The KENYA INSTITUTE for PUBLIC POLICY RESEARCH and ANALYSIS

Policy Brief

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Thinking Policy Together

Tracking the Progress Towards Sustainable and Inclusive Energy Transition in Kenya

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1. Introduction

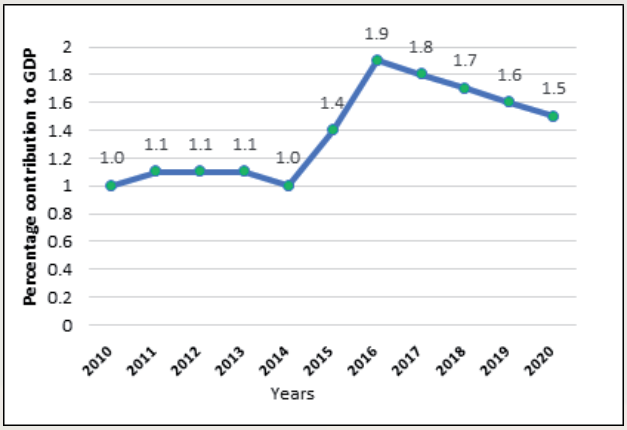
Energy transition is a policy-driven process involving a systematic global shift from fossil-based energy production and consumption systems to carbon neutrality, renewable, sustainable, efficient, secure, and reliable energy systems (World Economic Forum, 2018). The 2030 Agenda for Sustainable Development, Goal 7, guides the global energy transition process advocating for access to affordable, reliable, sustainable, and modern energy sources for all. While energy transition is a shared global concern, the progress and pathways differ across countries and are driven by socio-economic context, political economy, resource endowment, and the priority sectors that require intervention (International Renewable Energy Agency - IRENA, 2021). Tracking energy transition indicators provides precise and comparable measurements for analysts and policy makers to evaluate policy impacts and implications (Yu et al., 2020). The critical energy system performance dimensions for energy transition include: 1) economic development and growth; 2) universal access; 3) reliable energy supply; and 4) environmental sustainability (World Economic Forum, 2021).

2. Tracking Energy Transition Performance Indicators

(i) Contribution to economic development and growth

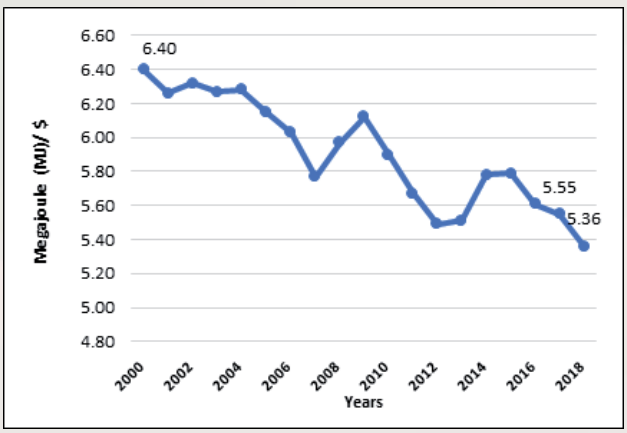
The contribution of electricity supply to GDP in Kenya increased from 1.0 per cent in 2010 to 1.5 per cent in 2020 (Figure 1a). In 2016, the sector contribution accelerated to 1.9 per cent, with a significant increase in electricity production from geothermal energy, which is cost-effective and plays a crucial role in ensuring a stable baseload. The contribution has been declining due to depressed generation of hydro-electricity due to erratic weather patterns and a considerable increase in the generation of electricity from thermal sources that are highly input-intensive, increasing the sector's production costs. Further, a decline was experienced in 2020 with a reduction in total electricity generated from 11,620.7 Gigawatt hours (GWh) in 2019 to 11,603.6 GWh in 2020, due to reduced demand from large-scale consumers during the COVID-19 pandemic. Therefore, sustained electricity generation from renewable sources enhances electricity contribution to GDP, and is therefore a pivotal pathway to the energy transition.

Figure 1a: Percentage contribution of electricity supply to GDP, 2010-2020



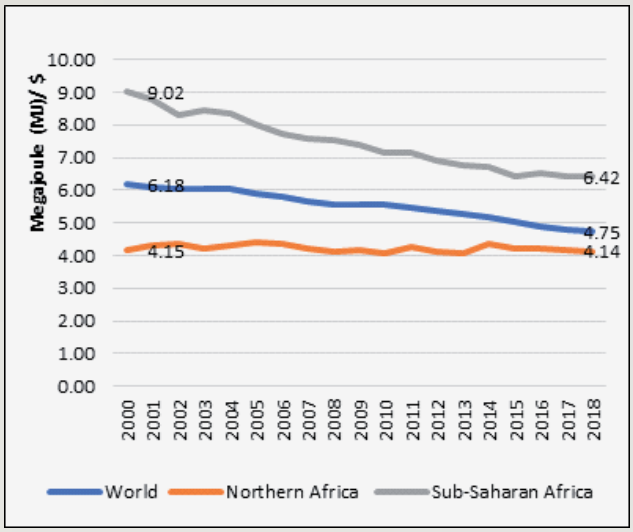
Source: Kenya National Bureau of Statistics (Various), Economic Survey

Figure 1b: Trends in primary energy intensity in Kenya, 2000-2018



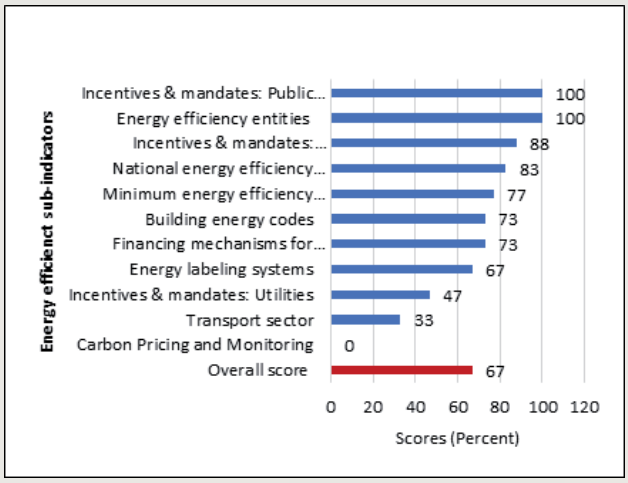
Source: United Nations Statistics Division (UNSD), 2020

Figure 1c: Trends in primary energy intensity across regions, 2000-2018



Source: United Nations Statistics Division (UNSD), 2020

Figure 1d: Energy efficiency sub-indicators scores



Source: World Bank: RISE, 2020

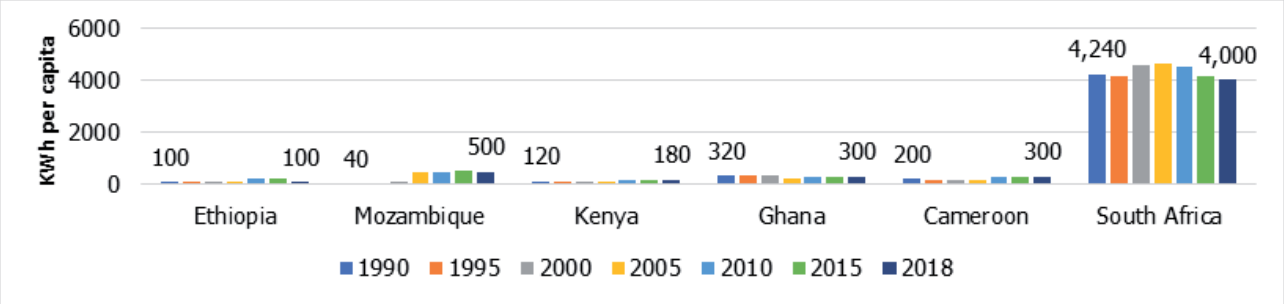
The primary energy intensity, defined as the percentage decrease in the total primary energy supply ratio per unit (GDP), improved by 16. 3 per cent from 6.40 MJ/$ in 2010 to 5.36 MJ/$ in 2018 (Figure 1b). The same improvement was experienced at the global level, Sub-Saharan Africa (SSA), and North Africa (Figure 1c). That said, Kenya's primary energy intensity in 2018 was better than the SSA average, but worse than the world (4.75 MJ/$) and North Africa (4.14 MJ/$). The improvement in Kenya is attributable to significant energy efficiency measures such as the establishment of Energy Efficiency and Conservation (CEEC), which undertakes subsidized energy efficiency audits and other programmes for the industrial sector and SME sectors, promoting energy efficiency and conservation in public buildings, conducting energy audits in government buildings, installing solar water heaters in residential areas, and sensitizing citizens on energy efficiency programmes.

Kenya attained an overall energy efficiency score of 67 per cent in 2018 (RISE, 2020). However, the scores vary across the various sub-indicators. Energy efficiency policies and regulations supporting incentives and the mandates of public, commercial, and industrial sectors; energy efficiency entities, and efficiency performance standards, among others, scored high (Figure 1d). The impressive performance indicates that Kenya has adopted advanced and comprehensive policy and regulatory frameworks for energy efficiency, which are key in shaping utilities' generation, transmission, distribution, and demand-side management. However, the sector lags in energy adoption and implementation of regulatory and policy frameworks targeting the transport sector; carbon pricing and monitoring; and incentives and mandates for utilities. This reflects absence of adequate policy frameworks to support transport demand reductions, and a shift to more energy-efficient modes for commercial and industrial use.

Electricity consumption increased significantly from 5,754 GWh in 2010 to 8,796 GWh in 2020. The increase is mainly driven by increased electricity connectivity through grid expansion, off-grid solutions, and high electricity consumption by the commercial and industrial sectors. This implies that the country is on the right pathway in transitioning to clean and modern energy sources. However, despite the increased electricity consumption, in 2021 only 9 per cent of the total energy consumed was from electricity. Use of traditional energy sources such as wood fuel and biomass constituted the bulk (68%) of total energy consumption, while petroleum products stood at 22 per cent (Ministry of Energy, 2021). Even with key improvements in electricity supply and connectivity, majority of the population still rely on non-clean energy sources, which is detrimental to transitioning to clean and modern energy sources for all. This is mainly attributable to the high cost of electricity in the country where commercial and industrial consumers opt for less costly alternative sources such as solar, and households shift to non-clean sources.

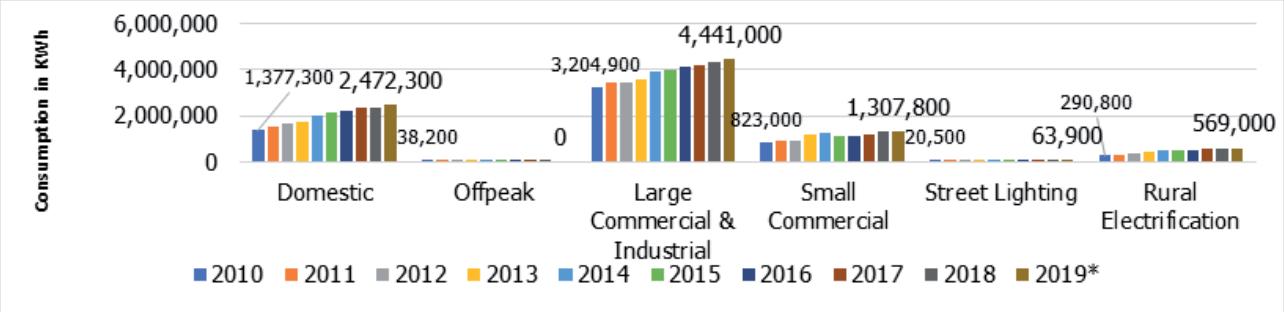
Electricity consumption per capita registered a marginal increase from 120 KWh per capita in 1990 to 180 KWh/ capita in 2018 (Figure 2a). However, the progress is slow compared to comparator countries in SSA. For instance, South Africa registered the highest electricity consumption per capita in the region of 4,000 KWh per capita in 2018 and is the only country in SSA that exceeds the world average of 3,060 KWh per capita (International Energy Agency, 2020). Electricity consumption across sectors differs but has registered an increasing trend among all the end-users (Figure 2b). In 2019, large commercial and industrial consumers accounted for 51.6 per cent of the total energy consumption, and domestic consumer and small commercial accounting for 26.5 and 14. 8 per cent of total energy consumption, respectively. Therefore, large commercial and industrial consumers and domestic consumer categories remain central and pertinent to the energy transition plans.

Figure 2a: Electricity consumption per capita with comparators,1990-2018



Source: IEA (2020)

Figure 2b: Electricity consumption by sector, 2010-2019



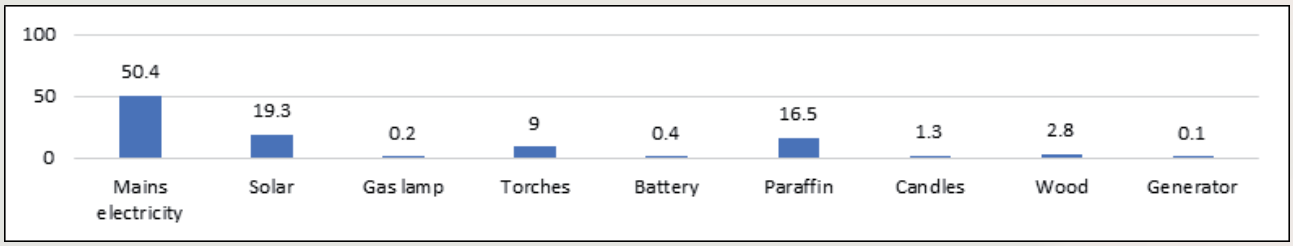
Source: KNBS (2020), Statistical Abstract

(ii) Universal access and reliable energy supply

In Kenya, about 50.4 per cent have access to electricity as the main source of lighting followed by solar at 19.3 per cent. A significant proportion of households still rely on kerosene (16.5%) and burning wood (2.8%), which are non-clean sources (Figure 3a). Only 25.5% of households have access to clean cooking fuels, with majority (74.5%) still relying on non-clean sources (Figure 3b). Therefore, there is need to fast-tract electricity access to ensure universal access to clean lighting sources.

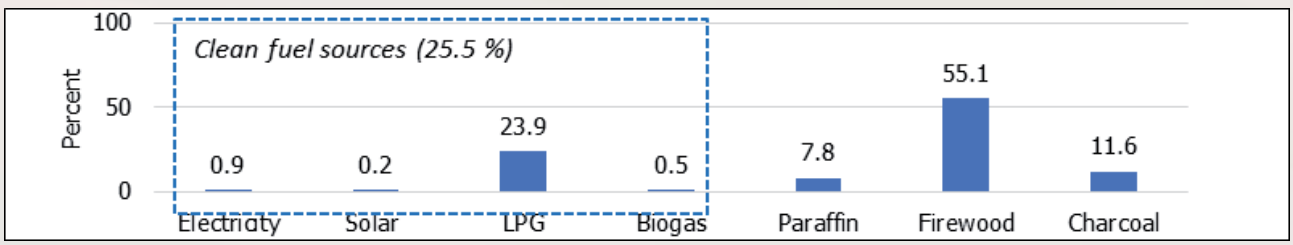
Kenya attained an average score of 76.4 per cent in energy access (RISE, 2020). The frameworks for mini grids and standalone systems, grid electrification and electrification planning registered high scores, attesting to growing understanding of the potential of energy infrastructure in accelerating electricity access (Figure 3c). This demonstrates that Kenya has made significant progress in developing a policy framework,

Figure 3a: Percentage distribution of households by main type of lighting source



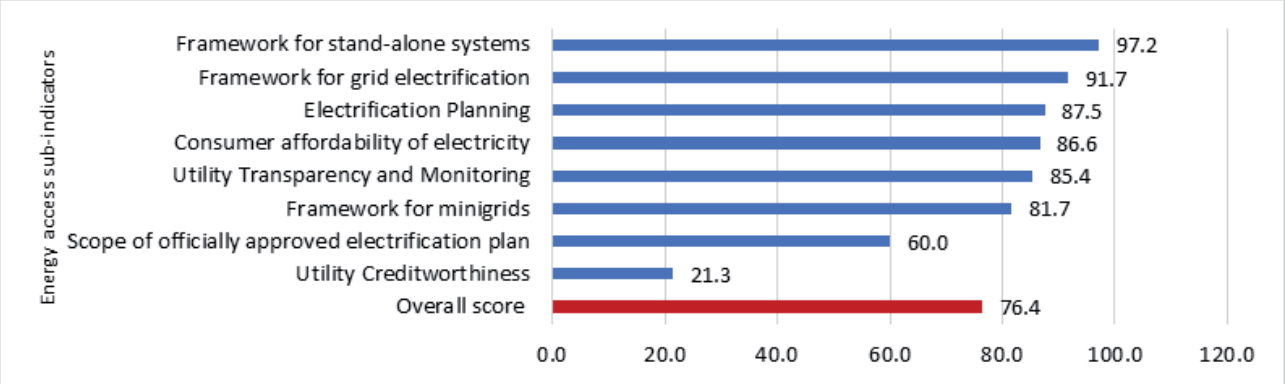
Source: Kenya National Bureau of Statistics (2019), Kenya Population and Housing census

Figure 3b Percentage distribution of households by main type of cooking fuel



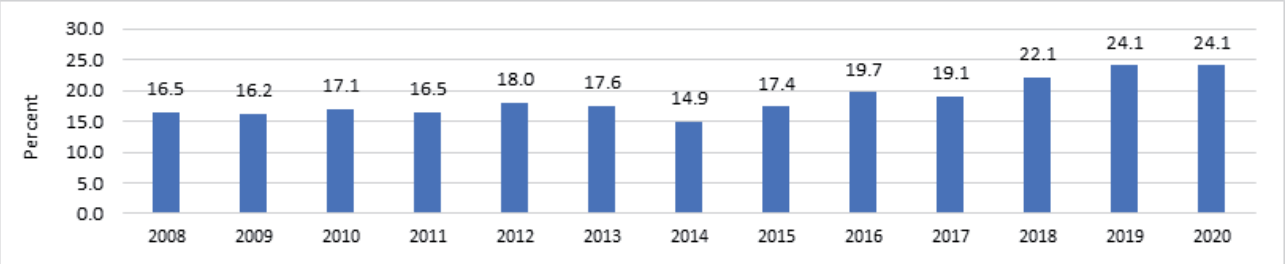
Source: Kenya National Bureau of Statistics (2019), Kenya Population and Housing census

Figure 3c: Energy access sub-indicators scores



Source: World Bank: RISE (2018)

Figure 3d: Transmission and distribution losses as a percentage of generated capacity (GWh)



Source: Kenya National Bureau of Statistics (Various), Economic Survey

including the National Electrification Strategy 2018-22, which defines the roadmap towards universal electricity access through grid expansion and mini grids; and the Kenya Electricity Sector Investment Prospectus 2018-2022, which presents investment and financing opportunities in renewable energy power generation, electricity transmission, and distribution for the grid and off-grid electrification. In addition is the Renewable Energy Auctions Policy, 2021 Feed-in Tariffs Policy on Renewable Energy Resource Generated Electricity (Small-Hydro, Biomass, and Biogas), 2021. The development of mini-grid regulation is underway and will provide a clear and competitive process for mini-grids licensing and interconnection to the main grid.

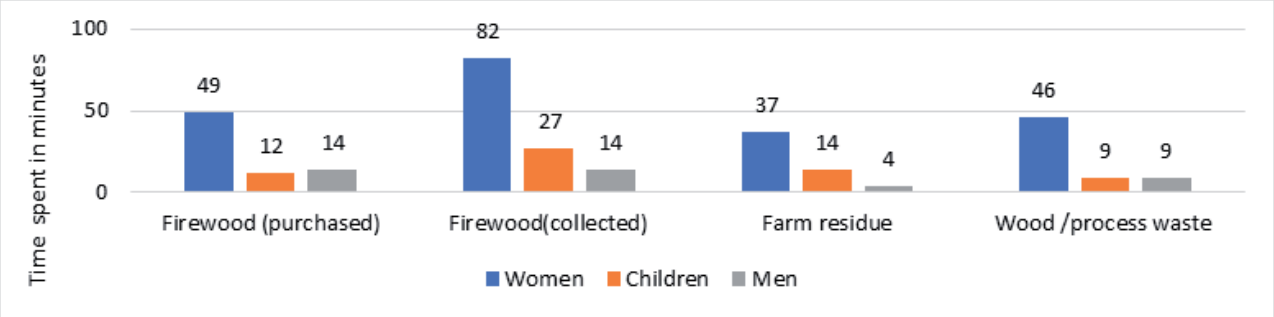
The transmission and distribution losses as a percentage of generated capacity increased from 16.5 per cent in 2008 to 24.1 per cent in 2020 (Figure 3d). The loses are mainly attributable to technical causes and occurs during the transfer of energy across transmission and distribution networks, primarily due to poorly maintained grid infrastructure. Non-technical losses arise from unidentified and uncollected revenue, meter tampering, illegal connections, metering errors, and billing and revenue collection shortfalls. Power losses have severe effects on the quality of power delivered to customers and have an adverse impact on meeting the expected revenues targets. Despite the efforts to modernize the grid network, the sector does not have an electric grid power policy and strategy to counter the increasing electricity transmission and distribution losses.

Transition towards a low-carbon growth is not only technical and economical, but also deeply social and gendered. Women and children tend to bear the primary responsibility of acquiring non-clean fuels such as firewood, farm residue, and wood waste (Figure 4). On average, women and children dedicate an equivalent of 1.36 hours and 0.45 hours in collecting firewood, respectively, while men spend 0.23 hours per day. A similar pattern is observed in purchased firewood, whereby women spend three times more time than men. The International Energy Agency (2017) estimated that the average firewood load carried by women for several miles daily varies from 25-50 kilogrammes.

(iii) Environmental sustainability

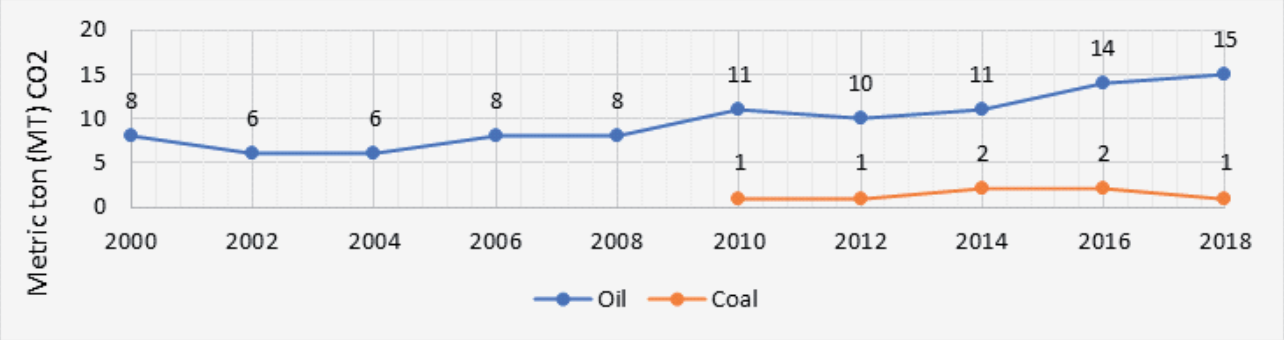
Energy related carbon emissions in Kenya are mainly from combustion of oil, which is the highest emitter at 15 Mt CO_2 and coal 1 Mt (Figure 13). Emissions from coal are lower as coal is under-exploited in Kenya. In 2018, carbon emissons from oil in Kenya were relatively low compared to the global and regional (Africa) emissions which stood at 11,418 Mt CO_2 and 557 Mt CO_2, respectively. Emissions across sectors indicate a steady increase in the transport sector attributable to increase in passenger and freight transport activities over past years, which depend on petroleum products. This notwithstanding, emissions in Kenya are comparatively low compared to emissions across sectors in Africa and global level as shown in Figures 5b, 5c, 5d.

Figure 4: Time spent in acquiring various energy sources by women, men, and children



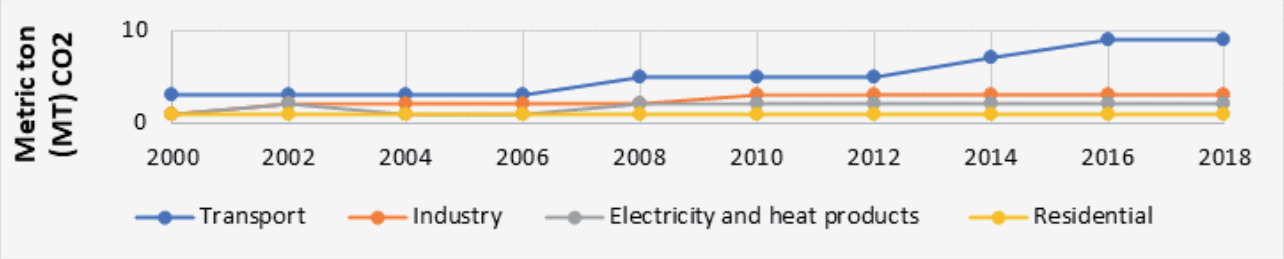
Source: Computed from Kenya National Bureau of Statistics (2016), Kenya Integrated Household Budget Survey - KIHBS 2015/16

Figure 5a: CO_2 emissions by energy source, Kenya 2000-2018



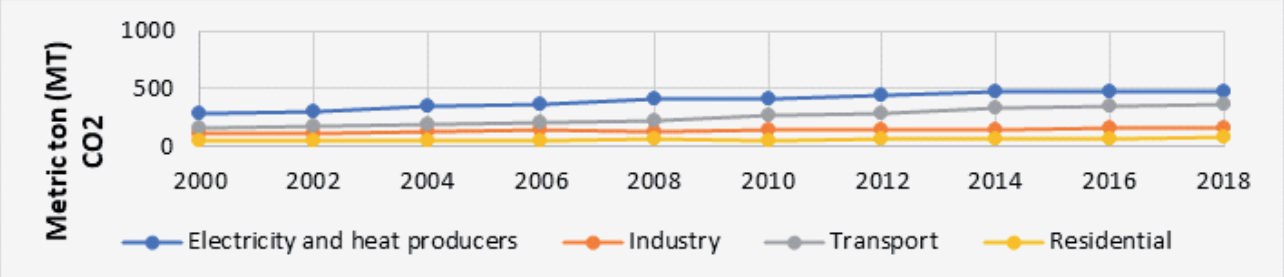
Source: International Energy Agency – IEA (2020)

Figure 5b: CO_2 emissions by sector, Kenya 2000-2018



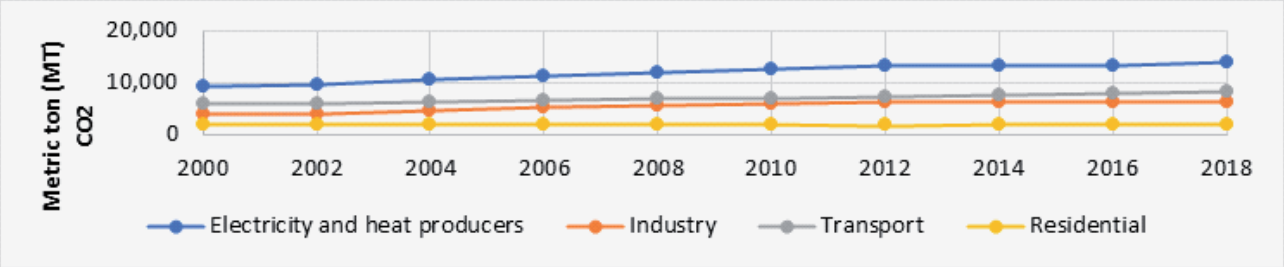
Source: International Energy Agency – IEA (2020)

Figure 5c: Carbon emissions by energy source in Africa, 2000-2018



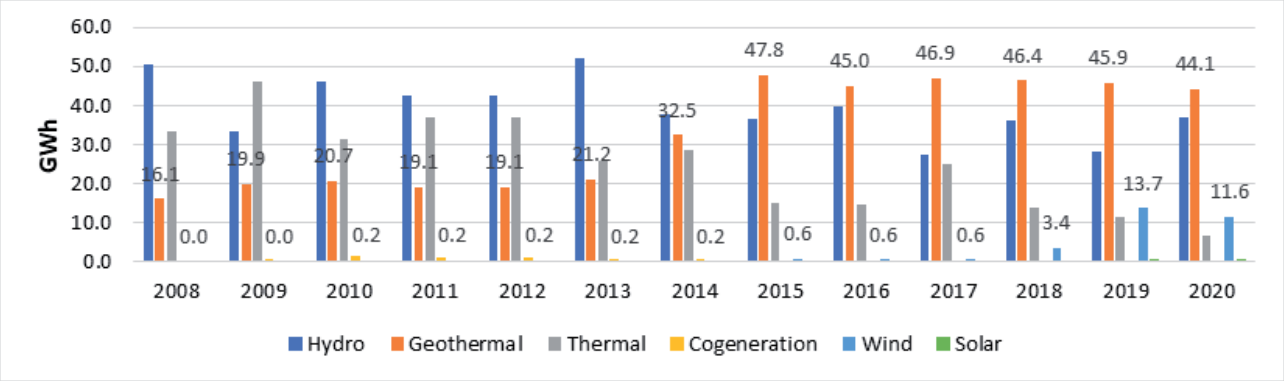
Source: International Energy Agency – IEA (2020)

Figure 5d: CO_2 emissions by sector, Global 1990-2018



Source: International Energy Agency – IEA (2020)

Figure 6: Share of electricity generation from various sources in Kenya, 2008-2020



Source: Kenya National Bureau of Statistics (2020), Economic Survey

The share of renewable energy sources in the total energy generation mix has increased steadily over the past years. For instance, the share of geothermal energy increased from 16.1 per cent in 2008 to 44.1 per cent in 2020 (Figure 6). Kenya's natural abundance in solar, hydro, wind, biomass and geothermal resources means that the country boasts of many alternatives to fossil fuels. By tapping into these renewable energy sources, Kenya can simultaneously mitigate climate change, boost economic growth through "green" job creation, and reduce poverty through the benefits that access to electricity brings.

3. Policy Implications

While Kenya has made significant milestones in energy transition, a lot more is required. This requires the following.

(i) Sustained electricity generation from renewable sources such as geothermal, wind, and solar to boost growth of the sector as these sources are deemed cost-effective and reliable and therefore pivotal in transitioning to affordable, reliable, clean, and modern energy sources.

(ii) With the transport sector accounting for the highest emission of CO_2, transition to net-zero carbon pathway necessitates formulating energy efficiency programmes, including incentives for the uptake of bio-based and synthetically produced fuel, and increased market penetration for highly efficient (battery and fuel-cell) electric vehicles and electric trains.

(iii) Developing a carbon pricing and monitoring policy framework to facilitate the implementation and administration of carbon pricing mechanisms by establishing financial resources to fund emission reduction projects that can stimulate national carbon markets. Carbon financing also encourages the adoption of discounted green mortgages, green or energy efficiency bonds, and partial risk guarantees.

(iv) The energy sector has adequate legal frameworks to facilitate the energy transition. Therefore, there is need to fast-track the implementation of various strategies, policies and programmes including Kenya National Electrification Strategy, Kenya Electricity Sector Investment Prospectus and the Kenya bioenergy strategy, among others.

(v) Electric power transmission and distribution losses have severe effects on the quality and cost of power delivered to customers and have an adverse impact on meeting the expected revenue targets of the power utility. Therefore, the grid modernization programme should include formulating the electric grid power policy and strategy to counter the increasing transmission and distribution losses.

(vi) The diffusion of clean energy sources for cooking remains limited. Affordability can be enhanced through inclusive approaches such as the pay-as-you-go model, and subsidies for the upfront cost of LPG, bioethanol, and biogas. In addition, engendering energy projects, programmes, and policies through gender mainstreaming will ensure both women and men participate and benefit from access to clean and modern energy sources.

(vii) Formulating a comprehensive carbon pricing and monitoring policy framework to facilitate mobilization of the financial investments required to stimulate clean technology and market innovation, fuelling new low-carbon drivers of economic growth.

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