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Energy Accessibility and Green Energy Cooperation in East Africa

Munsu KANG Research Fellow, Africa and Middle East Team, Center for Area Studies (kangms@kiep.go.kr)

I. Introduction

Climate change has been attributed to global warming, the main drivers of which have been an increase in renewable energy generation, a diversification of energy sources, and an increase in energy efficiency. Despite the arguments on energy issues are moving forward to sustainable energy usage, energy access in sub-Saharan Africa still remains limited.

By 2020, 90% of the world's population should be able to access energy, including 97% of the urban populations. However, only 49% of sub-Saharan Africans have access to electricity, while only 28% of rural populations can. It is not different when it comes to the availability of clean energy for cooking. In 2020, according to the International Energy Agency, only 17% of people in sub-Saharan Africa will have access to clean energy for cooking, which means that more than 881 million people will rely on traditional energy sources such as charcoal for cooking.

At the same time, net-zero targets in the energy sector to combat climate change are becoming increasingly important even in Africa as well. With this in mind, East African countries are also increasing their generation capacity by using renewable energy sources such as hydropower and solar power. The IEA estimates that renewable energy will become the largest source of energy in sub-Saharan Africa by 2030.

The availability of green energy in East Africa could be improved through the development of green energy supply capacity. It has been suggested that energy accessibility could become a golden thread for economic growth,

equity enhancement, and environmental sustainability, as stated by former UN Secretary General Ban Ki-Moon. Therefore, the policy implications for the cooperation between Korea and East Africa in improving the access to green energy in East Africa are crucial for achieving SDG7, which is affordable access to energy.

II. Energy Accessibility and Power Generation in East Africa

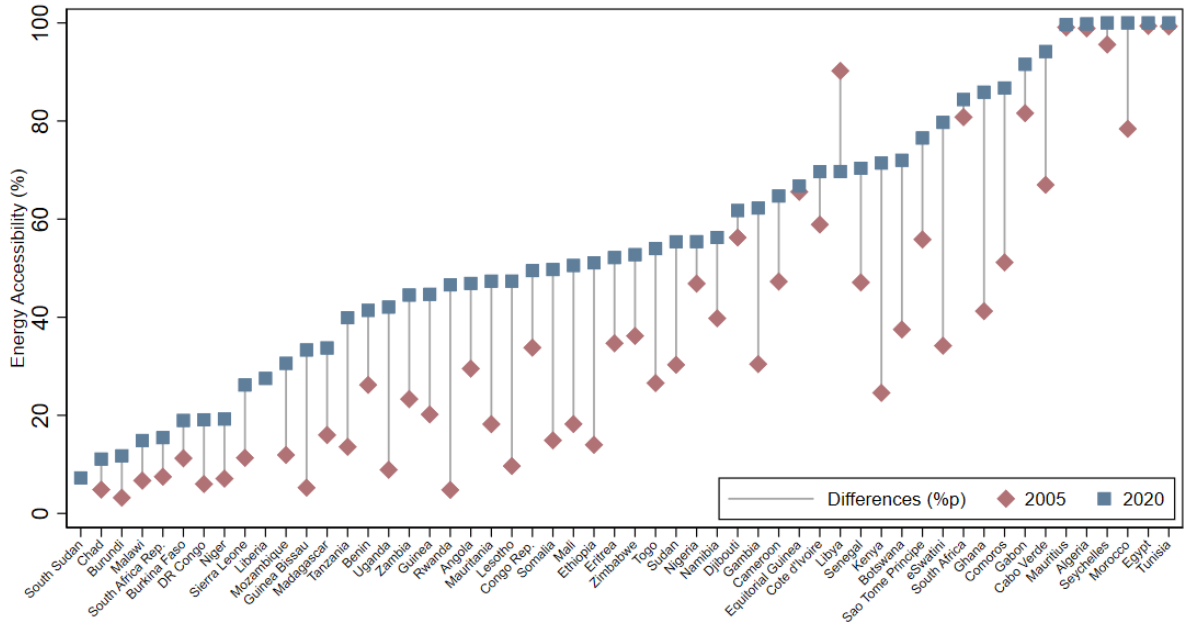
1. Energy Accessibility

Four of the largest countries by population in Africa are located in East Africa including Ethiopia, Tanzania, Kenya, and Uganda. Therefore, this study focuses on four countries. In Kenya, 71.4% of its population had access to electricity in 2020. Ethiopia had 51.1%, Uganda had 42.1%, and Tanzania had 40%. The proportion of Ugandans and Tanzanians with access to electricity remains low even within the African continent despite significant improvements (see figure 1).

Considering rural areas only, the percentage of electricity access in Kenya is 69%, whereas it is 35%, 13%, and 19% only in Ethiopia, Uganda, and Tanzania. In light of this, it appears that there is a significant gap between the accessibility of electricity in urban and rural areas. This suggests that there may be different solutions for improving access to electricity in rural and urban areas.

Figure 1. Energy Accessibility by Country in Africa

(Unit: %)



Source: World Bank Online data (“Access to electricity”).

It would be a good idea in this regard to use green energy to improve energy access in East Africa. For example, solar energy is an important source of lighting in rural East Africa. According to the Kenya household survey and the World Bank LSMS-ISA household survey, electricity is the most important source of lighting in Kenya and Tanzania. In Uganda, however, respondents reported that solar power and lanterns were the most important sources of lighting. Therefore, it is possible that Korea could consider the use of solar power when cooperating with East African nations.

Even if the situation regarding energy accessibility is not encouraging, it is also difficult to increase the capacity of fossil fuel-based power, since African countries are working towards net-zero energy production. Therefore, it is becoming more realistic to access energy through green energy, such as solar and wind power, as opposed to using hydrocarbon resources.

2. Power Generation

East Africa has experienced a trend of increasing power generation capacity. As a result, Kenya's electricity consumption per capita has also increased, consuming 176.8kWh per capita annually in 2020. There is, however, a large gap between Kenya and other East African countries, as Tanzania, Ethiopia, and Uganda consume only 103, 90, and 71 kWh of electricity annually, respectively.

Hydropower is the major source of energy for power generation, followed by hydrocarbons and geothermal energy. The energy generation sources in each country, however, differ greatly. Tanzania generates over 68% of its energy from hydrocarbons, whereas Ethiopia and Uganda rely on hydroelectricity for more than 85% of their power generation. For the generation of electricity, Kenya developed geothermal and hydropower resources. In Ethiopia, Uganda, and Kenya, green energy accounts for a larger portion of power generation than in other countries. Samia Suluhu Hassan, President of Tanzania, has also stated that the country is committed to reducing its carbon footprint by increasing its power generation capacity through the use of renewable energy.

Table 1. Solar Energy Potential in East Africa

	Theoretical average potential (kWh/m2/day)	Actual average potential (kWh/kWp/day)	Economic affordability (USD/kWh)	PV Seasonality index	PV installed land proportion	Accumulated PV generation capacity	PV generation capacity per capita (Wp/per cap)
Ethiopia	5.85	4.70	0.09	1.58	0.003	11	0.1
Kenya	5.78	4.50	0.09	1.38	0.006	92.5	1.8
Tanzania	5.66	4.51	0.09	1.31	0.003	25.4	0.5
Uganda	5.64	4.46	0.10	1.24	N/A	48	1.1
Rwanda	5.08	4.10	0.10	1.22	N/A	30.3	2.5
SSA	5.52	4.46	0.10	1.33	0.04	72.82	3.24

Source: Solargis online DB (https://datacatalog.worldbank.org/search/dataset/0038379)

Focusing on electricity generation, green energy shares such as hydropower, wind, geothermal, and solar energy are more than 70%, which means that green energy is the key to electricity access in East Africa (author's calculation based on Africa Energy Portal database).

The global share of power generation is dominated by solar power. Approximately 50% of the newly installed electricity capacity is derived from solar power, while 25% comes from wind power, according to Maia, Demoro, and Foroni (2022). There is a similar trend in Africa as well. Solar energy accounted for the largest share of newly installed power generation in Africa between 2020 and 21.

The potential of PV generation in East Africa is substantial compared to that of sub-Saharan Africa. The economic feasibility of PV generation in Ethiopia, Kenya, and Tanzania is around $ 0.09/kWh with a high potential (see Table 1). In spite of the bright future of the PV market, current PV generation capacity in all East African countries is significantly lower than the SSA average.

III. Green Energy Policies in East Africa

East African countries are cooperating in the energy sector to improve energy access and power generation in the region. For example, energy policies such as EAPP (East Africa Power Pool) and African Clean Energy Corridor have been announced since 2000s. EAPP is one of the regional power pools along with CAPP (Central Africa PP), COMELEC (Maghreb PP), SAPP (Southern Africa PP), and WAPP (West Africa PP). The purpose of EAPP is to ensure power supply in member countries by building transmission and distribution infrastructure, co-investing in transnational power infrastructure, and developing power market within the region. However, institutional differences are an obstacle to an integrated electricity market. Accordingly, EAC (East African Community) has also unveiled Vision 2050 with targets for the energy sector. Among the three goals, the third goal aims to increase power supply through green energy such as bio-energy, solar and geothermal energy.

UN also announced 'Sustainable Energy for All (SE4ALL)' for a better access to modern energy, improve energy efficiency, and double the share of green energy in the energy mix. SE4ALL focuses on the energy accessibility. Among other things, SE4ALL especially aims to improve energy access for the poor through affordable energy prices and the development of safe and clean energy.

Following the discussions within Africa, East African countries including Kenya, Tanzania, and Uganda also announced to increase the share of green energy up to 50% by 2030 through the use of hydropower, geothermal, solar and wind energy. The three countries have also adopted feed-in-tariff and feed-in-premium policies to encourage the installation of green energy-related power generation (REN21, 2016). Tanzania, for example, aims to increase the green energy share up to 80%

by 2032. The Tanzanian government announced the 'Scaling up Renewable Energy Programme for Tanzania' in 2013 to increase the share of green energy in the power generation. Tanzania's president also pursues to install 6 GW green energy generation by 2025. Kenya is leading the green energy market in East Africa. The Kenyan government announced KOSAP (Kenya Off-Grid Solar Access Project), Bioenergy strategy, and SREP (Scaling-up Renewable Energy Plan) to achieve 100% of green energy shares in terms of power generation. The Ugandan government is focusing on rural electricity access through small-scale power generation using biomass, wind, geothermal, and solar energy.

Despite the efforts of governments in East African countries, there are not enough incentives. For example, Pueyo (2018) points out that relatively low demand on green energy and lack of infrastructures related to energy connectivity as well as poor governance disincentive inward investments in Kenya. Situation is not very different in Tanzania and Uganda, and institutional indicators in two countries are even lower compared to Kenya.

IV. Policy Implications

Based on the discussion, we suggest four policy implications for Korea-East African cooperation in the energy sector. First, improving the policy environment is essential. There could be more incentives for the private sector to invest in the green energy sector in East Africa countries. Another area where Korea and East African countries can cooperate together in terms of policy is rural electrification. Korea already has experiences in rural electrification during the development era. The Korean government also aims to achieve its net-zero goals by 2050, and energy transition is key by increasing green energy use.

Scaling up of green energy projects through ODA funds could be another cooperation strategy that Korea and East African countries can pursue. The Korean government is supporting transmission and connection-related projects in East Africa. According to statistics by OECD CRS, more than 70% of ODA funds by Korean government in the energy sector have been allocated to power transmission and connection. However, as the demand for green energy is increasing in East African countries to ensure better access to electricity, the Korean government can increase its budget for small-scale power generation from solar and wind power.

Diversification of cooperation in the green energy sector should be prioritized for cooperation with East African countries. For example, recent cooperation areas by Korean agencies have focused on the solar power for small-scale power generation or energy accessibility. However, as it is shown in the previous section, wind, small-scale hydropower, and geothermal power are also prioritized in East African countries. For example, proportion of geothermal power in Kenya is more than 30% of total power capacity. It is also important to consider electricity access for the poor. In particular, improvement of energy access in the rural East

Africa could be accomplished by applying off-grid solar power generation facilities. Furthermore, energy access in public service areas such as clinics and schools also can be improved by adopting off-grid PV. For this reason, Korea and East African countries could collaborate to install off-grid power generation infrastructure at decent prices for the rural energy accessibility. Another area for cooperation could be the provision of clean energy for improved cooking energy accessibility. Energy access for not only lightening but also cooking are difficult in the rural East Africa, and residents depend on fossil fuels such as charcoal. However, green energy for improving cooking condition could also be considered which also affects asthmatic diseases.

Private participation could also be encouraged. Key barriers for private sector for Korean companies to enter the East African market are lack of information and limited financial support. In comparison with other countries such as US, Japan, Germany etc., the private participation in the African energy market of Korean companies is still at an early stage. For this reason, more information and financial support for the private sector could be considered so that Korean private sector for the green energy could enter East African energy market. KIEP

References

Maia, S., Luiza Demoro, and Laura Foroni. 2022. “Climatescope 2022 Power Transition Factbook.” BloombergNEF. https://global-climatescope. org

Pueyo, A. 2018. “What constrains renewable energy investment in Sub-Saharan Africa? A comparison of Kenya and Ghana.” *World Development*, 109, pp. 85-100.

Renewable Energy Network for the 21st Century (REN21). 2016. “EAC Renewable Energy and Energy Efficiency Regional Status Report.” Commissioned by United Nations Industrial Development Organization (UNIDO).