renewable energy sources (wind, hydropower, solar, cane and non-cane biomass), corresponding to 178,000 tons of fossil fuel that would have otherwise been generated. By 2030, predicted the increase of 24% or more in generation of electricity from renewable sources in the energy matrix, 7,000 GWh will be achieved and approximately 1 800 000 tons of fossil fuel will be saved.

It is forecasted that Cuba will stop emitting more than six million tons of CO2 annually, if it will succeed in increasing its potential to generate electricity from sugarcane, forest-fired biomass, solar plants, hydropower and wind plants. (EIA)

The most common renewable source of electricity in Cuba is the "Bagasse", the dry pulp residue left over after sugar extraction from sugar cane. In 2009, the sugarcane energy's production accounted for 3% of overall electricity production in the country, making up 80% of Cuba's renewable profile at that time. Bagasse represents a high potential to boost the renewable energies production. Cuba has 57 sugarcane mills and 10 refineries that generated 730 GWh in 2017 and the country expects by 2027 to build up 25 bioelectric plants with a potential of 872 MW.

Cuba's solar industry is small but growing at a face-pace. In 2009, the country had only 1.8 MW of total installed solar PV capacity and 3.8 MW installed capacity in 8,000 solar water heaters. In recent years, with the implementation of the "Policy for the Perspective Development of Renewable Sources and Efficient Energy Use 2014 – 2030", Cuba has begun investing in utility-scale solar projects because of its high solar potential. The daily average solar energy that reaches Cuban land throughout the year is 5 kWh/m2. A key barrier to investment in further solar energy is the initial capital costs to build PV systems. To reach its goal of 700 MW of solar capacity by 2030, the government is looking for further private investment, including investment in a 100 MW plant in Cuba's western provinces.

Wind generation is further developed than solar but still makes up only a small portion of total capacity. Currently, the country has 11.2 MW installed capacity in four wind parks. To reach its goal of 633 MW of wind generation capacity, Cuba plans to build 13 wind farms along the northern coast of the country. Foreign capital has been earmarked to build seven out of 13 of these wind farms.

Speaking about hydropower, Cuba has about 650 MW in installed hydro power capacity. Most of hydropower comes from isolated systems in off-grid areas. However, a large portion of unutilized potential is in protected areas. Thus, Cuban leaders do not appear to be planning an expansion of the resource (EDF – Environmental Defense Fund).

Stakeholders identified

Local institutions and agencies

- Ministry of Energy and Mines (MINEM)
  - Department of Renewable Energy
  - Department of Electricity
  - Department of Geology
- Ministry of Industry (MINDUS)
- Ministry of Construction (MICONS)
- Ministry of Foreign Trade and Foreign Investment (MINCEX)
- Ministry of Science, Technology and Environment (CITMA)

The Ministries are all engaged in reaching the goals of the "Policy for the Perspective Development of Renewable Sources and Efficient Energy Use 2014 – 2030". Main goal of the policy is to produce up to 24 % of its electricity in 2030 through renewable energy.

- Other relevant institutions and specialized national agencies
  - Electricity Union of Cuba (UNE)
    UNE is a company of Cuba State that operates through the Ministry of Energy and Mines. It aimed at guaranteeing the generation, transmission, distribution and commercialization of electricity through the union of national companies and local companies.

- Cuban Oil Industry (CUPET)
- Cuba Solar (CS)
  Solar network of Cuba to promote the adoption of renewable energy sources, energy efficiency and environmental respect.

National companies

- Energoimport
  It is responsible for guaranteeing the delivery of the necessary supplies for the execution of investments, imports and exports, maintenance and operation of the National Electro energetic System within the required timeframes.
- ENERGAS
  Energas is a joint venture of the Canadian company Sherritt, Cupet, the state oil company, and UNE, the electric utility. Each party holds a 33% stake in the joint venture. The company is responsible for natural gas electricity generation at Varadero, Boca de Jaruco, and Puerto Escondido
- HYDROENERGY
  Company in charge of providing Electricity Generation serviced from renewable energy sources

Local sectoral associations

- AZcuba

Local companies responsible for generate, transmit, distribute and commercialize Electric power under the supervision of UNE

- Cienfuegos Electrical Company
  It is responsible for providing Technical and Specialized Serviced of assembly, maintenance, modernization and repair of equipment to the UNE.
- Pinar del Rìo Electrical Company
- Artemisia Electrical Company
- Habana Electrical Company
- Mayabeque Electrical Company
- Villa Clara Electrical Company
- Sancti Spìritus Electrical Company
- Electrical Company Ciego de Avila
- Las Tunas Electrical Company
- Holguìn Electrical Company
- Granma Electrical Company

Academia and research institutions

- National Renewable Energy Laboratory (NREL)
  The National Renewable Energy Laboratory (NREL) is transforming energy through research, development, commercialization, and deployment of renewable energy and energy efficiency technologies.
- Study centre for renewable energetic technologies (CETER)

Ethiopia

Background

Ethiopia is the second most populous nation in Africa after Nigeria, and the fastest growing economy in the region. Ethiopia's economy is based on agriculture, which occupies 80% of the active population, amounting to ca. 43% of GDP production. During the last decade, Ethiopia's economy enjoyed a strong, broad-based growth averaging 10.3% annually from 2006/07 to 2016/17, compared to a regional average of 5.4%. With a 2.6% annual average growth rate of population, this translates into a per capita GDP of 7.7%. However, the country is still one of the poorest, with an annual per capita income of $783. Agriculture, construction and services accounted for most of the growth, with modest contribution from the manufacturing sector. Private consumption and public investment explain the demand-side of the growth, with the latter assuming an increasingly important role as a growth driver.

Ethiopia aims to reach lower-middle-income status by 2025. The government is implementing the second phase of its Growth and Transformation Plan (GTP II) which will run to 2019/20. GTP II aims to continue expanding physical infrastructure through public investments and to transform the country into a manufacturing hub. GTP II targets an average of 11% GDP growth annually, and in line with the manufacturing strategy, the industrial sector is set to expand by 20% on average, creating more jobs.

The industrial sector development, with a primary focus on light manufacturing (agro-processing, textile and apparel, leather and leather products), is at the core of GTPII. According to the recent data of Ethiopian National Planning Commission, the contribution of the industrial sector to the overall economy has increased from 23.7% in 2016/17 to 27% in 2017/18. Within the industrial sector, the share of the manufacturing sector steadily increased from 6.2% in 2015/16 to 7% in 2016/17 however then decreased to 6.8% in 2017/18. This shows that the manufacturing base of the country is still weak and unstable.

The development of the industrial sector in general and the agro-processing sector in particular, is constrained by a number of key challenges, among these:

- An inadequately developed business enabling environment, including access to finance;
- A poor human resource development system and a shortage of highly qualified human capital;
- An inadequate supply of quality raw materials, causing industries to produce under capacity or to import raw material;
- lack of quality standards, causing a low level of competitiveness and income along all the value chains;
- Insufficient industrial inputs and infrastructure development;
- An insufficient provision of safe and just labor conditions, causing high turnover and low productivity;
- A lack of well-established investment and technology development;
- An inadequate market diversification and development;
- An inadequately developed institutional support system and enterprise cultivation.

The Government of Ethiopia has determined that private sector investment is critical to achieve these aggressive power generation targets, but acknowledges that it lacks sufficient experience with Independent Power Projects (IPPs). The development of IAIPs is a new initiative for Ethiopia. The main rationale of

concentrating business in industrial zones is to solve problems related to the business environment (by offering different administrative services at one stop shops) and access to infrastructure and utilities. Industries benefits as well from better conditions for access to finance and foreign exchange. The IAIPs are being implemented by the newly established Regional Industrial Development Corporations (RIPDCs), which have a limited capacity in managing the parks and promoting agribusiness. Their managerial skills must be brought up to international standards if the IAIPs are to compete effectively in global and regional markets.

Regarding the FDI flows in Ethiopia, these continued to be the biggest FDI recipient in East Africa, with investments in petroleum refining, mineral extraction, real estate, manufacturing and renewable energy. FDI to the country was diversified in terms of both sectors and countries of origin. Prospects remain positive due to economic liberalization, investment facilitation measures and the presence of investment ready SEZs. Addressing the investment environment as of concern to national and international partners, in 2018 the Ministry of Finance and Economic Cooperation (MoFEC) has issued a PPP legal framework Private Partnership Proclamation Proclamation No. 1076/2018.

Moreover, regarding the investment laws, on January 30, 2020, the House of People's Representative approved a draft Investment Proclamation ("New Proclamation") that replaces the Investment Proclamation No. 769/2012 ("Existing Proclamation"), modernizing the framework regulating FDI. The New Proclamation will become effective as of the date of its publication in the official Nagarit Gazetta.

Energy and Environmental National Strategies and Policies

In its Intended Nationally Determined Contributions (INDCs) communicated to the United Nations Framework Convention on Climate Change (UNFCCC), Ethiopia commits to reduce greenhouse gas emissions by 64% of the business-as-usual (BAU) scenario by 2030. Ethiopia's INDCs are stated in the Climate Resilient Green Economy (CRGE) Strategy, which prescribes the strategies and defines the objectives in terms of the effects of climate change.

Regarding the notable novelties on the institutional side, The Ethiopian Electric Power Corporation (EEPCo) was established in 2013 by the Council of Ministers Regulation and is the entity responsible for generating, transmitting and managing the wholesale of electricity to be utilized nationwide as well as to be sold to the neighboring countries. Its objective is to integrate alternative power plants, such as solar, wind, geothermal, fuel oil and gas-based plants, to meet the expected increase in domestic electricity demand.

In this context, the relevant policies regulating the energetic sector in Ethiopia are the following:

- The National Energy Policy of 2013 aims at promoting the exploitation of the country's renewable energy resources, prioritizing hydro sources (Government of Ethiopia, 2013).
- According to the National Growth and Transformation Plan I (GTPI), the objective of building a climate-resistant green economy is a strategic priority for the country. In the GTPI, the government lays out the effort of achieving universal electrification, to be supported, primarily, by developing large-scale hydroelectric projects. In detail, the strategy to achieve universal electrification is set out in the Ethiopian Government's National Electrification Program, which aims to connects 65% of the populace to the conventional national grid whilst 35% access electricity through off-grid systems by 2025 (The World Bank, 2018).
- The Growth and Transformation Plan II (GTPII) builds on the vision contained in the GTPI and pushes the programmatic effort one step further, closing the gap towards the realization of Ethiopia's vision

of becoming a lower middle-income country by 2025. The GTP II has set out the following specific objectives:

- The achievement of an annual average real GDP growth rate of 11 percent within a stable macroeconomic environment while pursuing comprehensive measures towards narrowing the saving-investment gap and bridging the widening trade deficit;
- The development of the domestic engineering and fabrication capacity and the improvement of productivity, quality, and competitiveness of the domestic productive sectors (agriculture and manufacturing industries) to speed up structural transformation;
- The further solidification of the on-going public mobilization and organised participation to ensure that the public stakeholders become both owners and beneficiaries from development outcomes.

Other than these objectives, Ethiopia commits to pursue:

- zero carbon emissions by 2025;
- opportunities to export electricity;
- integration of other conversion technologies into the energy system;
- the development of the TIMES model (RES development model) for the power sector.

Regarding the environment as of relevance to the agricultural sector, Ethiopia's Agricultural Sector Policy and Investment Framework (PIF) 2010-2020 incorporates a number of tools improving the capacity to adapt to climate change such as: systems to search for new crops and agricultural models for warmer or drier conditions, water harvesting, agro-forestry, improved short and long-term weather forecasts, and risk management measures to cope with the increase in climate variability. Mitigation measures such as carbon sequestration through conservation agriculture and reforestation should also be considered.

The Ethiopian government is taking a cluster approach to enhance agricultural transformation. This initiative is called the Agricultural Commercialization Clusters (ACC). The ACC Initiative contains clearly defined geographic clusters specializing in priority commodities across the four major agricultural regions of the country: Amhara, Oromia, SNNP, and Tigray. These ACC clusters are intended to act as Centers of Excellence, where regions will be supported to maximize production and productivity while integrating commercialization activities. These clusters therefore are meant to serve as models for learning as Ethiopia intensifies the ACC approach and scales up best practices across the country. In parallel, many regions have begun to replicate the model across other geographies and commodities.

To collect data necessary both for planning and monitoring achievements in the ACCs, a comprehensive baseline study was commissioned by the International Food Policy Research Institute. Nine priority crop commodity value chains have been identified for focus by the ACC Initiative in the last two years of GTP II: wheat, maize, sesame, malt barley, and horticulture crops— tomato, onion, banana, mango, and avocado. This prioritization of crops has been laid out on a map and shared with relevant stakeholders interested in working on agricultural value chains. This information is particularly important for the energy sector because it points out where water intensive crops are produced throughout the country impacting business strategies of water pump importers. If this area prioritization can be coupled up with other available information such as shallow ground and surface water availability as well as soil type analysis in each area, it would steer the marketing strategies of productive use appliance producers/assemblers/importers in the right way.

Regarding efforts in waste management, although the sector was not directly addressed in Ethiopia's INDCs, the country plans to develop wastewater treatment infrastructure in the medium to long term. Waste management in Ethiopia is regulated in the country's 1995 constitution and in the 2007 Solid Waste Management Proclamation No. 513. The Environmental Protection Agency of Ethiopia, in 2011, formulated the National Environmental Policy that contains guidelines on how waste management should be executed.

Local authorities are expected to plan, collect, transport, store, recycle or dispose of waste at properly designated sites within their jurisdiction or within other jurisdictions with the permission of the respective authorities.

Current Energy Mix, Renewable Energy Sources potential and Environmental cutting-edge Technologies

For many decades, the development of the electricity sector was based on the exploitation of huge hydro resources that made the electric power system dependent on water and therefore particularly exposed to climate change problematics. The non-hydro renewable sources can be efficiently exploited in the power sector to improve energy diversification and support both short-and long-term power system resilience.

Ethiopia is endowed with abundant renewable energy sources and has a potential to generate over 60,000 megawatts (MW) of electric power from hydroelectric, wind, solar, biomass and geothermal sources. Currently it only has approximately 2,300 MW of installed generation capacity to serve a population of over 95 million people. The GTPII has set new targets to increase generation capacity to over 17,000 MW by 2020, with an overall potential of 35,000 MW by 2037 which would help sustain Ethiopia's continued economic growth and enable it to became a regional renewable energy hub in East Africa.

To set the basis for such developments, the Government of Ethiopia has launched one of the most successful electrification programs in Sub-Saharan Africa, expanding the electricity grid to nearly 60 percent of the country—from only 667 towns and villages to approximately 6,000. New investments and strategies would be necessary to reach the goal of universal access, including private sector participation, off-grid solutions, and scaling up the country's vast renewable energy resources.

The II National Electrification Program (NEP) was re-launched as NEP 2.0 in March 2019. Access targets were based on the ESMAP Multi-Tier Framework and the rollout of new connections under NEP 2.0 were also based on geospatial analysis generated from the ESMAP supported geographic information system (GIS).

The NEP 2.0 includes a rapid assessment of productive uses location and electricity needs to inform the design of mini-grid sites for piloting of the mini-grid program. However, access to finance for productive use solutions is difficult, and smallholder farmers are often part of the "unbanked" sector and not eligible for loans or other financing from microfinance institutions (MFIs) or other financial institutions.

According to IEA's data, the Ethiopian primary energy demand in the Stated Policies Scenario (2010-2040) features the following trajectory:

- In 2018 the Ethiopian's GDP is ca. 84 USD billion (220 USD billion in PPP), with a demand of: Oil 4 Mtoe, Bioenergy 39 Mtoe.
- In 2040, with a forecasted GDP of 870 USD billion in PPP, the expected energy mix would feature the following energy mix composition: Bioenergy 45 Mtoe; Oil 12 Mtoe; Other low carbon 9 Mtoe; Coal 5 Mtoe; Hydro 4 Mtoe; Solar PV 2 Mtoe;

To be covered via oil and other fossil fuel imports, which is not an optimal solution in terms of security of supply, and by an improvement of the hydro sector which, according to the Stated Policies Scenario should envision a scaling up from 15TWh in 2020 to 42TWh in 2040. The need for energy imports could be reduced by a determined push to further develop the country's renewable energy potential coupled with an acceleration in the electrification rate, as well as by the development of its more limited natural gas reserves.

The research developed by Enel Foundation and RES4Africa on the integration of Variable Renewable Energy Sources (VRES) in the National Electric System shows that the country can accommodate up to 3.6 GW of wind capacity and as much as 5.3 GW of solar PV capacity by 2030. Given the strong dependency on hydro power, the country could see its renewable mix improve by growing from the current 0.3 GW of wind capacity to 2.4 GW by 2025 and to 3.6 GW by 2030. In the same period, the virtually inexistent solar PV capacity can reach an impressive 3.3 GW by 2025 and 5.3 GW projected installed capacity by 2030.
The Addis Ababa government, through the "Scaling Solar" program promoted by the World Bank (which provides financial assistance to emerging countries in the field of solar energy) has launched the first public tenders for the construction of new photovoltaic plants. Thanks to this program, the country plans to build 500 MW of solar energy, which should be sufficient to avoid the future energy deficit (today 60 million Ethiopians still do not have direct access to electricity) yielded by the electrification programs set up by the government.

Regarding the present political climate, the current Prime Minister Abiy Ahmed confirmed the green policies made by his predecessors, as well as guaranteeing a stable regulatory framework based on tenders and PPA.

Stakeholders identified

- Regional Association of Energy Regulators for Eastern and Southern Africa (RAERESA)
  RAERESA, is one of the specialized institutions of COMESA in the field of energy regulations, whose objectives include, among others, capacity building and information sharing, facilitation of energy supply policy, legislation and regulations. Other objectives are to enhance Inter-regional cooperation and regional energy regulatory co-operation.
    - Solar Energy Development Association: is an independent non-profit association dedicated to facilitating the growth and development of Solar energy business in Ethiopia.
    - Ethiopian Entrepreneurs Association: an international organization that works within the private sector development of Ethiopia.
    - Ethiopian Women Entrepreneurs Association
    - Ethiopian Economic Association (EEA)
    - Local chamber of commerce
- Ethiopian Chamber of Commerce and Sectoral Association
- Addis Ababa Chamber of Commerce
- Ethiopian Chamber of Sectoral Association
    - Local federation of industries
    - Ethiopian Trading Businesses Corporation: It aim at creating market opportunities for farmers and industrial consumer commodity manufacturers and increase foreign currency earnings through export of agricultural products
    - National Industrial Federation of Energy, Chemical Petroleum and Mine Trade Union: It is part of the Industrial Global Union, which covers the oil and gas industries and electricity, required by the generation method, and is connected to the upstream extraction of coal and uranium, as well as providing the raw material for most of the downstream chemical industry.

Academia and research institutions

- Addis Ababa Science and Technology University
- Addis Ababa Institute of Technology;
- Adama Science and Technology University

- Ethiopia Climate Innovation Center (ECIC): is an initiative supported by the World Bank's InfoDev and funded by the United Kingdom's UKaid and the Norwegian Ministry of Foreign Affairs. The ECIC aims to accelerate the development, deployment, and transfer of locally relevant climate technologies that can favourably impact the effects of climate change.

Relevant Ministries

- Ministry of Industry;
- Ministry of Trade;
- Ministry of Agriculture and Rural Development;
- Ministry of Water, Irrigation and Electricity – Climate Change Directorate;
- Ministry of Environment, Forest and Climate Change;
- Ministry of Public Enterprises;

Local and national regulators

- Ethiopian Energy Authority (EEA);
- Federal Small and Medium Manufacturing Industry Development Agency (FeSMMIDA);
- Ethiopian Investment Commission;
- Ethiopian Electric Power Corporation;
- Ethiopian Electric Utility
- Water Resources Development Fund

Kazakhstan

Background

Kazakhstan is the largest economy in Central Asia in both absolute and per capita terms, despite the currency sharp depreciation saw between 2013 and 2016. The country experienced a slowdown in economic growth from 2014 sparked by falling oil prices and the effects of the Ukrainian crisis. Indeed, the Kazakh currency, called *tenge*, was devalued by 19% in 2014 and by 22% in 2015. However, thanks to the rapid economic growth over the past two decades, in 2015 the World Bank classified Kazakhstan as an **upper-middle income country** – GDP 179 bln $, GDP PPP 500 bln $, per-capita GDP increased from US$ 8,500 in the late 1990s to US$ 27,500 in 2018. **The GDP growth rate was at a 4.5% in 2019 and a sound growth is expected also in the biennium 2020-2021[1].**

Kazakhstan is a prominent, world-class energy producer. Its proven reserves of oil, coal and uranium all rank among the top 15 countries in the world, and natural gas in the top 20. Furthermore, Kazakhstan leads the world in the production of uranium, and consistently ranks among the top 10 production countries for coal and top 20 for oil. It is also the largest greenhouse gas (GHGs) emitter (14th worldwide) and second most energy intensive country in the region.
Due to the oil-related depreciation between 2013 and 2016, **the country is working towards diversification**, but energy will continue to play a significant role to Kazakhstan's economy. The oil and gas sector alone accounts for a fifth of the country's GDP (21.3% in 2018) about two-thirds of total export earnings (70% in 2018), and nearly half of state budget revenues (44% in 2018). The energy sector also has been the primary destination for FDI within the country. Therefore, regulations and appropriate implementation mechanisms are critical areas for the future management of Kazakhstan's energy resource endowment and long-term sustainability.

Exports are almost double imports. Russia is the biggest trading partner (19% of total trade turnover) while Italy (14%) is the main trading partner from the EU and China is the most important Asian trading partner (12%). Key export categories: oil and oil products (70%); metals and articles (14%), food products (5%).[2]

Kazakhstan attracted approximately USD 25 billion in foreign direct investment and the share of small and medium-sized enterprises in economy reached 29.5% in 2019. The number of operating enterprises grew by 8% in 2019.[3]

According to the **World Bank's Doing Business 2020 report, Kazakhstan ranks 25th** for ease of doing business, while **4th for enforcing contracts**, **7th for protecting minority investors,** 22nd for starting a business, 24nd for registering property, 37th for dealing with construction permits.

Challenges and **opportunities** faced by the country can be summed up in:

1. Inefficient use of energy resources which translates into USD 4 to 8 billion lost by the economy each year and may amount to USD 14 billion by 2030. The energy saving potential amounts to USD 3 to 4 billion per year, which is likely to reach USD 6 to 10 billion per year by 2030.

[1] *Kazakh President calls for a new economic course* – The Astana Times, January 25, 2020
[2] *Business Outlook in Kazakhstan 2019* - Deloitte
[3] *Kazakh President calls for a new economic course* – The Astana Times, January 25, 2020

2. Inadequate system of tariffs and pricing for energy resources disincentivises industrial technology improvements.

3. Natural resources and environment are seriously deteriorating across all crucial environmental standards, such as land degradation, water management, environment contamination, air pollution and solid municipal waste management.

4. Currently, the economy of Kazakhstan depends on commodity export and, due to this, is highly exposed to sharp price fluctuations in the commodity markets.

5. Development of new industries and green clusters will make it possible to reduce inequality in the development of various regions and harness their potential in the renewable energy sector, agriculture, water management, waste disposal and other sectors.

Energy and Environmental National Strategies and Policies

According to the 2012 *Strategy Kazakhstan-2050* and the *Concept for transition of the Republic of Kazakhstan to Green Economy*[4], the transition will be based on seven key areas:

- development of renewable energy sources;
- energy saving and energy efficiency;
- development of sustainable and efficient organic agriculture;
- waste management;
- rational use of water resources;
- development of "green transport";
- conservation and effective management of ecosystems.

Among the ambitious targets set in the national strategic documents, it is planned to increase **the share of alternative and renewable energy in the power mix up to 50% by 2050 with intermediate targets of 3% by 2020, 6% by 2025[5] and 10% by 2030.[6]** Furthermore, Kazakhstan is committed to: decrease energy intensity of GDP by 10% until 2015, 25% by 2020 and 30% by 2030 compared to 2008 baseline (energy efficiency); reduce its GHGs emissions by between 15 and 25% by 2030 compared with 1990 levels; resolve drinking water supply by 2020 and agricultural water supply by 2040; increase agricultural land productivity by factor of 1.5 by 2020.

Moreover, the transition to a green growth model will allow for additional GDP growth of 3%, create more than 500.000 new workplaces, create new industries and services, universally ensure high standards of quality of life for the population. Overall investments required for transition to a green economy will be about 1% of GDP per annum, which is equivalent to USD 3 to 4 billion.

According to the other relevant strategic development plans[7], to stimulate the green energy market, **the Government launched a system of preferential fixed tariffs taking into account inflation and changes in the**

[4] *Concept for transition of the Republic of Kazakhstan to Green Economy* - Decree of the President of the Republic of Kazakhstan on May 30, 2013

[5] Specified in *the 2025 Republic of Kazakhstan Strategic Development Plan*

[6] *Kazakhstan puts focus on renewable energy* – UNECE

[7] It is referred to: *the 2025 Republic of Kazakhstan Strategic Development Plan*, approved by Decree of the President of the Republic of Kazakhstan No. 636, dated February 15, 2018; *the Strategic Plan of the Ministry of Energy for the period 2017–2021*, Order of the Minister of Energy No. 490, 2017*; the Law of the Republic of Kazakhstan On*

dollar. Moreover, for the development of the renewable energy sector, **the Government will reimburse 50% of the investments for the installation of renewable energy source stations (more than 5 kW**) for households and enterprises that do not have access to a centralized electric grid.

The new legal framework recently adopted in Kazakhstan established certain incentives for operating and developing renewable energy sources in Kazakhstan (i.e., wind, solar, geothermal, biomass/biogas power plants and hydroelectric power plants with a capacity of less than 35 MW).

To sum up, the main renewable energy support mechanisms are:

- **Tariff stability guarantees** — tariffs are approved for a period of 15 years and are subject to annual indexation depending on inflation. Tariff indexation with regard to difference in exchange rates is possible in projects financed with foreign currency loans.
- **Guaranteed purchase** of the whole generated electricity volume produced with renewable power plants by fully state-owned company, Accounting and Finance Center LLP ("AFC")
- **Guaranteed connection and access to the network:** grid operators are obliged to connect renewable energy facilities on a priority basis.
- **Exemption from service fees** for electricity transmission.

Relatively high tariffs were fixed in Kazakhstan, several times higher than the threshold set for traditional power plants, to attract investors' attention.

Furthermore, Kazakhstan launched the **AIFC's Green Finance Centre** to develop and promote green finance in Kazakhstan and neighboring countries, and provides an important platform that will be key to sustainability efforts in the region going forward. The center provides assistance to issuers, investors and market players in the preparations for issuance of **green bonds** on the Astana International Exchange (AIX).[8]

The above scheme makes **renewable energy projects more investor-friendly** and, currently, a number of major market players and investment institutions are considering investments in this area of the power sector.[9]

Taking into account proposals of the KAZEnergy Association, **the auction was designated as the preferred mechanism for project selection**. In 2017, **amendments were introduced in the Law on Support for the Use of Renewable Energy Sources,** providing for the organization of reverse auctions for new renewable energy projects (this mechanism does not apply to existing facilities or projects under construction already using fixed tariffs). The average reduction in the cost of a kWh of electricity at solar power plants was 34%, and about 13% at WPPs and small HPPs. A total of 113 companies from 9 countries participated in the auctions; 36 projects with a total capacity of 857.9 MW were selected.

All major stakeholders of Kazakhstan (KEGOC, KOREM, FSC, etc.) with the support of international expert organizations (UNDP, GEF, etc.) and major financial institutions (EBRD, ADB, etc) have set intermediate target of 3,000 MW (GW) renewable power capacity in the country by 2025[10].

Supporting the Use of Renewable Energy Sources dated 4 July 2009; *Plan of Action for the development of Alternative and Renewable Energy for 2013-2020* and the *Environmental Code*.

[8] *Kazakhstan Leads Central Asia in Green Finance* - Bloomberg

[9] Baker and Mckenzie Doing Business 2019

[10] *Kazakhstan Doubled its Renewable Energy Capacity in 2019 and has Ambitious Plans for 2020* – Renewable Energy Market Watch

Current Energy Mix, Renewable Energy Sources potential and Environmental cutting-edge Technologies

Kazakhstan is a significant producer of coal, crude oil and natural gas, and a major energy exporter. While coal dominates the country's energy mix, at present renewable sources of energy represent only about 1% of the energy balance but they are growing in terms of electricity generation.[11]

According to the KAZEnergy Report 2019[12], the current **structure** of **electricity production** is dominated by coal-fired generation (70.4%), followed by gas fired plants (19.4%), hydropower plants (9.7%), wind and solar plants (0.4% and 0.1%, respectively). Around 80% of electricity is produced in the country's north, where the coal mines are located. Southern Kazakhstan is less rich in fossil fuel resources and therefore relies on electricity imports from neighbouring countries and the supply of electricity generated in the north. This leads to high losses, as electricity is delivered to the south of the country by highly inefficient transmission networks.

According to the Ministry of Energy, in 2016 the share of renewable energy sources (RES) in electricity generation reached 0.98%, including small HPPs. The target for renewable energy development is to increase the share of RES in total electricity production by 2020 to 3% (1,700 MW), which would include wind power (933 MW), solar (467 MW), small hydro (290 MW) and biogas (10 MW).[13]

Kazakhstan is working to expand the use of RES. As a matter of fact, according to the results of 2019, 90 renewable energy facilities with an installed capacity of 1,061 MW are operating in the country. In the first nine months of 2019, they generated 1.65 billion kWh of electric energy, which is **65%** more than in the same period in 2018. According to preliminary data, **the share of renewable energy from the total electricity generation is estimated at 2.3%. In 2018, the indicator was 1.3%.**[14]

The current energy intensity of Kazakhstan's industry is 4-5 times higher than in European countries. The energy intensity index of the country's GDP in the world ranking is 1.9, while in Japan – 0.1, and in Germany – 0.16. In this regard, among the priority sectors of economic development are energy efficiency, the construction market and the development of RES.

Kazakhstan has the potential of wind, solar, hydrothermal power and the hydro power of small rivers. The great RES potential of Kazakhstan exceeds 1 trillion kWh per year (about 10 times the energy consumption in the country).

Wind Energy

Kazakhstan's steppe geography makes it suitable for the development of wind energy. Roughly 50% of the country's territory has average wind speeds of 4 to 6 metres per second, suitable for energy generation. Kazakhstan is the leader in the region in terms of per capita wind energy resources and the most promising areas include the northern and central regions, as well as locations around the Caspian Sea. Nevertheless, access to these abundant resources requires fundamental work in understanding the market potential and outlining the policy challenges. For example, there are severe technological and logistical challenges to overcome in the development of wind power. Kazakhstan is about the size of western Europe, but it is

[11] *International Energy Agency - Kazakhstan*
[12] *National Energy Report 2019* – KazEnergy Association
[13] Kazakhstan Environmental Performance Reviews 2019 – UNECE, p.23; *National Energy Report 2019* – KazEnergy Association, p. 139
[14] *Electricity generation by renewable energy facilities increase by 65% in Kazakhstan* – AKI Press (February 4, 2020)

landlocked and has weak transport links internally. The transportation of large-scale items such as wind towers and blades to their final destination, and their subsequent installation, are major challenges. Furthermore, manufacturers must be prepared to guarantee equipment performance at temperatures ranging from -50 ºC to +50 º C. This increases the cost of wind power in Kazakhstan, compared with countries that have more temperate climates and are closer to the manufacturing sites of wind power equipment. The government has responded to this challenge by seeking external support to develop the wind power industry from an early stage.[15]

Solar Energy

The solar energy potential is great for the vast territory of Kazakhstan, there are high levels of solar irradiance in most regions of the country. But as Kazakhstan is in the northern hemisphere, the general trend is to develop solar sources in the south, such as in the Burnoye area near Shymkent. This helps to address imbalances in the energy network. However, the country's current total of installed solar power capacity is low, at 209 MW, with a large number of projects scheduled to start operations by 2020. The number of sunny hours is 2,200–3,000 per year, and the energy of solar radiation is 1,300– 1,800 kW/m2/y. According to experts[16], Kazakhstan's solar power potential is estimated to be 3.9 to 5.4 TWh, or approximately 5% of annual power consumption.

Hydropower

Hydropower's major contribution to power generation in Kazakhstan dates back to the Soviet era, when it played a significant part in efforts to increase the Soviet Union's energy potential. Today, the six largest hydropower stations, with a total capacity of 2.5 GW, account for up to 9% of the country's total electricity generation, a relatively small contribution compared with that of neighbouring countries, but reflecting Kazakhstan's geography. More recently, 27 small and medium-scale hydropower plants, with a total capacity of 200 MW, have been put into operation.[17] These are attractive in terms of their cost, speed of construction, reliability and reduced environmental impact. Based on absolute indices of hydro resource potential, Kazakhstan ranks third among CIS countries. Because of the mountainous relief in the south and the east, Kazakhstan possesses significant hydropower potential.

Energy Efficiency

Energy savings and energy efficiency are key elements of climate policy and improving the competitiveness of the economy. Despite the fact that Kazakhstan's economy has one of the highest energy intensities of GDP in the world, the country has a significant potential to reduce energy consumption. Kazakhstan is set to develop urban Energy Efficiency Plans for its two largest cities – Astana and Almaty, which face steady population and economic growth requiring an expansion of reliable energy and delivery of municipal services. A new study, conducted jointly by city municipalities and the World Bank, outlines key improvements to be made in the energy sector of the two cities within the next 15 years, allowing savings of up to 25% on total energy consumption. Indeed, the assessment of the energy performance of Astana and Almaty found that targeted interventions in energy-efficiency in municipal service sectors - including public buildings, district heating, transport, street lighting, waste and water supply – can lead to significant energy savings annually, including 43% savings (3,7 billion kWh) in Astana and 34% savings (3,1 billion kWh) in Almaty.[18]

Other Renewable Energy Sources

Other renewable energy sources such as geothermal energy and biogas are not particularly developed in the country. However, among the targets set in the strategic national documents, small biogas facilities are

[15] *Green Economy Transition – Case Study*, European Bank for Reconstruction and Development (EBRD)
[16] *Green Economy Transition – Case Study*, European Bank for Reconstruction and Development (EBRD)
[17] *Ibid.*
[18] *New Energy Efficiency Plans to Unlock Kazakhstan's Energy Potential* – World Bank

considered. Kazakhstan should incentivize the penetration of renewable energies, such as geothermic heat pumps and biogas, in housing, street lighting, public utilities, etc., as a partial alternative to the use of coal. Concerning geothermal energy, Kazakhstan possesses large resources of middle - and low-temperature thermal water. The geothermal field Kaplanbek (near the city of Shymkent) with thermal water temperature of 80°C is used for the heat supply of residential buildings.[19] With regards to biogas, Kazakhstan has 76.5 Mha agricultural land, 10 Mha forest that represent 4% of the overall territory of the country, including 4.7 million hectares covered by saxaul (lowly shrubs), and 185 Mha steppe grasslands providing abundant biomass wastes and residues which have the potential to generate arrange of bioenergy services. The country has large reserves of biofuel produced from agricultural waste; it has been estimated that electricity generation potential in Kazakhstan from biomass is up to 35 billion kWh of power and 44 million Gcal of heat.[20]

Stakeholders identified

Relevant Ministries

- Ministry of Energy
  - Department of Renewable Energy
  - Department of "Green Economy"
- Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan
  - Department of Environmental Policy and Sustainable Development
  - Department of Climate Policy and Green Technology
  - Committee on Environmental Regulation and Control
- Ministry of Industry and Infrastructural Development
- Ministry of Foreign Affairs

- Other relevant institutions and specialized national agencies
  - Invest in Kazakhstan
  - Kazakh Export
  - Astana International Financial Centre (AIFC)
  - DAMU Fund for SMEs
  - World Bank – Astana and Almaty
  - Asian Development Bank - Kazakhstan
  - GEF – Global Environmental Facility
  - PFAN
  - Green Climate Fund
  - UNDP in Nur-sultan
  - UNEP – Almaty Office for Central Asia
  - Green Council under the President of Kazakhstan
  - Coordination Council for Attracting Foreign Investments
  - Foreign Investors' Council

Local private stakeholders

- Local sectoral associations
  - Association of Renewable Energy of Kazakhstan (AREK)

[19] *Renewable Energy and Energy Efficiency Partnership*

[20] *Biomass and biogas in Kazakhstan report – Energy Partner LLP.*

        - KazEnergy Association
        - Kazakhstan Electricity Association
        - Association of Environmental Organizations of Kazakhstan
        - Solar Power Association of Qazaqstan
        - Kazakhstan Association of Waste Management - *KazWaste*

- Local chamber of commerce
    - National “Atameken” Chamber of Entrepreneurs
- Local federation of industries
    - Kazakhstan Business Council for Sustainable Development
    - Environmental Union of Associations and Enterprises of Kazakhstan Tabigat
- Local companies
    - Baiterek Holding JSC
    - International Center for Green Technologies and Investment Project (Non-profit Joint-Stock Company)
    - Financial Settlement Center of Renewable Energy LLP
    - KEGOC (Kazakhstan Electricity Grid Operating Company)
    - Green Bridge Company
- Academia and research institutions
    - The Regional Environmental Centre For Central Asia (CAREC)
    - Almaty Management University
- Public advisory boards
    - Association “Kazakhstan Chamber of Environmental Auditors”
- Regional/Municipal special agencies on energy and environment
    - Nur-Sultan City Administration of Environment and Use of Nature

Italian institutional and private sector stakeholders

- Italian Embassy in Nursultan
- ICE-ITA (Almaty)
- Italian-Kazakh Chamber of Commerce
- Association for Italian-Kazakh Trade

Kenya

Background

The Republic of Kenya is one of the most developed and economically robust countries in Africa. It is located near the equator in East Africa and it is composed of 47 semiautonomous counties. Over the past decade, Kenya has accomplished significant political, structural and economic reforms that have managed to set the stage for sustained political gains, social development and economic growth.

Notably, since 2014, Kenya has been ranked as a lower middle-income country, because, thanks to its steady economic growth, its GNI per capita crossed the World Bank threshold of USD 1,026. The country is, in fact, currently considered the economic, commercial, and logistics hub of East Africa and represents the second largest economy in the region. It has a market-based economy and its economic outlook has remained positive in the past few years, with its GDP growing on average by 5.6% between 2014 and 2018, higher than continental average growth of 3.2%. According to the International Monetary Fund, its GDP is projected to grow by 6.0% throughout 2020.

In addition, the sectoral shares of agriculture, industry, and services in Kenya's GDP have progressively changed over the last few years. The service sector currently represents more than half of Kenya's GDP (56% in 2017). On the other hand, the share of agriculture progressively declined from 29.3% in 2000 to 23.5% in 2017. As for the industrial sector, its share only grew from 18.2% in 2011 to 21.0% in 2017, after a long period of stagnation. It is worth emphasizing that, in spite of the declining contribution of agriculture in Kenya's GDP, the share of workers employed in agriculture remains high, indicating that the pace of structural transformation is not in line with the changing sectoral share contributions. Besides, over 75% of agricultural output in the country is either from small-scale, rain-fed farming or livestock production.

Trade and FDI

Kenya is the 101st largest export economy in the world and the 89th most complex economy according to the Economic Complexity Index (ECI). The top exports of Kenya are tea, cut flowers, refined petroleum, coffee and legumes, exported to the United States, Pakistan, Uganda, the Netherlands and the United Kingdom. On the other hand, it mostly imports refined petroleum, palm oil, cars, packaged medicaments and raw sugar from China, India, the United Arab Emirates, Saudi Arabia and Japan.

Furthermore, Foreign Direct Investment (FDI) in Kenya increased by $1.6 billion in December 2018, compared with an increase of $1.3 billion in the previous year. Manufacturing, real estate, energy, ICT, tourism and, more recently, oil and mining have been key sectors attracting FDI. However, Kenya's FDI levels as a share of GDP was 0.8% in 2017 compared to 2.2% for Tanzania, 8.5% for Ghana and 4% for Rwanda, implying there is room for improvement. To untap its potential, the country released in 2019 the Kenya Investment Policy (KIP), aimed at guiding attraction, facilitation, retention, monitoring and evaluation of private investment. The KIP, among other things, aims at increasing the level of public and private investment to at least 32% of the country's GDP by the year 2030 while increasing the level of private investment to 24% of GDP by the same year, at promoting domestic direct investment to reach 20% per annum from the 2019 baseline and at attracting high-quality FDI.

Regional integration

The country is part, among others, of the following regional economic organizations: African Union, Common Market for Eastern and Southern Africa (COMESA), East African Community (EAC). It is also part of the Eastern

Africa Power Pool (EAPP) is a regional organization adopted as specialized institution of COMESA for the electric power sector. Its aim is the development of energy resources in the region to guarantee access to electricity power supply in the Eastern Africa Region through regional power interconnections.

Challenges and opportunities in the private sector

Kenya has been ranked 56th in the World Bank Doing Business classification, with a score of 73.2. Indeed, its private sector can be described as vibrant: it is to be noted that Nairobi has a growing startup ecosystem with a strong focus on innovation. In the Startup Friendliness Index (SFI) of the Middle East and Africa, Nairobi is ranked seventh out of the 16 cities assessed in this region. However, despite significant progress to date, it is safe to say that there are still many challenges that Kenya has to overcome in order to become a prosperous upper middle-income country, in particular in the private sector. In fact, it is still heavily characterized by a dichotomous structure: a formal productive business sector, consisting of a few large entities (mainly in financial and related services, wholesale, and horticulture, tea, coffee and sugar cane production), and a massive, informal business sector, made of small businesses, which contributes to 83% of employment in the private sector. The lingering stagnation of the private sector is further exacerbated by poor infrastructure, political uncertainty, and the effects of regional terrorism.

Challenges and opportunities in the energy sector

Kenya's power generation capacity has increased steadily over the past decade, reaching 2,351MW in 2018 from 1.768MW in 2013. In the same year, access to electricity was estimated at 75% thanks to increased investment in generation and distribution, although it is worth mentioning that there is a significant gap between the percentage of rural population with access to electricity and the urban one. Through the Last Mile Connectivity Project, a total of 5 million new households are targeted for connection to electricity through grid and off-grid solutions as well as 15,739 public facilities in addition to primary schools will be connected. On the other hand, despite significant progress to date, the energy sector still suffers from poor infrastructure, with the number of number of outages experienced in the country above Sub Saharan Africa average.

Furthermore, due to its overreliance on its natural resource base, the country is particularly vulnerable to the effects of climate variability due to climate change. In fact, in the recent past the country has been affected from rising temperatures and changing rainfall patterns, resulting in droughts and flooding. These extreme weather events not only represent a serious threat to Kenya's natural ecosystems, but also constitute a burden on its economy: in fact, it is estimated that economic cost of floods and droughts are able to create a long-term fiscal liability equivalent to 2%-2.8% of GDP each year in the country.

Therefore, the transition to renewable energy would have the twofold effect of further boosting the population's access to energy while also tackling the effects of climate change. For this very reason, the renewable energy sector is experiencing a momentum in the country. Indeed, not only Kenya can benefit from an impressive endowment of green energy sources, but it has to be noted that currently a strong flow of FDI is going into renewable energy projects: Kenya has been ranked 3 as for renewable energy capital investments in the Middle East and Africa region in 2018. Notably, the country could count on investment of US1.4 billion in 2018, the highest on record, targeting geothermal at US486 million, wind at US476 million and solar at US467 million.

It also has to be stressed that oil was discovered in 2012 in the northwestern area of the country, namely in the Turkana country, after decades of exploration. The country started exporting crude oil in 2019 and it is

expected to become an oil export hub in the coming years; however, it is still hard to predict how this sector will affect the development of the country.

Energy and Environmental National Strategies and Policies

The government is committed to transform Kenya into a modern and competitive country, with no trade-off between economic prosperity and sustainable development for the country. This commitment is embedded, first and foremost, a number of national and international long-term development agendas, which are ambitious development blueprints that set the stage for sectoral strategies in the energy and environment fields.

Long-term Development Strategies

In 2015, Kenya adopted the African Union - Agenda 2063, Africa's development blueprint aimed at achieving sustainable development, seeking to promote environmentally sustainable and resilient economies.

At the national level, it is worth mentioning that right to a clean and healthy environment is embedded in the 2010 Kenyan Constitution, which provides the basis for action on climate change. Most importantly, the country launched in 2008 Kenya Vision 2030, the national long-term development blueprint, aimed at transforming Kenya into a newly industrializing upper middle-income country with a high quality of life and a clean and secure environment for all citizens by 2030. The Vision 2030 is anchored on three main pillars: economic, social and political. It also recognized the importance of energy, which is considered one of the infrastructural "enablers" upon which the three pillars will be built.

In the same spirit, the Green Economy Strategy and Implementation Plan 2016 - 2030 aims at boosting Kenya's economic growth rate with an eye on sustainable development. Among other things, it calls for increasing the sharing of renewable resources in the country's power mix up to 70% and developing innovative financial instruments, e.g. debt financing aimed at directing capital to sustainable infrastructure.

Medium term Development Strategies

The Third Medium Term Plan represents the operationalization of Kenya Vision 2030 for the period 2018-2022 and it aims at implementing the "Big Four" initiative. Notably, it aims at increasing the manufacturing share of GDP from 9.2% to 20% and at improving Kenya's ranking in the Ease of Doing Business Indicator from position 80 (in 2017) to at least 45 out of 189. It is to be noted that climate change is one of the three thematic areas prioritized by the Plan, that promotes climate resilient and green growth development, climate change governance and coordination, capacity building and public awareness. It also specifically targets increase in power generation, emphasizing the pivotal role of renewable energy sources in the creation of a reliable, adequate and cost-effective energy supply regime to support industrial development.

Key programmes and projects are prioritized for implementation to increase additional electricity installed capacity to 5,221 MW by 2022 from the following sources:

- 93MW from Hydro Power Projects;
- 913MW from Geothermal Power Projects;
- 800MW from Wind Power Projects;
- 157MW from Biomass Power Projects;
- 442MW from Solar Power Projects;
- 328MW from Coal Power Project;
- 400MW from Imports.

Energy

Target: Universal access to electricity by 2022. Furthermore, President Kenyatta expressed its intention to attain 100 per cent transition to green energy by 2020.

Long-term energy strategies

LCPDP – Least Cost Power Development Plan 2017-2037. Kenya's generation and transmission system planning is based on a 20-year, rolling Least Cost Power Development Plan, updated and readjusted over the years. According to the Plan, as a result of the power production costs, and more specifically, on the basis of a least cost approach, the development of geothermal and wind energy plants as well as solar mini-grids for rural electrification are to be prioritized.

Medium term

Kenya National Electrification Strategy, 2018 – It calls for the achievement of universal access to electricity by 2022. This entails expanding grid electric power to areas where feasible in terms of cost while also identifying off-grid solutions that can meet the energy needs of lower income remote population centers. The strategy also provides an Investment Prospectus covering six subsectors: geothermal development, power generation, power transmission, power distribution, off-grid electrification (particularly investment in mini- grids and solar home systems) and energy efficiency.

Short term:

The Energy Act 2019 provides several tools to foster the use of renewable energy in the country, namely:
The use of Feed-in-tariffs (FiT), introduced in 2008 (revised in 2010 and 2012) to promote private investment in renewable energy by providing a secure long-term price and guaranteed access to the grid. The tariffs apply to grid-connected plants and are valid for a 20-year period from the start of the power purchasing agreement (PPA). Called within the 2019 Energy Act "Renewable Energy Feed-in-Tariffs", this system is aimed at catalyzing the generation of electricity through green energy sources and decreasing dependency on non-renewable energy resources. FiT apply to wind power, biomass, small hydro, solar, biogas and geothermal.
The net-metering mechanism. Notably, consumers are allowed to supply any excess capacity they have back to the grid.

Furthermore, a number of tools have been adopted to foster transition toward a low-carbon economy:Under the Value Added Tax Act and the Value Added Tax (VAT) Amendment Act of 2014, Kenya offers VAT and import duty exemption for a number of components of solar technologies, including certain solar cells and modules and PV semi-conductor devices as well as wind engines. Moreover, hydraulic turbines and water wheels are free from import duty but 16% VAT is applicable nonetheless.

- Exemption from tax on interest paid on loans from foreign sources for investing in the energy or water sectors
- Exemption from payment of stamp duty in respect of instruments executed in respect of transactions relating to loans from foreign sources received by investors in the energy sector.
- Exemption from withholding tax payments made to a nonresident for services rendered under a PPA including the design, construction, installation, testing, commissioning, operating and maintenance of a power plant.

- The Green Bond Programme aims to promote financial sector innovation by developing a domestic green bond market, for the purpose of raising capital for projects in renewable energy, energy efficiency, green transport and waste-water treatment.

Climate change

Target: Cutting GHG emissions by 30% by 2030 relative to the business as usual scenario of 143 MtCO2eq.

Long term Environmental Strategies:

With its Intended Nationally Determined Contribution (NDC) under the Paris Agreement of the UNFCCC, the country committed to "abate Kenya's GHG emissions by 30% by 2030, relative to the business as usual scenario of 143 MtCO2eq." Kenya's attainment of its NDC is conditional to international support in the form of finance, investment, technology development and transfer, and capacity development. In line with its commitment, the adoption of the National Adaptation Plan, 2015 - 2030 consolidates the country's vision on adaptation supported by macro-level actions in order to enhance long term resilience and adaptive capacity. In particular, it calls for incorporating climate change considerations into current and future sectoral actions and for working toward universal access to reliable, affordable energy to build climate resilience.

Medium term Environmental Strategies:

- National Climate Change Action Plan 2018-2022 guides the climate actions of the National and County Governments, the private sector, civil society and other actors in Kenya's transition toward a low carbon climate resilient system.
- Kenya Climate Smart Agriculture Strategy 2017-2026 aims at promoting the resilience of agricultural systems, while minimizing GHG emissions also through the promotion of energy-efficient technologies and innovations along agricultural value chains, while also promoting affordable and reliable clean energy in agriculture.

Short term strategies:

- National Climate Change Framework Policy, 2018: it promotes a climate change mainstreaming approach that includes integration of climate change considerations into development planning, budgeting and implementation in all sectors. It calls for the involvement of the private sector in climate finance opportunities through the introduction of incentives, removal of investment barriers, creation of a conducive investment climate and facilitation of access to finance.
- The Climate Change Act, 2016: it provides a regulatory framework for an enhanced response to climate change, and calls for the establishment of financial mechanisms to boost the transition towards low carbon development, namely the Climate Change Fund.

Current Energy Mix, Renewable Energy Sources potential and Environmental cutting-edge Technologies

Kenya's energy mix comprises 26.84% geothermal, 35.12% hydro, 34.93% thermal, 1.09% wind,1.12% biomass and 0.81% of-grid energy.

Therefore, around 65% of the nation's power generation capacity comes from renewable energy sources, more than three times the global average.

Renewable Energy

The country is endowed with a significant and diversified amount of green energy resources, which led the government to seek the expansion of renewable energy generation in the country. Notably, Kenya is ranked 40 worldwide according to the 2019 EY Renewable Energy Country Attractiveness Index. Among the most relevant renewable energy sources, it is worth mentioning the following:

Solar: Kenya is characterized by high insolation rates (namely 4-6kWh/m2/day levels of insolation), with average of 6/7 peak sunshine hours. Solar utilization is mainly for photovoltaic (PV) systems, drying and water heating. This sector has grown in importance over the last few years, partially due to the Energy (Solar Water Heating) Regulations 2012, which requires all buildings with hot water requirements exceeding 100 liters per day to be equipped with solar heating systems. Furthermore, as already mentioned, the solar energy sector benefits from duty and tax exemptions for PV products and a fixed FiT of US 0.12 per kWhr for 10MW. It is also worth mentioning that, in line with the KNES, the government is implementing the Kenya Off-grid Solar Access Project (KOSAP) for electrification of off-grid areas using solar PV systems. Several companies, too, are operating in the off-grid solar energy sector, by using mini-grids to achieve universal electrification in the country. In addition to this, the pay-as-you-go model, pioneered by M-Kopa Solar, is enabling low-income households, in off-grid locations, to rent, and, at a later stage, own, home solar power systems.

Wind: Excellent wind regime areas are located in the northwest of the country (e.g. Marsabit and Turkana), as well as at the edges of the Rift Valley. The Lake Turkana Wind Power Project (LTWP) and the Ngong Hills Wind Power Project are the only wind farms that are connected to the national grid, with capacities of 310MW and 25 MW respectively. Notably, the LTWP, operational since March 2019, is the largest wind power plant in the country yet, but wind energy development in Kenya is expected to increase from private investments, facilitated by the Least Cost Power Development Plan as well as by the FiT Policy of US 0.011 per kWhr. Notably, the government of Kenya has estimated that 2GW of wind capacity will be installed in Kenya by 2030.

Geothermal: Kenya is the leader in the African continent when it comes to geothermal power production. Indeed, it is ranked 8 globally for geothermal power generating capacity. This is due to the high temperature characterizing the Rift Valley setting: the potential in this sector stands at around 10,000 MW, with the Rift Valley alone estimated to have a potential of 2000 MW, while the current developed capacity reaches, overall, about 777 MW. The Olkaria Geothermal Field is, so far, the site producing the most geothermal power, but the sector has still plenty of potential for expansion, favored by the LCDP. In fact, geothermal power is deemed to be a reliable and cost-effective energy source. Furthermore, a fixed FiT of US 0.088 per kWhr applies.

Hydro: Hydropower potential in Kenya is concentrated in five geographical regions, Kenya's major drainage basins: namely, Lake Victoria basin, Rift Valley basin, Athi River basin and Tana River basin and it is estimated that the country has a potential of about 6,000MW including large and small hydros. However, since Kenya is particularly vulnerable to the effects of climate change, and in particular, it is prone to large variations in rainfall and to droughts, relying on hydro would likely result in dangerous power shortfalls. For this reason, the government has favored solar, wind, and geothermal generation in its current plans for energy generation. Currently over 743MW is exploited as for large hydropower, mainly in large installations owned by the Kenya Electricity Generating Company. On the other hand, potential for small hydros is over 3,000MW, of which roughly 30MW has been developed. The development of this sector can benefit from a fixed FiT of between US 0.06 and USS 0.12 per kWhr.

Bio-energy: There is no consolidated data on biogas production, therefore it is challenging to determine the country's overall capacity in this sector. There is potential in the country as for municipal waste, sisal and coffee production, as well as in the tea industry. The total installed electric capacity potential of all sources ranges from 29-131MW. This sector is however made more appealing by the existence of fixed FiT of US 0.10 per kWhr.

Energy efficiency standards

In 2014, 98 standards, including 10 minimum energy performance standards (MEPS), were approved by the Kenya Bureau of Standards, setting minimum requirements for electrical appliances which importers and manufacturers must comply with. In particular, the appliances concerned are:

- self-ballasted lamps;
- double capped fluorescent lamps;
- ballasts fluorescent lamps;
- refrigerating appliances;
- non-ducted air conditioners;
- three-phase cage induction motors.

This initiative was aimed at promoting the use of power saving equipment and increase energy efficiency in the country.

Local Stakeholders identified

Local Association

- Kenya Renewable Energy Association;
- Kenya Private Sector Alliance;
- Kenya Climate Ventures;
- Geothermal Association of Kenya;
- Invest in Africa (IIA);
- Kenya Energy and Environmental Organizations;
- Center for Justice Governance and Environmental Action;
- Alliance of Civil Society Organizations for Clean Energy Access;
- Sustainable Energy Access Forum Kenya;

Local chamber of commerce:

- Kenya National Chamber of Commerce and Industry
- Kenya National Chamber of Commerce and Industry (KNCCI) -Nairobi County;
- Kenya National Chamber of Commerce and Industry (KNCCI) -Mombasa Office

Local federation of industries:

- Africa Mini-grid Developers Association (AMDA);
- Association of Energy Professionals Eastern Africa

Local business aggregators and unions:

- Kenya Association of manufacturers

Local companies:

- Rural Electrification and Renewable Energy Corporation;
- Kenya Electricity Generating Company;
- Geothermal Development Company;
- Kenya Electricity Transmission Company;
- Renewable Energy Ventures Kenya;
- Africa Energy Development Corporation;
- African Solar Designs LTD

Academia and research institutions:

- Kenya Climate Innovation Center;
- Kenya Industrial Research and Development Institute (KIRDI);
- Institute of Energy Studies & Research;
- Micro-Grid Academy;
- Centre For Research in Environment;
- Centre for Energy Efficiency and Conservation;
- African Centre for Technology Studies;
- Coastal Oceans Research and Development – Indian Ocean;
- Kenyatta University;
- Strathmore Energy Research Centre (SERC);
- Strathmore University

Local institutions and agencies

- Ministry of Energy;
- Ministry of Petroleum and Mining;
- Ministry of Environment and Forestry (Climate change directorate);
- Ministry of public service, youth and gender;
- Ministry of Industry, Trade and Co-operatives;
- National Environmental Management Authority;
- National Environment Trust Fund (NETFUND);
- Kenya Water Towers Agency (KWTA);
- National Environmental Complaints Committee;
- NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION (NACOSTI);
- Kenya National Innovation Agency;
- Kenya Institute of Business Training (KIBT)

Local and national regulators:

- Energy and Petroleum Regulatory Authority;
- Kenyan Investment Authority;
- Micro and Small Enterprise Authority;
- Export Processing Zones Authority (EPZA);
- Kenya Accreditation Service;
- Kenya National Innovation Agency;
- National Commission for Science Technology and Innovation;
- Brand Kenya Board (BKB);
- Uwezo Fund;

- Women Enterprise Fund;
- Industrial and Commercial Development Corporation
- Public advisory boards:
- Renewable Energy Resource Advisory Committee

Regional/Municipal special agencies on energy and environment:
- Nairobi City Council - Environment Energy Water and sanitation Sector;
- Regional Development Authorities:
- Tana and Athi Rivers Development;
- Lake Basin Development Authority;
- Kerio Valley Development Authority;
- Ewaso Ng'iro South Development Authority;
- Ewaso Ng'iro North Development Authority;
- Coast Development Authority

Italian stakeholders:
- Ambasciata d'Italia a Nairobi;
- SACE Nairobi Servizi Assicurativi del Commercio Estero;
- A.I.I.K. – ASSOCIAZIONE INDUSTRIALE ITALIA KENYA;
- Associazione per il Commercio italo-keniana

OI/IFI:
- UNIDO;
- UNEP – HQ;
- FAO – Kenya;
- World Bank;
- AfDB - Kenya Regional Hub

Perù

Background

The Republic of Peru is an upper-middle income country located in western South America by the central Pacific coast. With a territorial extension of 1.28 million km2, it is the third largest country in South America and it presents a wide variety of natural ecosystems, ranging from the tropical rainforest of the Amazon Basin and the glaciers of the Andes mountain to the coastal deserts of the Pacific Ocean. Peru has a millennial history going back to the pre-Columbian Norte Chico civilization and the Inca Empire, the Spanish conquest in the 16th century and its independence in 1821. The Country is currently divided in 25 regions and has a population of 32 165 485 people (2018 Census), mainly concentrated in the area of its capital, Lima.

Economic situation

With a GDP of $222.045 billion (2018), Peru has been rated by the World Bank as an upper-middle income country. The country has experienced a constant growth of an average of 5% in its gross domestic product (GDP) over the last two decades, while the growth in employment and income reduced poverty rates from 52.2% in 2005 to 26.1% in 2013. Peru's economic development has mainly been driven by the use of its abundant natural resources and the production and export of commodities. In particular, Peru is the second biggest global producer of copper and the sixth in the production of gold. Its mining sector represents about the 15% of its GDP and around the 60% of its total exports. The sector of agriculture, and its fishery subsector, are still relevant and employ 27% of the total Peruvian workforce. The International Monetary Fund defined Peru has one of the strongest economies in the region, despite a deceleration in its growth during 2019. Through this event, partly caused by the volatility of global commodity prices, Peru managed to stay afloat thanks to its prudent macroeconomic policies and a surge in mining production which translated in increased exports. In 2018, Peru counted with 2.332.218 companies, 95% of them being micro and small enterprises (INEI). The economy has high informality rates, coinciding with the low-income tiers of the population.

FDIs

Peru also distinguished itself for its openness to foreign investments and private enterprises and the great amount of trust received by the investors, reflected by its credit rating of BBB+ (Standards & Poor's). The reasons behind this success can be traced to its macroeconomic policies, which over the years contributed to the stability of its currency, the Peruvian 'sol', and a falling fiscal deficit. Other elements that contributed to its attractiveness are the presence of an independent central bank, a well-functioning investment authority and a relatively advanced anti-corruption legislation compared to other Latin American countries.

Challenges and Opportunities

Alongside these strong fundamentals, Peru still faces challenges related to building a model of sustainable development, some of them including infrastructure gaps, low productivity and limitations in human capital. However, the rise in export and in infrastructure projects and the increased investments in the mining sector are promising factors for the future. The Country is yet to further expand the diversification of its economy and its export capacity, while upscaling the complexity of its value chains. In particular, there is an untapped potential in sectors touching key themes in sustainable development, such as sustainable food production, ecotourism and renewable energy.

Energy and Environmental National Strategies and Policies

National Development Plans

Peru has taken advantage of the constant economic growth of the last two decades to expand its industries and strengthen its institutions. The increase of productivity through investments in human capital and innovation, investments in infrastructure and efforts to enhance social inclusion are pivotal elements in its current country strategy. Along with them, conservation of natural resources remains one of the priorities.

Short Term

- Plan Estrategico de Desarrollo Nacional. El Perú hacia el 2021

It defines 6 objectives at the national level with a set of indicators to track their achievement. The Objective 4 'Competitive economy and high levels of employment and productivity' and the objective 6 'Conservation and harnessing of natural resources and biodiversity' are in line with the scope of the Project.

Medium - Long Term:

- Plan Nacional de Competitividad y Productividad 2019 -2030

First Government plan defining 9 prioritised objectives for the short, medium and long-term development of the country. Objective 3 on 'Generating development of capacity for innovation, adoption and transfer of technologies' and Obj. 9 on 'Promoting environmental sustainability in the operation of economic activities' align with the scope of the Project.

Environmental Policies

The Peruvian Constitution qualifies natural resources as renewable and non-renewable and it considers them national heritage. The State determines environmental policies and promotes the sustainable use of natural resources. Peru's latest legislation reflects its commitment to climate action, both in prevention and mitigation measures.

Short- Medium term:

- Política Nacional del Ambiente 2009 – 2021

It prioritizes the conservation and sustainable use of natural resources and biodiversity, environmental governance, international environment commitments and the incorporation on BioTrade as a green growth strategy.

- Estrategia Nacional de Diversidad Biológica al 2021. Plan de Acción 2014 - 2018

Its aim is to halt the loss and deterioration of biologic variety components, improve its management and opportunities for sustainable use and the fair and equal distribution of its benefits.

Medium - Long term:

- Estrategia Nacional Ante el Cambio Climático

Approved before the COP21, on one hand, it aims to prevent climate change impact and reduce the vulnerability of economy and society, while on the other seeks to reduce Greenhouse Gases emissions through the transformation of productive sectors, including the energy one.

Energy Policies

Energy production in Peru over the last two decades sustained and enabled its economic growth. The Country now seeks to expand and increase the quality of the distribution grids, to promote social energy inclusion and to shift the energy matrix to higher percentages of renewable energy.

Short Term:

- Decreto Legislativo Nº 1002 ("DL 1002"), 02/05/2008
- First act declaring in the national interest the development of electricity generation through Solar, Wind, Geothermic, Biomass and Hydroelectric under 20 MW energy, namely Non-Conventional Renewable Energy Resources. It also promotes the sale of electricity from renewable sources through auctions.
- D.S. Nº 012-2011-EM, 23/03/2011, regulation on electricity generation through renewable energy.
- D.S. Nº 020-2013-EM, 27/06/2013, regulation for the promotion of electric investments in off-grid areas.

Medium Term:

- Plan Energético Nacional 2014-2025

Based on the data available, it shapes the development of the energetic sector, the development and improvement of distribution grids and the shift of Peru's energy matrix. Duplication of renewable energy production by 2022 is one of the objectives.

Long Term:

- Política Energética Nacional 2010- 2040

Among its objectives, there are the development and use of clean energies and the alignment with national environmental and social legislation.

Current Energy Mix, Renewable Energy Sources potential and Environmental cutting-edge Technologies

Peru, as many other Latin American countries, has an abundance of conventional resources alongside a remarkable renewable energy potential due to its territorial characteristics. Peru is considered to have a 'high' potential for wind, solar, hydro and geothermal, a 'high-medium' potential for biomass and an 'unknown' potential for ocean-based RETs (Norton Rose Fulbright). Its energy matrix was considered one of the cleanest in Latin America in 2019, with 50% deriving from hydroelectric power, 5% from non-conventional renewable energy resources and the remaining part from thermoelectric power. The percentage of the latter saw an increase in the last 15 years due to the discovery of natural gas deposits in Camisea, which captivated the attention of the Peruvian energy sector provoking a slowdown in non-conventional renewable energy investments. As of 2017 the latter accounted for 2.7% of the energy distributed through the country's power grid, known as the National Interconnected Electric System (Sistema Eléctrico Interconectado Nacional, SEIN). As of May 2019, with a mix of contributions from hydroelectric, wind, biomass and solar facilities, Peru maintained 14,900 MW of renewable energy generation capacity. Hydroelectric and wind provided 43% and 40%, respectively; biomass sourced a further 11.6%; and solar produced the remaining 5%. Through projects such as 'Repartición', a 22-MW solar plant finalized in 2012 which was the largest of its kind in South America at the time, the country earned a reputation as a renewables pioneer in the region (Oxford Business Group).

Technologies for climate change mitigation and adaptation

Peru has been identified as one of the most vulnerable countries to the effects of climate change, due to the variety of its microclimates. In addition, its poverty rates represent a limitation to the application of adaptation measures, especially in the rural areas, which for instance due to climate change might witness a damage of small-scale agricultural production directly affecting livelihoods. Hence, poverty reduction and the shift of the energy matrix towards the use of renewable resources can be found among the top strategies for climate action. The country aims to continue its investments in the energy sector in a structured way by promoting the establishment of an efficient infrastructure for gas, in order to guarantee security of supply

and decentralized power generation. In a first phase, there will be a development of infrastructure towards the south, the centre and consequently the north of the country. In the coming decade, natural gas will play a major role in the energy mix. Thereafter Peru's long-term transition to a sustainable energy future will be done by a gradual substitution of natural gas by renewable energy sources (hydro, solar, wind, geothermal). In alignment with this plan, in 2018, Peru added roughly 500 MW of green capacity through projects such as the opening of the 145-MW Rubí solar photovoltaic (PV) plant. Moquegua, the department near the Chilean border that hosts the facility, has one of the highest PV electricity potentials of any region in the world.

In the 2014 report 'Evaluación de necesidades tecnologicas por el cambio climatico', the Ministry of the Environment identified the potential for two types of technologies for climate change mitigation and adaptation: on one hand, improvements on solid waste management through recycling and composting technologies, which would allow the reduction of CO2 emissions while improve living standards for the population; on the other, water resources management, which includes technologies to capture and conserve water and the prevention of damages from extreme climatic events, such as 'El Niño' in 2017, which are expected to increase in the future as a consequence of climate change. Peru aims to progress in its transition towards a low carbon energy mix and set the objective to reach a 60% renewable energy and 40% gas in the electricity mix by 2025 and 15% of renewables in its energy mix by 2030, reducing the imports of gasoline and diesel, mostly used in the transport sector. Moreover, by 2021, the government expects to reach a 100% coverage in electrification, mainly closing the gap in rural areas (IRENA).

Stakeholders identified

Local institutions and agencies

- Ministerio del Ambiente (MINAM)
- Grupo de Trabajo Multisectorial para la implementación de las Contribuciones Nacionalmente Determinadas (GTM-NDC)
- Comisión Nacional sobre el Cambio Climático (CNCC)
- Consejo Nacional del Medio Ambiente (CONAM)
- Ministerio de Energia y Minas
- Dirección General de Electricidad (DGE)
- Ministerio de la Produccion (PRODUCE)
- Innóvate PERU
- Startup Peru
- Ministerio de Economia y Finanza
- ProInversion – Agencia de Promocion de la Inversion Privada

Local relevant institutions and specialized national agencies

- Fondo de Inclusion Social Energetico (FISE)
- Agencia Peruana de Cooperacion Internacional
- Proyecto PLANCC – Planificacion ante el cambio climático

Local and national regulators

- OSINERGMIN – Organismo Supervisor de la Inversion en Energia y Mineria

Public advisory boards

- Comité Nacional Peruano (CEPIER) de la Comision de Integracion Energetica Nacional (CIER)
- Comité de Operación Economica del Sistema Interconectado Nacional (COES)
- SENHAMI Servicio Nacional de Metereologia e Hidrologia

- Consejo Nacional del Medio Ambiente (CONAM)

Asociacion peruana de Energia Solar y del Ambiente

Local chamber of commerce

- Camara de Comercio de Lima
- Camara Nacional de Comercio del Peru

Local federation of industries

- CONFIEP – Confederacion Nacional de Instituciones Empresariales Privadas

Local business aggregators and unions

- Asociacion Emprendedores Peru (ASEP)
- inPERU
- COMEX Peru

Academia and research institutions

- Universidad Nacional de Ingenieria
- Centro de Energia Renovables y Uso racional de Energia
- UTEC – Universidad de Tecnologia y Tecnologia

Startup incubators/accelerators

- Peru Incuba - Asociacion Peruana de Incubadoras de Empresas
- Centro de Innovacion y desarrollo emprendedor - Pontificia Universidad Catolica del Peru
- UTECVentures

Local press, media and specialized agencies

- Revista Energiminas
- ConexionCop
- El Peruano
- Energia Estrategica
- Revista Proactivo