Energy Security for a Holistic Developmental Transformation in Kenya: A SWOT Analysis

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Abstract

During 2020 and 2021, the COVID-19 Pandemic brought economic productivity and billions of livelihoods globally to a near halt. It disrupted trade, commerce, industry and exchange within states and across regions, thereby worsening unemployment and human suffering. Barely two years later in early 2022 the world was plunged into yet another crisis following the Russian invasion of Ukraine. A host of international sanctions against Russia have since fuelled a global food and energy crisis thereby worsening inflation, national debt and a host of other macroeconomic problems world over. This state of affairs, coupled with the adversities occasioned by global climate change spells doom on many developing countries' quest for holistic and sustainable development. Kenya is no exception. Against all these odds, Kenya seeks to transform itself into an industrializing middle income economy by 2030. This overarching national developmental end objective resonates with key regional and global development blueprints including Africa Agenda 2063 and UN Sustainable Development Goals (SDGs). In 2030, the population of Kenya will be 66 million and at least 80 million by 2050 (Population Reference Bureau, 2015). The main argument in this paper is that, for Kenya to handle the human security demands and needs of such a populace, it has to undergo a holistic developmental transformation. Taking-on a conceptual and discursive approach to a SWOT Analysis informed by secondary sources of data, the paper responds to this puzzle by making a strong case for energy security as a prime ingredient in any recipe for holistic developmental transformation in Kenya. While the findings point to serious threats and weaknesses, they also reveal numerous strengths and opportunities in

as far as the energy security-holistic development nexus in Kenya is concerned. Subsequently, it makes a number of pertinent recommendations on how to harness these strengths and opportunities going forward.

Key Words: *Energy Security, Holistic Development, Kenya, SWOT Analysis, Transformation*

Introduction

Vision 2030 seeks to transform Kenya into an industrializing upper middle income economy by 2030. However, Kenya is yet to attain energy security to power its economic ambitions, especially industrialization, economic growth and economic development. This has partly been contributed by the fact that *Vision 2030* technically under-states the significance of the energy sector to Kenya's economic aspirations. The country's energy sector is characterized by rigid monopolies, state control or interventionism and over-reliance on hydro-electric power (HEP). Given climatic adversities such as drought and structural constraints including monopoly and state control, Kenya's energy sector's competitiveness and growth is limited. The country's energy sector growth is stuck in under-explored energy generation potentialities, captured by institutional rigidities, and restricted by policy frameworks. The main contention herein is that Kenya is energy insecure and for it to holistically transform its developmental outlook, a deliberate and phenomenal energy undertaking ought to be made. Such reforms will unlock the country's energy generation potentialities, and liberalize the regulatory frameworks to spur competitiveness in the sector.

The central argument of the paper therefore is that Kenya's economic development significantly depends on attaining energy security from effective energy sector governance. Energy is a critical force or engine of industrialization and economic development because it fundamentally drives the production of industrial output (Barney & Franzi, 2002). Proper energy sector regulation and governance also needs to focus on energy markets to stabilize prices for better industrial performance (Martchamadol & Kumar, 2012). Price is a market factor that can affect access, affordability, consumption and ultimately production. In fact, according to Asghar and Zahid (2008) the higher the prices of energy in an economy, the slower the GDP growth and vice versa. The causal relationship

between energy supply capacity or the energy price (as a direct factor) and growth in gross domestic product (GDP) or energy consumption has been argued to be directly proportional (Asghar & Zahid, 2008). In other terms, increase in GDP has a direct impact on energy consumption in an economy as a result of expanded demand from productive activities which account for GDP growth (Asghar & Zahid, 2008). It is therefore important for Kenya to effect favorable policy regulations and governance regimes for the energy sector to boost energy production and installed capacity or ready supply, to stabilize energy prices, to support industrial production or industrial energy consumption for GDP growth.

The paper begins with the theoretical and analytical scope behind the central argument that 'energy security contributes to holistic development', before briefly discussing the empirical framework and the methodology of the research. Thereafter, the paper makes a retrospective analysis of Kenya's development experience, and carries out a SWOT analysis of Kenya's energy sector governance and capacity prospects. Lastly, the paper makes a number of pertinent recommendations on how to harness these strengths and opportunities.

Theoretical Framework

At the macro-economic level, economic development theory of Joseph Schumpeter (1911) predicates economic development of nations on the dynamism of the economy, and the contribution of innovation, technological and organisational forms which may include entrepreneurship (Foxon and Steinberger, 2011). While traditional economics focusses on labor and capital as the primary sources of economic growth or economic production, progressive economic thought acknowledges the role of technology and energy in economic growth (Moe, 2010; Allen, 2009). Accordingly, the availability (and access to) high quality and affordable sources of energy has significant contribution to economic output or GDP growth. At the micro-economic level, the energy poverty theory aptly prognoses that the lack of access to reliable, safe and affordable energy services at the household level, undermines households' economic output, cost of living and quality of life (Guevara et al, 2022). The theory further holds that the higher the energy poverty among households, the lower the prospects for national economic output growth (Guevara et al, 2022). Therefore, by applying both the economic

development theory and energy poverty theory, this paper presents Kenya's energy insecurity (at both macro-economic and micro-economic levels) as a risk to the country's holistic development.

Conceptual and Analytical Scope

There are as many understandings of what constitutes a state of 'being developed' as scholars and/or expert policy practitioners who attempt to define it. True enough, development is relative and contextual and hence the dicey question about the most acceptable set of criteria for qualifying the same. Scholars who analyzed the 20th Century development experience of the capitalist economies of western Europe and North America used the theoretical concept of modernization, in which they depicted a linear process of stages through which economies undergo to attain an industrialized and in effect, modernized state (Rostow, 1971). In reaction to modernization prescriptions, Neo-Marxist theorists faulted the historical process through which capitalism-driven industrialization in the West took place. They contended that the historical models behind slavery, enterprise capitalism and/or mercantilism, colonialism among other imperialist ventures essentially made the capitalist model as exploitative and hence responsible for global inequality and underdevelopment, which would ultimately not be sustainable in the long run. Instead they prescribed the socialist model in which advocated for centrally planned economies where the state had a direct hand in the process of production, distribution, marketing and pricing in the manner that it was applied in the Soviet Union, Cuba and the Peoples Republic of China albeit with modifications, customizations and immense challenges along the way (Frank, 1972, Wallerstein, 2004).

Yet other theorists of the Neo-liberal tradition contended that sound liberal economies are built on working institutions (North, 1990). All the same, there are a number of generally accepted working definitions that depict development as a progressive process through which nations go towards a better end-state in terms of general quality of human life, higher economic and social productivity and enriched and/or bettered mediums of supporting livelihoods and other domains of human productivity at a scale that on aggregate or/on average reflects such as state of affairs across various segments and/or facets of the

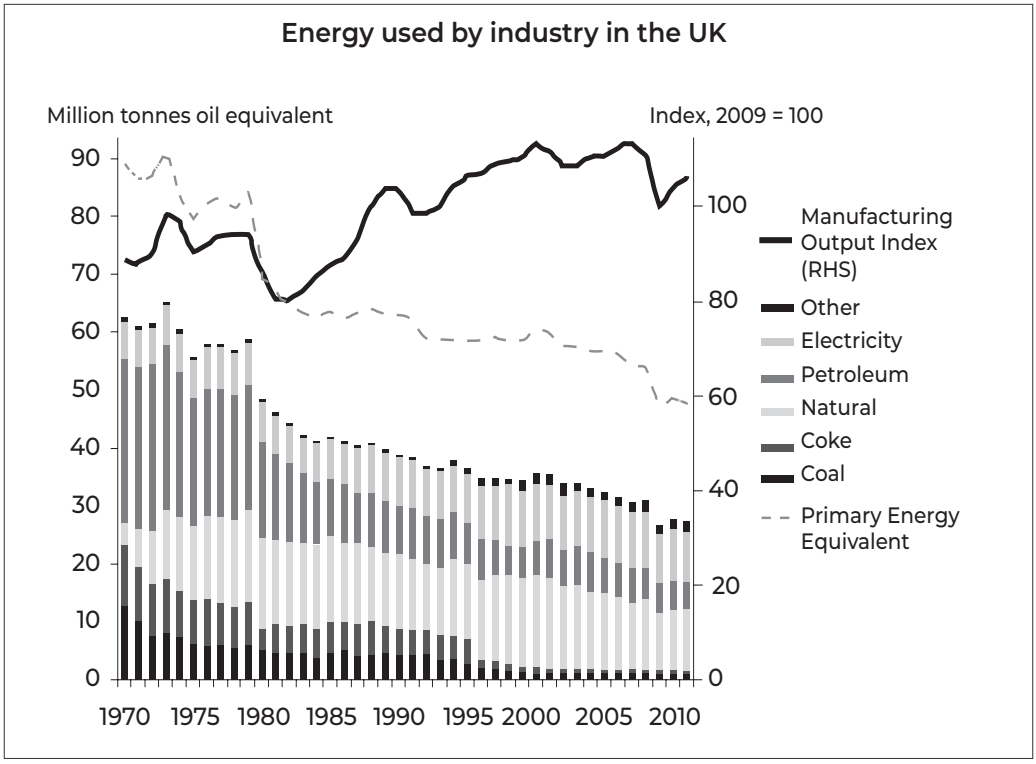
society; and hence higher human development index indicators (Todaro, 2021). The transformative economic modelling which seeks to enrich and/or advance the processes of production from simple hand-work to more efficient and effective modernized technology is at the centre of the energy-development discourse herein. Energy, (more so clean, sustainable and affordable energy), is therefore a crucial factor in industrialization and general economic transformation because it is a fundamental driver for optimal industrial output (Barney and Franzi, 2002; Sovacool & Murkerjee, 2011).

Empirical Framework

Besides other energy-specific nuances, transformative energy sector regulation and governance needs to focus on energy production and energy markets in order provide a favourable environment for industrial performance (Matchamadol & Kumar, 2012). Energy cost affects production, access, affordability, consumption, ultimately slows down GDP growth. In effect, scholars point to a direct and proportional causal relationship between energy supply, energy cost, energy consumption (as a direct factor) and GDP growth. Early studies on the energy-economic development nexus were done by Kraft and Kraft (1978), where they established that GDP growth increased energy consumption in the United State between 1947 and 1974. While other studies (such as Akarca & Long, 1980) later refuted this finding. yet others vindicated it. In the Gulf Cooperation Countries (GCC) of Oman, Saudi Arabia, United Arab Emirates, Kuwait and Qatar, a unidirectional relationship exists between energy consumption and economic growth (Al-Iriani, 2005).

Another study by Stern and Kander (2010) which examined 200 years of energy and output growth established that in Sweden for instance, a scarcity of energy was accompanied by a commensurate contraction in output growth. Conversely, increased access to energy production as well as consumption did have direct outcomes on output expansion. To this extent, the study concluded that energy supply and consumption significantly contributed to industrial and hence, developmental transformation in Sweden. It is possible to argue that vibrant and fast-growing economies are powered by energy. Another study by Green and Zhang (2013) finds a direct correlation for instance between industry and energy

sustainability in the United Kingdom. From Figure 1, shows that a good chunk of the UK's industrial output between 1970 – 2013 review period for instance, is energy driven according to Green and Zhang, (2013).



Source: Green & Zhang, 2013

Going by the UK's experience, it is possible to capitalize on green and clean energy while maintaining a decent level of industrial productivity in a country, other things held constant. Therefore, when compared to the global average Sub-Saharan Africa lags behind in all these respects, that is: energy access, consumption and economic development. Well above 645 million people (more than half of the continent's population at the least) in Sub-Saharan Africa lack access to electricity on the continent (AfDB, 2018).

Data and Methods

Ideally, empirical research seeks to make meaningful patterns of the interaction(s) among specific variables in order to develop, test and explore certain theoretical

stances, conjunctures and/or explanations behind any given phenomenon in question (Kivunja, 2017). Nonetheless, this paper adopts a conceptual and discursive approach to a SWOT Analysis informed by secondary sources of data, the analysis makes a strong case for energy security as a prime ingredient in any recipe for holistic developmental transformation in Kenya. As such, it relies heavily on secondary data where books, book chapters, journal articles and other academic works, as well as authentic and credible professional and media reports are systematically examined in analytical prose fashion.

Kenya's Development Experience: A Retrospective Account

Kenya, like many other nations in the developing world attained her independence at the height of the Cold War divide which directly pitted the capitalist west against the socialist east. Though by all means and purposes Kenya tactically maintained a western orientation, in principal it adopted a non-aligned approach to these ideological differences while adopting an economic model that took a hybrid-like middle ground between the two economic models. Under the famous Sessional Paper No. 10 of 1965, which espoused a customized and unique African brand of socialism the government took upon itself to rollout a series of public enterprises and state-owned companies and/or parastatals with the aim of kick-starting productive ventures across specific sectors of the economy especially where there was little or no liquid capital in private hands, to undertake the same. This neo-classical economic approach in the western tradition was then coupled with a fair measure of open and liberal markets (Nzau, 2011).

During the decades of 1960s and 1970s Kenya adopted a number of Bretton Woods-prescribed models on development, especially under the platform of 'balanced growth' and 'rural development.' At that time, the developing countries (then classified as 'Third World') under the common platform of the Group of 77 (G77) were lobbying the United Nations and various International Financial Institutions (IFIs) including the World Bank (also known as the International Bank for Reconstruction and Development- IBRD) and the agitating for the establishment of a New International Economic Order (NIEO) while decrying what they perceived to be global inequity, inequality and souring national debt which was essentially driving populations in the developing world deeper into

poverty and destitution despite 'favourable' rating in macroeconomic indices such as GDP per capita among others (Nzau, 2010).

In the early 1980s, the government rolled out the District Focus for Rural Development (DFRD), a programme that was meant to operationalize the then District Development Plans (DDPs) in a manner that brought development closer to the people. While these gross-roots oriented models were meant to tackle rural poverty and mitigate against the negative effects of runaway rural-urban migration; the role of parastatals and other state-owned ventures was to spur industrial activity through manufacturing, value addition and some forms of import-substitution in order to ensure economic self reliance and national productivity through savings and meaningful wealth creation in the country (Nzau, 2011).

Despite all these policy and institutional undertakings, by the decade of 1980s, developing countries (including Kenya) had sunk deeper into poverty and indebtedness, in what came to be known as the Third World Debt Crisis. To the World Bank and other IFIs as well as (mainly western) multilateral lending institutions, believed that poor governace led to Africa's woes and this could only be resolved through structural adjustments and economic divestiture, (hence the idea of Structural Adjustment Programmes SAPs, Privatization and Commercialization) while also liberalizing the political environment by make sweeping changes of the legal, policy and institutional kind that would provide for a favourable socio-political and administrative environment for national development anchored on the principles of good governance and rule of law. However, to African regional and/or sub-regional economic platforms under the Organization of African Unity (OAU; *now*, African Union) such as the Lagos Plan of Action (LPA, 1980), the solution lay in alternative home-grown policies that sought to seek unique solutions to African problems (Nzau, 2007).

Kenya also experienced economic decline. It is noteworthy that in the year 2000 her economic annual growth rate was at 0.6 percent, one of the lowest since independence (World Bank 2022). To improve the worsening human conditions in the developing world, in 2000, the United Nations launched the Millennium Development Goals (MDGs) a global developmental platform that aimed at

addressing global poverty, inequality and hunger, improving access to maternal and paediatric health as well as fighting TB, HIV/AIDS and Malaria, mitigating against the adverse effects of climate change; while encouraging mutual multilateral development assistance engagements for the global south through favourable aid, trade and debt relief policies, by 2015.

In line with the MDGs outlook, governments in the developing world begun to roll-out a number of policies tailored to lift the majority lower cadres of society (the masses) from abject poverty through Poverty Reduction Strategies as well as Economic Stimulus Programs. It was against this background that Kenya government, through Sessional Paper No. 3 of 1999, launched the National Poverty Eradication Plan (NPEP, 1999-2015) with the aim of lifting the rural and urban poor from abject poverty, while enabling them to access decent livelihoods and incomes. In 2003 the Kibaki Administration and with the assistance of both bilateral and multilateral development partners, adopted the Economic Recovery Strategy for Wealth Creation and Employment (ERSWEC, 2003-2007).

The Kibaki administration initiated the first progressive policy frameworks for energy production, distribution and consumption beginning with the Sessional Paper No.4 of 2004 and the Energy Act of 2006. The Energy Act (No.12 of 2006) sets out the powers, roles and functions of energy sector institutions, while the Physical Planning Act zones areas for storage, retailing and distribution of petroleum products and electric power sub-stations and related energy infrastructure construction. The Ministry of Energy and Petroleum is therefore tasked with formulating national energy policies and plans, and coordinates stakeholders to implement national energy policies and plans for national development goals. Energy regulation falls under the Energy Regulatory Commission (ERC) which carries out tariff setting, price stabilization, and licensing, regulatory approvals for power purchase and network service (Government of Kenya, 2018a). For energy generation, the Kenya Electricity Generating Company Limited (KenGen) is the main power producer and is state-owned with shareholding of 70 percent government and 30 percent private. Kenya Power (KP) on the other hand distributes power purchased from KenGen, while Kenya Electricity Transmission Company (KETRACO) develops, designs and maintains the transmission grid

across the country. The Rural Electrification Authority (REA) on its part is responsible for electricity supply across rural areas in the country and part of rural development agenda (Republic of Kenya, 2018).

Kenya therefore increased investments in the energy sector and subsequently increased production volumes and capacities as well as supply across the country since the coming to power of President Mwai Kibaki. In the past two decades, the country has made significant strides to increase electricity access to its population from a low of 18.9 percent in 2002 to 39.97-75 percent in 2013-2022. Kenya adopted a strategy to increase grid-connected electricity capacity by 5,000 MW from 2013 – 2016. This was not achieved hence the government set to push it between 2020 and 2021 to 6670MW. Only 2.3 million households were connected to the electric grid in 2013 compared to 8.2 million households in 2021 for instance. Despite the country's electricity access being the highest in East Africa, it remains low by global standards (Gakunga, 2021; Xinhua, 2022; Macrotrends, n.d) as shown below:

Figure 2: Energy consumption across different sizes of economy

Country	GDP	Energy Use
Kenya	$98 billion	5,884.74 kWh
South Korea	$1.631 trillion	62,957.23kWh
South Africa	$300 billion	31,348.73kWh
Turkey	$720 billion	19,205.33kWh
Malaysia	$336 billion	34,930.13kWh
USA	$21 trillion	32,151.33kWh
UK	$2.7 trillion	79,130.48kWh
Luxembourg	$73 billion	76,157.96kWh
Singapore	$340 billion	59,566.58kWh
UAE	$421 billion	88,950.82kWh

Source: Our World in Data, 2015

Countries ranked at the same level with Kenya at independence in 1960s such as Malaysia, Singapore and South Korea have made major economic growth strides which is further reflected in their energy use or supply capacities as shown

above. For instance, South Korea's GDP stands at $1.63 trillion (17 times larger than Kenya's economy) with energy use of 62,957.23kWh (11 times Kenya's energy use). Luxembourg, which is a smaller economy to Kenya's consumes 13 times Kenya's energy use. Kenya's low energy to GDP ratio risks a gap between demand and/or consumption on hand, and actual energy generation capacity in the economy. Kenya's energy demand was projected to grow to 2600–3600 MW by 2020, which when compared with production capacity risks overwhelming the grid-connected energy, over and above load-shedding, outages and hence power rationing (Takase, Kipkoech & Essandoh, 2021).

As shown in *Figure 2*, currently Kenya consumes about 5,884.74 kWh for its GDP per capita of USD 2,000 and GDP size of USD 98.84 billion. The country's energy consumption is below sub-Saharan Africa's average of 7,992.45 kWh, world average of 22,329.5 kWh, upper middle-income average of 25,397.44 kWh, and lower middle-income average of 15,462.51 kWh. Kenya therefore operates with energy consumption nearly three times below its lower middle-income average and this might complicate or delay its transition to upper middle-income economy (Our World in Data, 2014). In effect, there is a significant energy consumption gap as well as energy supply gap between Kenya and the economies it aspires to catch up with. Such a reality does not only portend delays in Kenya's economic take-off, but also directly undermines its industrial competitiveness globally. Further, the demand and supply gaps in the energy sector in Kenya indicate the country is yet to attain energy security. The country therefore stands just a crisis away from acute national energy shortage, which in turn will impact negatively on the economy and the cost of living.

Indeed, the global economic developments during the period 2020-to-2021 have had all odds stacked against the quest of developing countries, Kenya included. Over this period, the COVID-19 Pandemic brought economic productivity and billions of livelihoods globally to a near halt. It disrupted trade, commerce, industry and exchange within states and across regions, thereby worsening unemployment and human suffering. By 2021, the pandemic pushed more than 30 million people in Africa into extreme poverty (Zuefack et al., 2021). Barely two years later in early 2022 the world was plunged into yet another crisis following the Russian

invasion of Ukraine. A host of international sanctions against Russia have since fuelled a global food and energy crisis thereby worsening inflation, national debt and a host of other macroeconomic problems world over. It is also estimated that the economic hardships emanating from the Russia-Ukraine conflict will push 2.1 million Africans (Kenyans included) into extreme poverty by the end of 2023 (AfDB, 2022). The IMF further predicted worse macroeconomic conditions world over in 2003 as a result of the aftershocks of the COVID-19 Pandemic and the Russo-Ukraine War while compounded by an economic slowdown in China (*New York Times*, 2022). The big question at this juncture is: How will Kenya achieve this holistic developmental transformation under these conditions? In responding to this puzzle this paper makes a strong case for energy security as a prime ingredient in any recipe for holistic developmental transformation in Kenya.

Towards a Holistic Developmental Transformation in Kenya: Making the Case for Energy Security

Kenya's energy sector is set up in a context of strengths and risks as well as opportunities, which the Government of Kenya should carefully review to ensure effective energy sector governance as follows:

Strengths

Even though Kenya is generally, energy insecure, Kenya's national energy planning is consistent with the GDP growth rate (through load forecasting) which therefore ensures that energy generation can sustain the country's industrialization and economic development targets (Government of Kenya, 2018; Republic of Kenya, 2018a). Load forecasting involves data-driven projections of energy requirements in relation to macro-economic changes and other variables. For instance, the Least Cost Power Development Plan (LCPDP) 2017-2037 works with annualized GDP growth rate of 7 percent from the third medium term plan (MTP3) between 2017-2022, and 10 percent from 2025 (Government of Kenya, 2018; Republic of Kenya, 2018b).

Therefore, the country's energy sector plans are to ensure energy supply meets the energy demand to be occasioned by the GDP growth rate and related increase

in energy consumption for productive sectors. According to LCPDP, the country aims at certain energy capacities paced with commissioning dates and for the sake of transition into green energy, plans are also paced with decommissioning dates for 'dirty fuel or energy sources'. The total capacity targeted is 9400MW made of 3161MW (geothermal), 1381MW (wind), 356MW (oil), 824MW (hydro), 743MW (solar), 750MW gas turbine at Dongo Kundu from 2034, 1200MW (nuclear) from 2036, and 981MW (coal from Lamu) from 2024 (Kehbila, Masumbuko & Ogeya, 2021). The Kenya National Energy Policy of 2018 structures the regulatory environment for the energy sector in the country in a manner that liberalizes energy production and allows Independent Power Producers (IPP) to operate and further allows Public Private Partnerships (PPPs) in energy generation. To date, there are about 14 IPP arrangements that account for 24 percent of the country's installed electricity capacity (Republic of Kenya, 2018b). With such a provision for the private sector to play a critical role in Kenya's energy sector, the country is likely to attract robust participation of the private sector and attract private sector investments to drive up energy production where the government is under-resourced. The country is also poised to benefit from public private partnerships which help unlock energy potential in mega projects that the government alone cannot possibly fund.

Weaknesses

Industrialization, economic growth (GDP) and economic development are goals which are tied together and hinged on energy. While advanced energy sources power industrial production, the alternative uses or sources of energy should further improve the quality of life and protect the environment for sustainable development. However, 80 percent of Kenya's population uses the three-stone method of cooking, and wood accounts for 74 percent of the country's primary energy supplies and 47 percent of households countrywide and 82 percent of urban households use charcoal with an annual wood fuel demand of 34.3 million tons. By and large, the cost of production and/or manufacturing (as well as ordinary running costs), across all economic sectors in Kenya is generally high and mostly unsustainable. One of the factors behind this state of affairs is (among others) the high cost of energy, which all other aspects of macroeconomic performance.

However, weaknesses in Kenya's energy sector mainly lie in the policy regulations, legal and institutional frameworks. The country's legal and institutional frameworks have tended to encourage monopolies in the energy market, which in effect stifle competitiveness in the sector. Competitiveness helps to spur supply and to lower costs of energy across the population and differentiated market sizes. Further, competitiveness in the energy sector helps to advance quality of energy products as well as innovation or adoption of better energy technologies. Fundamentally, suppression of monopolies in the energy sector can help to stimulate necessary investments that would in turn, sustainably expand the sector.

The institutional frameworks for instance created a behemoth of state-controlled or state-owned monopolies in the sector. Electricity production is carried out by Kenya Energy Generation Company (KEGEN), distribution by Kenya Power and Lighting Company (KPLC), while design and maintenance of transmission lines by Kenya Electricity Transmission Company Limited (KETRACO) which are all government-owned corporations. Kenya faces two serious challenges to developing a robust energy sector capable of propelling its strategic economic goals: not only overreliance on hydroelectric energy, but also under-investment in it; and under-investment other domains in the energy realm. As a result supply is not steady. Subsequently, does major and frequent power outages which last on average five hours and in some parts of the country, the entire day or several days on end (Takase, Kipkoech & Essandoh, 2021). Over-reliance on a hydroelectric energy pool that has not been expanded for many decades since independence has led to underinvestment in other energy sources with in fact larger productive potential hence leading to slow expansion of electricity generation and exposure of the country's energy to unfavourable weather and climate variability risks among other weaknesses.

On the whole therefore, though Kenya's legal, policy and institutional framework and/or environment is generally sound, it is also weak when it comes to actual implementation. The cost of energy production in Kenya is very high which makes every other sector in the economy a costly. It is a fact that Kenya has lost out on many foreign direct investment opportunities especially in the mining, manufacturing and agricultural sectors due to the high cost of energy in the

country. It is also an established fact that the energy supply and/or distribution sub-sector, (especially the processes of electricity supply) are corruption-ridden, highly monopolized, inefficient and prohibitively costly for the most part.

Threats

Besides destabilizing energy market dynamics through monopolies, the management of the energy sector is effectively subject to political interests, public service lethargy and corruption since critical electric energy companies are state-owned. Climate variability and erratic weather patterns expose Kenya's largest source of energy, the hydro-electric energy, to low water levels, scarcity of water sources including rivers as well as competition from agricultural activities such as irrigation (Kiplagat, Wang & Li, 2011). Kenya's over-reliance on wood fuel, mostly attributable to poverty, smaller market size for LPG and lack of LPG infrastructure, threatens the country's environmental sustainability and subsequently, its energy sector. It is thus imperative to change domestic fuel system from wood or biomass to LPG and electricity or simply, to greener options which conserve the environment and protect the hydro power in long-term. Poverty is a factor threat to energy market in Kenya. Energy poverty is sustaining the use of wood fuel to the extent of providing 74 percent of the country's energy requirements for domestic use, while LPG market struggles to stabilize and expand including in urban areas where 82 percent of households still use charcoal (Njiru & Letema, 2018).

Poverty therefore not only restricts the LPG market but also electricity access across households in the country. While the electricity grid might have connected more Kenyan households to electricity since 2013, low-income households still suffer energy poverty which therefore threatens the country's energy access and transition ambitions. Imposition of 16 percent VAT tax on LPG used for cooking domestically in Kenya in July 2021, is yet another threat to Kenya's goal to transition to clean energy and expand access to LPG to 100 percent by 2028. LPG was zero-rated in 2016 to promote its access and use across Kenya in consistent with the 26th Conference of Parties (COP26). The introduction of VAT therefore increases LPG initial costs and refilling costs which therefore reduces the clean energy market size especially in rural Kenya as well as urban Kenya where nearly

82 percent of households now use charcoal as earlier highlighted. There is an urgent need to eliminate VAT on LPG gas and zero-rate it to promote its adoption and use across the country. Kenya should also make plans for exploration and establishment of local LPG sites to make the fuel cheaper for use (Shupler et al, 2022).

Further, critical infrastructure security threats also risk Kenya's energy sector. In mid-January 2022 for instance, the country suffered a serious of nationwide power outages following the collapse of four electricity pylons both in Nairobi and Nakuru. Such extreme acts of economic sabotage through systematic pilferage and vandalism supported by wider criminal networks are a major threat to Kenya's quest to industrialize. It is also a fact that due to corruption and unethical practices undue 'middleman profiteering' in the costing, billing, supply and distribution of energy (especially electric power, refined fuels and even LPG gas) at times ends up passing the burden to the consumer, which ultimately makes the cost of production prohibitively high, which subsequently discourages investment especially in the mining and manufacturing sectors. These are threats to the energy sector that with dedicated national leadership and functional institutions over and above a supporting national socio-political culture can be overcome to the betterment of Kenya's industrialization quest.

Opportunities

Kenya's energy production potential remains heavily untapped and un-actualized. There is much more room for energy production in Kenya through solar, wind and hydroelectric power sources. The energy potential in River Tana, Athi River and River Yala rivers among many others is yet to be fully and effectively harnessed. If this potential is fully tapped, Kenya will also realize its goal to achieve 30 percent forest cover by 2032 because the well regulated water flow and reservoir volumes realized will go a long way in ensuring forestation, which will further add value to the country's green economy and green energy potential.

In terms of wind power potential, Kenya's 2013 Wind [Task] Force established that over 73 percent of the Kenyan territory bears about 6m/s at least at 100 meters above the ground. Kenya can thus expand its wind power generated capacity from the three wind farms, two of which are in Ngong Hills, which generate 5.45 MW, to more wind farms.

The current generated capacity of 900MW is poor comparison to Kenya's economic growth aspirations. The total of 11 wind power sites in Kenya which account for 900MW indicate that there is potential to generate thousands of MW having learnt from the feasibility of the existing 11 wind power plants shown in Figure 4.

Figure 3: Wind power generation capacity in Kenya

No.	Name of firm	Status	Capacity (MW)
1	Aeolous Kinangop Wind	Existed before 2013	60
2	Aeolous Kinangop Wind	Existed before 2013	100
3	Aperture Green Wind	Existed before 2013	60
4	Daewoo Ngong Wind	Existed before 2013	30
5	KenGen Wind	Existed before 2013	15
6	Lake Turkana Wind Power Station	Commissioned 2019	310
7	Osiwo Ngong Wind	Existed before 2013	60
8	Meru	Planned	100
9	Isiolo	Commissioned in July 2013	150
10	Ngong Hill Wind Farm	Commissioned 2013–2016	25
11	Marsabit	Feasibility ongoing	50
	Total		**900**

Source: Kenya National Power Development Plan, 2019; Takase, Kipkoech and Essandoh, 2021

Kenya lies on the equator where its exposure to the sun is elevated, hence bears the potential to supply 4-6 Kilowatts per minute per day which can be easily found in the country's north eastern and northern arid and semi-arid lands (ASALs). There is need to invest further in expanding solar generated and grid-connected energy from the vast ASALs (Kiprop, Matsui, Maundu, and Mix, 2017). Kenya's geothermal energy potential remains significant especially due to the advantage created by the Great Rift Valley running from the northern to southern parts of the country. According to Malala and Adachi (2020), the Central Rift alone can generate about 7000 MW-10,000 MW which can be a huge addition to the country's grid, given that the southern and northern parts of the Rift Valley also hold significant potential for geothermal power generation.

Kenya can begin to invest in bio-fuels or bio-diesel by exploiting the 80 percent of its territory which is arid or semi-arid; such ecological conditions are favorable for growing feedstock such as Jatropha, which is good for production of bio-fuel. The investment in bio-fuels help to cut down on deforestation and improve environmental sustainability (it is carbon-neutral), cut down on dependency on foreign fossil fuel supplies, and create an alternative livelihood system for farmers in the country. Revisiting and perhaps holistically reviewing the energy sector's legal, policy and institutional frameworks will help get rid of these monopolistic tendencies in the sector and thereby enable it to sustainably produce affordable energy necessary to power the country to its next industrialization phase. Such policy reforms will inject healthy competition which will expand energy generation capacity, improve and stabilize energy prices and hence increase energy access across the country; which will ultimately spur sustainable wealth creation across all sectors (Kemoni and Ngulube, 2008; Nandi, 2016).

There is hydro-electric power potential in Kenya. Existing and upcoming dams such as Thiba Dam, Kerimenu Dam, Thwake Dam, Itare Dam, Aror and Kimwarer Dams among many others have the potential to produce even more hydro-electric energy for the country if only they can be upgraded and actualized to optimal levels. Dams will help not only with irrigation and steady water supply, but also clean energy generation that will power Kenya's economy to the next stage of its industrialization journey. Finally, the energy needed to transform Kenya into a stable middle income industrializing economy cannot be negated and/or accessed in Kenya alone. There is great potential in well thought out region-wide energy pooling. Kenya must take the lead in charting the way forward toward a situation where Africa countries can pool the financial, human and material resources that can fully operationalize energy production in major hydroelectric projects such as the Grand Inga Dam, which if fully harnessed can power the entire continent using clean, renewable and sustainable energy.

Conclusion

This paper set out to undertake a SWOT analysis of Kenya's energy sector in responding to the complex question of how best to actualize the country's vision

to transform itself into an industrializing middle income economy, against a background many odds stacked against Africa and the global south in the post-COVID world. A review of the conceptual and analytical dynamics around the energy security-holistic development nexus did support the idea that to transform a transitional economy- such as Kenya's- to optimality, energy sector policies, laws and institutional frameworks have to be set right at the strategic and/or governmental level, in order for the country to be energy secure. On the whole therefore energy generation, supply, access and affordability remains an important factor that will significantly determine Kenya's industrialization dream as espoused by Vision 2030 among other sector-specific development blueprints. In this direction, the analysis herein there of pointed to the fact that whereas there are serious threats and weaknesses in Kenya's energy sector, they also reveal numerous strengths and opportunities in as far as the energy security-holistic development nexus in Kenya is concerned.

Based on the findings, this paper recommends that the government re-examines and recasts the legal, policy and institutional environment of energy governance in the country in order to enable a major leap forward in energy generation, access, efficient distribution and affordability.

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