ENHANCING INDUSTRIALIZATION AND JOB CREATION IN THE CONTEXT OF JUST ENERGY TRANSITION

SCOPING PAPER ON KENYA

Dr Faith Wandera and Jacob Olonde

MARCH 2024



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Citation
Dr Faith Wandera and Jacob Olonde (2024). *Enhancing Industrialization And Job Creation In The Context Of Just Energy Transition*. Scoping Paper on Kenya.

Disclaimer

The aim of this project was to discuss a variety of views therefore each paper does only reflect the views of the author(s) and not the views of other participants in the project or the Ukama network as a whole.

This paper has received financial support from AFD (French Development Agency) and ADEME (French Agency for Ecological Transition).



This report was co-authored by a collective of independent experts, under the leadership of Dr Faith Wandera and Jacob Olonde of ECAS Institute. It builds on more than a decade of collaboration and experience of Ukàmà, a platform that brings together some of the leading think tanks in Europe and Africa with the aim to facilitate dialogue, knowledge creation, and action to smoothen EU-Africa relations in order to facilitate strong cooperation around green development pathways, sustainability transformations and shared prosperity in Kenya and Europe.

The authors thank all the partners and stakeholders who provided invaluable input to the report.

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The Ukama platform aims at building an informal dialogue process between a diversity of African and European experts bringing together perspectives of the Europe-Africa cooperation, including Climate, Sustainable Development, Economic transformation, International Cooperation, Finance and Trade to facilitate the emergence of such shared expectations. The main objective of the platform is to convene critical thinkers to help set out the themes and issues that are relevant for shared sense of prosperity for Africa and Europe.

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ACRONYMS

ACMI	Africa Carbon Markets Initiative
ACS	Africa Climate Summit
AfCFTA	African Continental Free Trade Area
AFD	Agence Francaise De Development
AfDB	African Development bank
AUC	African Union Commission
CBAM	Carbon Border Adjustment Mechanism
CLASP	Collaborative Labelling and Appliance Standards Program
CoG	Council of Governors
DFID	Department for International Development
DGIS	Dutch Ministry of Foreign Affairs
EAC	East African Community
EAIF	Emerging Africa Infrastructure Fund
ECAS	Environmental Capacity and Sustainability Institute
EIB	European Investment Bank
EnDev	Energizing Development
EPA	Economic Partnership Agreement
EPRA	Energy and Petroleum Regulatory Authority
ESCOs	Energy Service Companies
ESMAP	Energy Sector Management Assistance Programme
EU	European Union
FiT	Feed-in Tariff
FMO	Netherlands Entrepreneurial Bank
GOGLA	Global Off-Grid Lighting Association
GW	Giga Watt
IFU	Denmark Investment Fund for Developing Countries
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
JETP	Just Energy Transition Partnerships
JSC	Joint Cooperation Strategy
KCIC	Kenya Climate Innovation Centre
KJAS	Kenya Joint Assistance Strategy
KNBS	Kenya National Bureau of Statistics
KNES	Kenya Nationl Electrification Strategy
KOSAP	Kenya Off-Grid Solar Access Project
LPG	Liquefied Petroleum Gas
MECS	Modern Energy Cooking Services
MFA	Norwegian Ministry of Foreign Affairs
MoITED	Ministry of Industrialization, Trade and Enterprise Development
MSME	Medium small and Micro enterprises
MTP	Medium Term Plan
MW	Mega Watt
NDC	Nationally Determined Contributions
NEECS	National Energy Efficiency and Conservation Strategy
NGO	Non-Governmental Organization
PUE	Productive Use of Energy
PV	Photo Voltaic
RBF	Results Based Financing
SDC	Swiss Agency for Development and Cooperation
SDG	Sustainable Development Goals
SEFA	Sustainable Energy Fund for Africa
SEforAll	Sustainable Energy for All
SIDA	Swedish International Development Cooperation Agency
SREP	Scaling-up Renewable Energy Programmes
TVET	Technical and Vocational Education and Training
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
USD	United States Dollar
VAT	Value Added Tax

Abstract

Kenya and the European relationship have a long-term relationship revolving around trade and the desire to address climate change, the transition to green industrialization and the creation of jobs. Studies on the political economy of solar photovoltaic and electric cooking with respect to green industrialization and energy justice are still lacking. We conducted a desk review to assess the policies, economics and labour markets for the two technology sectors. The solar sector has relatively well-developed policies compared to the electric cooking sector. There are various supportive initiatives to drive their development but the potential for industrialization and job creation is yet to be realized. The solar has a high potential for job creation while the electric cooking sector is still nascent and prospects for job creation are not very clear. Opportunities to enhance job creation exist particularly through harmonization of regional regulations in the solar sector; development of local content requirements for lending to local companies. European Union could re-strategize its funding support to local companies while Kenya addresses the limited skill availability.

Key words: Electric cooking, green industrialization, job creation, political economy, solar photovoltaic

INTRODUCTION TO GREEN INDUSTRIALIZATION IN KENYA

Background and Context

The European Union (EU) and Kenya are committed to the UN 2030 Sustainable Development Agenda and to the Paris Agreement on climate change. A Kenya-EU joint programming process was started in 2014 in various developmental interventions and other strategic areas of interest such as the environment, climate change, irregular migration from Kenya to Europe, forced displacement, women's empowerment, peace, stability, and security. The EU is the biggest market in the world for Kenya's exports, and a major source of funding for the transition towards a green economy, the creation of employment and industrialization (Raga., 2021). Development priorities in this respect are integrated in the Joint Cooperation Strategy (JSC) (2018-2022) between Europe and Kenya (European Union, 2018).

Kenya has made great strides in electricity connectivity with 75% of the population accessing the grid. However, the country still lacks an enabling environment to spur innovation, industrialization and the creation of green jobs (Acey & Culhane, 2013). The creation of green jobs is contingent on the level of investments that go into renewable electricity generation and electric cooking (e-cooking) solutions among other sectors. The JSC offers an opportunity for spurring such investments. Renewable energy is a critical aspect of the EU-Kenya partnership (Schaik et al., 2022). This is evidenced by the launch of the Kenya Green Hydrogen Strategy and Action Plan which was supported by the EU, during the Africa Climate Summit, in September 2023. The strategy presents a promising pathway to unlock opportunities for sustainable manufacturing and drive industrialization and the creation of job opportunities, among other benefits (Alvik, 2022).

Kenya and Europe are located in regions which are at different phases of industrial development, whereby the pace of development in Europe cannot keep up with the needs of developing countries (Johansson, 2014). Kenya's Vision 2030 attaches importance to the realization of an industrialized economy through affordable, reliable, clean, and sustainable electricity (Mutuku and Mbatia, 2020). This study analyzes key aspects of Kenya- EU politics with respect to green industrialization/climate action on the one hand and EU quest for energy security and climate action on the other hand by focusing on the solar PV and electric cooking.

At the global level, green industrialization refers to the transformation of the manufacturing and industrial sectors through increased efficiency, productive and responsible use of materials (Luken & Clarence-Smith, 2020). It is assumed that green industrialization contributes to the generation of green jobs (those that contribute to the preservation of the environment). The jobs could be in manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency. In Kenya, green industrialization is defined in terms of rapid economic growth, access to African and global markets, opportunities for investment, employment creation, energy efficiency and decarbonizing industrial processes among other benefits (Government of Kenya Ministry of Environment and Forestry, 2016). Green industrialization promotes inclusive development through adoption of low-carbon pathways, resource use efficiency and socially inclusive production and consumption patterns. It is therefore necessary for achieving Sustainable Development Goals (SDGs) by promoting poverty reduction, environmental protection and prosperity

In Kenya, the green manufacturing sector has a great potential to create jobs despite its stagnation at 10% for the last four decades (Andersen et al., 2022). For example, the manufacturing sector employed 352,600 people in in formal employment in 2022, which is about 11.7% of the total number of persons engaged in the formal sector in 2022 (Kenya National Bureau of Statistics, 2023). The renewable energy sector in Kenya which encompasses geothermal, solar, wind and biomass has the potential of creating 344,000 direct and indirect jobs by 2040[1]. Other opportunities for

1 https://research.hktdc.com/en/article/MTM2MDg3NTczMA

creating green jobs in Kenya include the World Bank collaboration with the Micro and Small Enterprises Authority (MSEA) to empower micro, small and medium enterprises through the promotion of green jobs and the Kenya Association of Manufacturers (KAM) partnership with the Global Off-Grid Lighting Association (GOGLA) in setting up the Electronic Waste Producer Responsibility Organisation of Kenya (EPROK).[2] This study is conducted in the context of the solar PV and ecooking sectors.

Globally, solar PV is ranked first in terms of job creation, contributing to an estimated 4.9 million jobs representing one third of the total renewable workforce (IRENA, 2023). Forty percent of these jobs are held by women, mostly in administrative, and non-technical positions (marketing, sales, distribution, product assembly or installation), particularly for off-grid solar. In Kenya, the solar PV sector is thriving through government intervention and a favourable enabling environment and has developed a favourable model of off-grid electrification driven by the private sector, acceptable business models such as Pay-As-You-Go (PAYG), that has contributed to industrial growth and job creation in the sale, distribution, and installation of solar PV products (Mutuku and Mbatia, 2020). Kenya's solar photovoltaic (PV) market is expected to grow significantly in the next decade, driven by the country's high solar potential, supportive policies, and increasing electricity demand. It is estimated that the installed capacity of solar PV in Kenya will increase from 186 MW in 2020 to 1,592 MW in 2030, with a compound annual growth rate (CAGR) of 23.9%[3]. The government plans to hybridize thermal generation stations currently contributing 696MW (34% of the total installed capacity) with solar PV. Data estimates indicate that solar PV will represent 40% of all new capacity additions in Kenya over the time period 2019-2040 ((IASS), July 2021). Other initiatives for promoting solar PV include the Kenya Off grid Solar Access Project (KOSAP), and the Green Mini-grid Facility Programme. Solar PV is also increasingly promoted for ecooking particularly in refugee camps where access to firewood for cooking is a major problem.

The growth of the solar PV industry is a key factor in achieving Vision 2030, through the provision of clean renewable and affordable energy. Increased use of solar PV can lead to reduced costs of electricity, thereby improving competitiveness of Kenyan products in the regional and global markets. Kenyan manufacturers pay up to four times more for electricity than their counterparts in other African countries[4]. Solar PV can contribute to environmental sustainability of the manufacturing sector through reduced emission of greenhouse gases thereby contributing to the Nationally Determined Contributions. Solar PV also contributes to stimulating the development of small and medium enterprises that provide services for installation, maintenance and distribution of solar PV products (Lyakurwa, 2022). The biggest impact of solar PV could be felt in SMEs that are not automated, are semi–automated or are in need of an equipment upgrade[5]. Such SMEs could adopt environmentally sound technologies to enhance their energy efficiency and automate at minimum risk, while improving their competitiveness through emission reduction and labels for their products.

In Kenya, ecooking is part of the clean cooking sector. Clean cooking refers to the use of fuels and technologies with low particulate and carbon monoxide emissions levels (IWA ISO Tier 3–4 for the indoor). In Kenya clean cooking is framed as an issue of energy poverty and energy justice (Leary et al., 2021). Cooking energy, particularly solid biomass (firewood, charcoal, dung, and agricultural waste) is a dominant household factor in most countries, and accounts for the largest share of energy use in the domestic sector. Some of the barriers preventing upscaling ecooking include low affordability/awareness/willingness to pay for clean cooking easy access to free traditional fuels, last mile distribution constraints, and cultural, technical, and environmental barriers (Karanja et al., 2020). Large scale adoption of clean cooking options has the potential to catalyze widespread sustainability transitions in the country. Only about 30% of Kenyans have access to clean cooking (Ministry of Energy, 2019b). The government has committed to advance

2 Kenya'sgreenmanufacturingforasustainablefuture(kam.co.ke)
3 KenyaSolarPhotovoltaic(PV)MarketSize,Share&TrendsAnalysisandForecast2021-2030(globaldata.com)
4 https://kippra.or.ke/promoting-the-use-of-solar-energy-in-the-manufacturing-sector-in-kenya/
5 https://www.kenyacic.org/2020/07/renewable-energy-and-industrialisation-focus-on-smes/

the clean cooking sector by setting the goal to achieve universal access to modern cooking energy services by 2028 (Republic of Kenya Ministry of Energy, 2021). The last-mile connectivity is a big priority of the Kenya government, hence increased connectivity is likely to increase the demand for e-cooking.

Electric cooking offers the opportunity to leverage successes Kenya has made in electrification now at 75% of the population, but currently only 1% of Kenyans use electricity for cooking (Byrne et al., 2020). There are various policies and strategies under development on clean cooking, among them the Kenya National Electric cooking strategy which is meant to bridge the gap between electricity and clean cooking policy. There are barriers to increased uptake for example the high upfront cost of acquiring appliances but there are also opportunities including the high electrification rate, increased proportion of renewable energy in the generation mix, rising middle class and urbanization among others (Byrne et al., 2020). A number of electric cooking technologies have been introduced into the Kenyan market including electric pressure cookers (EPCs), induction stoves, hot plates, and rice cookers. While the benefits of solar PV and ecooking to green industrialization have been documented as discussed in 4.4, the political economy of these two technologies with respect to green industrialization and energy justice in the context of climate change mitigation has not been extensively studied. This paper takes a point of departure to understand the tensions that arise between actors in the two sectors, based on the Kenya-EU relations in fulfilling commitments to international development agenda such as the SDGs and Paris Agreement. For example, the promotion of solar PV and electric cooking in Kenya is dependent on foreign aid which may have negative implications on value chain sustainability and ownership of the technology (Lemi, 2023).

Methodology

This scoping paper explores issues relating to the creation of jobs and industrialization in Kenya through partnership with the EU. The overarching research question was "*What are the key aspects of Kenya-EU politics as regards Kenya's quest/strategies for green industrialization/climate action on the one hand and EU quest for energy security and climate action on the other hand?"* We answer this question by focusing on two sectors (solar PV and e-cooking) specifically the potential for job creation and green industrialization in Kenya. Focus on the two sectors is informed by their contribution to clean, renewable and affordable energy that can be used in manufacturing, agriculture, transportation and services. Solar PV and ecooking contribute to several SDGs including SDG 7 on clean and affordable energy through the provision of clean and renewable energy; SDG 8 on decent work and economic growth through employment creation; SDG 9 on industry, innovation and infrastructure through manufacturing; SDG 11 on sustainable cities and communities and SDG 13 on climate Action through reduced emission of greenhouse gases (Brock et al., 2021; Brahmbhatt et al., 2017). This makes solar PV and ecooking key technologies in the process of green industrialization and job creation because of the associated benefits for the environment, the economy and society. For a long time, clean cooking and electricity access have been treated as separate problems in energy policy and hence the need for integrated energy planning to enable increased access to electric cooking (Newell & Daley, 2022).

We break down the key question as follows: 1) How does solar PV and ecooking contribute to green industrialization in Kenya? 2) How does the political economy of a Just Energy Transition influence the growth of these two sectors? 3) What are the key recommendations to policy? We adopt a qualitative approach to conducting a desk review. Data is sourced from secondary sources, mostly peer-reviewed and grey literature. Literature sources are identified using terms such as green economy, green industrialization, green jobs, EU–Kenya relations, renewable energy, and green jobs. The documents reviewed include policies strategies and plans for solar PV and ecooking. The data was synthesized to isolate issues relating to policies, initiatives and political economy of green industrialization in Kenya. We also assessed the job creation potential, identified the opportunities and challenges for job creation and industrialization. We identified the key issues, tensions, and the opportunities for strengthening the EU-Kenya relationships in the two sectors before deriving the recommendations.

SITUATION ANALYSIS OF THE ENERGY TRANSITION IN KENYA

Overview

From a meager 25% access to electricity in 2010, Kenya has achieved more than 70% access as of 2019 (KNBS, 2019). And according to the World Bank, only 71% of Kenyan households had access to electricity by 2020, against a global average of 90% (World Bank, 2022). With the 29% plus Kenyans lacking connectivity to electricity, there are still difficulties in accessing basic needs like lighting and use of carbon-emitting fuels like firewood and charcoal becomes rampant. Currently, 29% of Kenya's electricity comes from diesel powered generators, which the country has plans to phase out by 2030 by upscaling geothermal, solar and wind as clean power sources (O'Callaghan, Bird, Lee, & Bondy, 2021).

Kenya holds significant renewable energy potential including wind, solar, geothermal and hydropower. The country is committed to the global calls to act on climate change and has adopted an ambitious Nationally Determined Contribution (NDC) that seeks to reduce its Greenhouse Gases (GHG) emissions by 32% by 2032. The ambition mirrors that of the EU Green Deal, where the Europe has committed to be climate-neutral by 2050. Locally, supportive policies and fiscal incentives have been key to driving renewable energy investments in the country (Kazimierczuk, 2019). For example, the market-oriented governance of the energy sector has attracted climate financiers like the World Bank which funded the Scaling up Renewable Energy Programmes (SREP) (Newell et al., 2014a).

According to Energy and Petroleum Regulatory Authority (EPRA), geothermal accounts for over 87% installed capacity. As at June 2022, the country's installed capacity was 3,074.34 MW with 837.58 MW being hydro; 949.13 MW geothermal; 435.5 MW wind, 170 MW solar and 646.32 MW supplied by thermal power plants. The country has the resources to meet its electricity needs almost entirely from green energy sources and achieve its commitment made in the COP 26 World Leader's Summit in Glasgow in 2021 to achieve 100 percent renewable energy supply by 2030 (ESMAP, 2022).

Kenya's installed solar power capacity increased to 5.53% up from 3.04%. This is about 0.67% of the total annual solar potential in Kenya (solar potential is projected to be 15000 MW) (EPPRA, June 2022). Despite this underutilization, the PV market in Kenya is considered one of the fastest growing in Sub Saharan Africa (Ituru, et al, 2022). The phenomenal growth is first attributed to commercial efforts dynamically intertwined with policy and state actors. Solar PV has become an attractive option for low carbon pathway mainly because it provides sustainable energy services, adaptability across scales of provision, simplicity of operation and rapidly falling prices (Byrne et al., 2018). The Ministry of Energy and Petroleum records about 62 mini grids that are fully operational and 28 are under construction even as Kenya seeks to deploy more mini grids to close the energy access gap and ensure universal access to electricity by 2030 (Hanbashi & Iqbal., 2023).

The success of the solar PV sector is attributed to the support and active intervention of donors, many of whom front self-serving prescriptions (Newell & Phillips, 2016). The sector faces challenges to do with enabling a 'just transition' to a lower carbon economy, one that delivers poverty reduction and climate resilience simultaneously. To address the challenges, the state has been instrumental in shaping the evolution of the solar PV sector by implementing an entirely state-funded programme to install PV systems in off-grid schools and other public service facilities through presidential influence (Byrne et al., 2018). Already, the country sells between 25,000 and 30,000 PV modules each year to around 200,000 rural homes, making it the second most dynamic commercial solar marketplace in the world after India (Rapid Transition Alliance, 2022).

Despite the high potential for solar PV, geothermal electricity is favored by the state and development partners over off-grid PV, mainly because geothermal avoids greenhouse gas emissions whilst providing a large increase in generating capacity but also because it benefits powerful grid-connected users (Think Geoenergy, 2021). However, preference for

geothermal power poses a risk for PV niche actors (UNESCO, 2021). As a result, the gains so far made to develop the solar PV market could wane if resources are directed towards geothermal interests, especially if an enabling environment is primarily about creating profitable investment opportunities (Byrne et al., 2018). Interestingly, the international development community has tried to push for energy access through private sector-led development which converge through the promotion of private mini-grids (Sokona; Mulugetta; Besaans et al, 2023). However, the prices offered by mini-grid developers for the target communities remain beyond the reach of the targeted population hence low absorption (New Climate Institute, 2021).

On e-cooking, there is competition between different providers of energy cooking services who are interested in protecting specific energy pathways by engaging their market and political power. These include cooking energy service providers for liquefied petroleum gas (LPG), ethanol, and biogas (Newell & Daley, 2021). These already have established business models and infrastructures and operate both formally and informally to sustain their markets. Interestingly, the embryonic stage at which the cooking sector is at the moment does not lend itself to institutional embeddedness and visibility in energy policy and planning discussions and consequently, it enjoys less access to markets and market share for existing energy technologies and their associated pathways (Salas, 2022). This situation is expected to change with the prioritization of e-cooking at both national and county levels in the ongoing Integrated Energy Planning Process. EPRA announced an electricity tariff band of 30-100 kwh in 2023, which is conducive to the use of electric cooking by low-income households.[6]

6 https://research.hktdc.com/en/article/MTM2MDg3NTczMA

Key Policy Developments in the Energy Transition

The government of Kenya has developed a number of policies and legislative frameworks that have kept the energy sector competitive. These include the National Energy Policy (2018), the Energy Act (2019), the Kenya National Electrification Strategy (KNES, 2018) and National Energy Efficiency and Conservation Strategy (NEECS 2020). However, very few policy frameworks have direct mention of solar PV technology and e-cooking (REN_21, 2023).

The Energy Sector White Paper recommends measures such as increasing installed capacity from 1.6 GW to nearly 3 GW between 2012 and 2022 and envisions a leap to 100 GW by 2040, necessitating a yearly average of more than 5 GW. At the African Climate Summit 2023, Kenya committed to 100% clean energy access and 100 GW clean grid by 2040 anchored on a green industrialization agenda.

The Energy Act (2019) provides for the involvement of decentralized governments in local energy planning, which has opened up the county governments to harness renewable energy resources in their jurisdictions. Locally, county governments are mandated under the Energy Act 2019 to prepare their respective County Energy Plans for their energy requirements. They are also mandated to reticulate electricity by providing supplementary funding to rural electrification projects within their counties. The counties are also permitted to regulate energy infrastructure. The Council of Governors (CoG) is a seven-year-old political institution that operates in a committee system that ensures consultation and cooperation between counties and national governments.

The Feed in Tariff Policy (FiT) 2021 on Renewable Energy Resource Generated Electricity (Small-Hydro, Biomass and Biogas) has contributed to increased private sector participation in the generation of electricity. The Feed-in Tariff Policy 2021, is intended to apply to renewable energy power plants not exceeding 20 MW in biomass, biogas and mini-hydro technologies. The Renewable Energy Auctions Policy, 2021, was also recently published to enable the government to procure renewable energy on competitive terms. The policy applies to all solar and wind power projects and other renewable energy projects larger than 20 MW.

The KNES focuses on productive use of energy (PUE), and positions the replacement of fossil fuels with solar as a matter of national importance and promotes energy efficiency across five pillars, including agriculture and electric transport, offering a range of specific recommendations. The Draft Energy (Solar PV Systems) Regulations 2020, Energy (Appliances Energy Performance and Labelling) Regulations 2016, and draft Energy (Mini-grid) Regulations 2021 also govern the off-grid solar and mini-grid sectors, including electric appliances and equipment. They enforce quality and minimum energy performance standards and design solar PV systems, and certification of solar PV technicians.

Kenya has developed a Behavior Change and Communication Strategy for Promoting E-cooking in Kenya, 2022. The BCC is aimed towards ensuring access to affordable, reliable, sustainable and modern energy for all Kenyans. A national e-cooking strategy is under development, and it encompasses a wide range of solutions including improved cookstoves, biogas, bioethanol, liquefied petroleum gas, and electric cooking. A separate strategy has already been initiated alongside the national e-cooking strategy in view of the interest from development partners in Europe. During the Africa Climate Summit 2023. The focus is on unlocking private sector capital and carbon finance to deliver on Kenya's ambitious climate targets and access to clean energy.

The Ministry of Industry, Trade and Economic Development (MoITED) has developed the Micro and Small Enterprises Act 2012 and the draft Micro and Small Enterprises Strategic Plan 2020-2024. Both documents promote small industries, including manufacturing, agribusiness, trade, and service sectors. The Act mandates collaboration with relevant actors in Information and Communications Technology, Mining, and Energy. It acknowledges renewable energy broadly in relation to the benefits for medium small and micro-sized enterprises (MSMEs).

The Energy Sector Donor group in Kenya offers space for discussing energy priorities between donors and government but there is little room for discussing pro-poor projects as large generation dominates. The energy poverty element is often reduced to the (significant) question of increasing grid capacity and reliability, without addressing a spectrum of the energy service needs of a large percentage of the Kenyan population that have to meet their energy needs off-grid. Development partners and international investors may differ with respect to support for particular energy sources and technologies but there is generally an alignment on the need for market-based approaches to tackling Kenya's energy challenges (World Bank, 2019).

There has been more deliberate donor support to independent power producers who generate renewable based electricity through the FiT policy. The FiT for solar PV has been criticized to be low compared with other renewables and this is attributed to government attempt to suppress investment in solar PV (Newell & Phillips, 2016). Private sector are mostly profit driven and have little regard for government interests which align with the need for the poor to access electricity (Newell & Phillips, 2016). The Solar-PV system space in Kenya is predominantly off-grid as opposed to on-grid, as in most developed countries (Ongeri & Mbataru, 2023). With this premise, it means that the legroom to provide job opportunities at large-scale is to some extent, still limited, as long as most of the systems are off-grid. However, the Solar PV space in the country has constantly developed over the years and is funded and supported by a number of multi-lateral partners and institutions and donor agencies such as the European Union (ESMAP, 2020).

Kenya is currently working on an Energy Transition and Investment Plan with support from the Sustainable Energy for All and UN Country Team. The plan is expected to help Kenya frame an energy transition agenda that will attract investments while at the same time ensuring a just transition and fully supporting Kenya's rapid economic growth.

Existing Initiatives/Schemes to Achieve Energy Transition Prospects

The renewable energy sector in Kenya is supported by international development partners through the Kenya Joint Assistance Strategy (KJAS) Working Group on Energy. This group consists of 15 major development partners including World Bank, African Development bank (AfDB), Agence Francaise De Development (AFD), European Investment Bank (EIB), United

Nations Development Programme (UNDP), United Nations Environmental Programme (UNEP), German Development Bank (KfW), Japanese International Cooperation Agency (JICA) and the United Staes Agency for International Development (USAID) among others. The European Investment Bank (EIB), and KfW (Germany) are the largest financing arms of the EU on energy in Kenya (Boateng et al., 2023). They have supported Kenya's growth and development agenda for decades by deploying a whole range of financial instruments available through both public and private sector counterparts alongside other EU Development Finance Institutes (DFI) such as Denmark Investment Fund for Developing Countries (IFU), the Netherlands Entrepreneurial Bank (FMO) and Sweden's Swedfund. There are investment companies, private equity and venture capital investors who target renewable energy sector across Kenya. These include Actis LLP; AHL Ventures, Ascent Capital, FinnFund, Alphamundi, DOB Equity, Oiko Credit etc. They fund projects through equity and debt and have varying criteria ad ticket sizes that they each consider when scoring for investor ready projects. However, there are concerns that renewable energy projects, mostly driven by development aid and foreign direct investment, have triggered tensions, challenges, and societal conflicts in Kenya (Muigua, 2020). We hereby present a select set of EU funded projects in the solar and ecooking sectors that demonstrate the EU-Kenya partnerships. We examine the tensions relating to climate justice offered by the Just energy transition in these two sectors in section 5.

Solar PV access Projects

Kenya Off grid Solar Access Project (KOSAP), and the Green Mini-grid facility Programme, are part of the national electrification strategy to provide electricity access to 14 underserved counties, accounting for 20 percent of the country's population, and 72 per cent of the country's total land area targeting to generate 96 MW through the installation of 120 solar hybrid mini-grids and off-grid standalone solar systems (Ministry of Energy Kenya, 2018). Through the KOSAP, the government aims to invest heavily in mini-grid for community facilities, enterprises, and stand-alone solar systems, e-cooking solutions for households and solar water pumps for communities in remote, low density, and traditionally underserved areas. The objective of the project is to distribute 250,000 solar home systems by 2030 to power households, schools, health facilities and agriculture (IEA 2019). The SNV Netherlands Development Organization manages the funds in partnership with SunFunder Inc.

The **Green Mini-grids Project** in Kenya is a joint initiative of the Kenyan government, the World Bank, the UK Aid, the European Union, and the Agence Francaise de Developpement. The project aims to support the development of 137 solar mini-grids in 12 of the 14 counties in Kenya, covering 567 public facilities and 380 boreholes. The project also provides grants and technical assistance to private sector developers of mini-grids. The project is aligned with the National Electrification Strategy of Kenya, which seeks to achieve universal access to electricity by 2030. The project will provide electricity to about 277,000 households, (1.5 million people), who currently lack access to modern energy services, contribute to the reduction in emission of GHG through avoidance of diesel generators and kerosene lamps; stimulate economic and social development in rural areas by enabling productive uses of electricity, such as irrigation, water supply, health care, education, and communication, and create opportunities for local employment and enhance the capacity of local communities to manage and maintain the mini-grids.

Kudura Power East Africa is partly owned by InfraCo Africa who invested USD 4.2 million in providing 22 villages in Busia County with 7,000 electricity connection points plus solar powered street lighting and water services. InfraCo acquired 40% Kudura Power East Africa mini grid developer owned by Portuguese entity. InfraCo is backed by the governments of the Netherlands, Switzerland and the U.K. This development will provide the communities in the villages with access to prepaid solar electricity and solar-powered appliances as well as powering street lighting, pumping and water purification. The grids will have generation capacities of 10-60 kWp for a total 512 kWp across the 22 systems. The total project cost is USD 8 million, with the USD 3.8 million balance being provided by a grant from the Green Mini Grid Kenya organization funded by the U.K. government's Foreign, Commonwealth & Development Office and the EU.

KenGen is developing a **floating solar PV project** with an approximate capacity of 40 MWp. The Project will be funded by the German Development Bank KfW. This initiative follows a pre-feasibility study for floating solar on three hydro power reservoirs: Kamburu, Turkwel and Kiambere [7]. EU development body Edfi Electrifi and impact investor Oikocredit will each take a USD 4 million stake in Canadian off-grid home panel business Solar Panda. This is an USD 8 million investment targeted to supply solar PV systems to 100,000 households in northern and north eastern Kenya. This is part of the initiative to expand solar access in Africa.

The **Africa Carbon Markets Initiative (ACMI)** was launched at COP27 to encourage private finance for African energy development. It is meant to expand Africa's participation in voluntary carbon markets which involve international buyers such as corporates who purchase carbon credits to offset their own emissions, thereby financing clean energy projects. ACMI announced a bold ambition to reach 300 million credits produced annually by 2030 across the continent. This would unlock USD 6 billion in income and support 30 million jobs. By 2050, its targeted that over 1.5 billion credits will be produced annually, leveraging over USD 120 billion and supporting over 110 million jobs.[8] It is on this basis that Kenya launched the Climate Change (Amendment) Act, 2023. The Act effects Article 6 of the Paris Agreement by introducing provisions on the regulation of and participation in carbon markets. It provides for establishment of carbon registry that would be accessible to the public with registers on information relating to carbon credit projects and the amount of carbon credits issued or transferred from Kenya. The registry is meant to boost climate finance activities by reassuring investors in carbon markets (Government of Kenya, 2023).

The **Sustainable Energy Fund for Africa (SEFA)** is a multi-donor Special Fund managed by the African Development Bank. The fund was established in 2011 by AfDB and Denmark. It has since become a leading energy fund in Africa and has received financial commitments from Germany, Italy, Nordic Development Fund, Norway Spain, Sweden, UK and USA. AfDB also supported the Facility for Energy Inclusion worth USD 400 million fund that invests in small scale renewables. This makes it the largest and most critical fund for the AfDB in providing catalytic finance to unlock private sector investments in renewable energy and to build an ambitious pipeline of renewable energy and energy efficiency projects. Denmark is recognized as a founding donor to SEFA and is also acting as the lead donor to SEFA, which allows Denmark to take central coordinating role between donors and the SEFA Technical Unit SEFA has already registered successes in overcoming barriers to accelerate deployment of renewable energy which include high transaction costs in technical/financial feasibility assessment and project development, higher upfront investment costs, lack of access to affordable long-term capital for the increased upfront costs, real and perceived technology risks and limited technical and commercial skills, information and knowledge. However, it still needs to overcome the main challenge in bridging green energy financing gaps and addressing the lower rates of return of green projects that discourage private investors when compared to fossil fuels as well as the currency mismatch that impede the sustainability of these projects (Alain-Stéphane Moulot, Grakolet Arnold Gourène and Matseliso Teele, 2023).

The **Energizing Development (EnDev)** Kenya project run between 2006 and 2019. It was commissioned by the Directorate-General for International Cooperation of the Dutch Ministry of Foreign Affairs (DGIS), German Federal Ministry for Economic Corporation and Development (BMZ), Norwegian Ministry of Foreign Affairs (MFA), British Department for International Development (DFID), Swiss Agency for Development and Cooperation (SDC), Swedish International Development Cooperation Agency (SIDA). It was implemented by the Ministry of Energy in Kenya. The programme promoted access to modern energy services, specifically improved cookstoves and small solar systems, for households, social institutions and small businesses in rural areas. Its implementation entailed capacity building of last mile distribution channels for technologies as well as supporting private sector to mitigate market development barriers. By 2018, 6.7 million people had access to improved cooking

7 Kenya:Floatingsolarphotovoltaicprojectinthepipeline(esi-africa.com)

8 https://www.seforall.org/news/energy-transition-plans-and-other-initiatives-to-unlock-finance-for-african-countries

facilities and about 740,000 people had access to electric power through small pico-solar systems.

Ecooking Initiatives

Kenya national electric cooking strategy aims at assessing the status quo for ecooking in Kenya and determine the contribution that ecooking could make towards the goal of universal access to clean cooking by 2028. Part of the deliverable is the development of a roadmap for scaling up ecooking in Kenya with the intended impacts of minimizing the drudgery and health risks associated with the use of solid fuels for cooking; improving environmental sustainability; and stimulating growth in demand for electricity This initiative is funded by the EU and implemented by Loughborough Centre for Sustainable Transitions: Energy, Environment and Resilience (STEER)[9].

Global eCooking Coalition (GeCCo) is a new coalition of partners launched at the Africa Climate Summit in September 2023. The aim is to accelerate the transition from traditional cooking methods to ecooking. The coalition includes the EU, the UK, the World Bank, the African Development Bank, the International Renewable Energy Agency, the International Energy Agency, the UN Development Programme, the UN Environment Programme, the Clean Cooking Alliance, the Modern Energy Cooking Services Programme, and several private sector and civil society organizations. The coalition will support policy development, market creation, innovation, financing, and awareness-raising for ecooking[10].

The eCooking Capacity Building & Market Development programme (eCAP) was implemented in parallel with the KNeCS, and in partnership with Kenya Power to accelerate the electrification of cooking by developing a pipeline of market ready innovations and building capacity within Kenya Power. Working under the United Kingdom Partnering for Accelerated Climate Transitions (UK PACT) programme to accelerate the uptake of electric cooking (eCooking) in Kenya, the work was also co-funded by Integrate 2 Zero and Modern Energy Cooking Services (MECS). It comprised twelve separate projects which addressed a range of issues to accelerate the electrification of cooking by developing a pipeline of market ready innovations and building capacity within Kenya Power.

9 KenyaNationaleCookingStrategy(KNeCS)-ModernEnergyCookingServices(mecs.org.uk)

10 GlobaleCookingCoalitionUnveiledatAfricaClimateSummit-GlobalEnergyAllianceforPeopleandPlanet

ECONOMICS, LABOR MARKET, AND TECHNOLOGY ANALYSIS

Overview

Economic development in Africa faces a lot of constraints including low levels of industrialization, low competitiveness and limited human skills among other challenges. The level of unemployment in Africa is a point of concern because estimates indicate that by 2030, 122 million young people will join Africa's labour force (ILO, 2022). This is about three times faster than the rate at which stable, wage-paying jobs will be created. Most of the jobs created are of low quality and in productive sectors that are adversely affected by climate change, and do not necessarily qualify as "decent" (McMillan & Zeufack, 2022).

Kenya is among over 15 African countries that have developed their green economy strategies guided by the second medium plan to Vision 2030, to facilitate the transition to a green, low-carbon and climate-resilient economy and jobs creation (United Nations Economic Commission for Africa, 2020). Unemployment and under-employment situations as well as the mismatch of skills with the labour market constitute major challenges that result in low productivity among the young population and this constitutes an obstacle to national competitiveness with informal workers constituting 82.7% of the employed population in Kenya (Shirley et al., 2020).

Economically, Kenya still suffers from vulnerability of energy supplies and dependence on imported fuels and this exacerbates the price volatility of energy. Investment in renewable energy, sustainability and social inclusion are among the priorities of Kenya's green strategy that is intended to promote industrialization. The low quality of electricity supply and the high prices contribute to a high cost of doing business, hence affecting competitiveness. The planned transition to 100% renewable energy offers promise for the creation of green jobs in various sectors including the production, sales, installation, and servicing of devices such as solar panels and lanterns, wind turbines, biogas digesters, and cook stoves among others (Colombo et al., 2013).

There is an increasing number of workers as suppliers and manufacturers for solar PV (Samoita, Nzila, Ostergaard, & Remmen, 2020). The job landscape pans out in the form of established and opportunistic importers, technicians, and solar sales agents. Kenya, which is perhaps only second to South Africa in terms of technology, skills, and competence, is able to develop Solar PV systems and expand her on-grid industry (Kibaara, Murage, Musau, & Saulo, 2020). Recent statistics project that annual job growth rates within the industry will be at a percentage point of 26 points by the year 2024[11]. According to IRENA, the projection is that 48,300 jobs will be created by the end of the year 2024, however, the volatility of energy systems/energy security during the climate crisis is increasingly informing the development of the Solar PV space, not only in Kenya but also across the globe (IRENA, 2019).

Jobs Creation in the Just Energy Transition

An assessment by the Kenya Revenue Authority highlights statistics from the importation of Solar PV units at a staggering 2,561,000 units as of 2018 (Kenya Revenue Authourity, 2022). This intervention has the potential to unlock a myriad of locally tailored employment opportunities for women and youth (Elmer, Nygaard, and Brix, 2014). To explore such an opportunity the onus is on stakeholders to build on the technology skills & expertise able to compete effectively at the global stage.

Additional investments for energy transition are need to support around 500,000 additional jobs beyond 2050 across the economy. Already, over 350 companies in Kenya are involved in the Generation Kenya programme which offers training to young people and matches the trained youth with companies in search of employees supported by Sweden. Kenya and Germany have also worked together since 2016 for the promotion of Youth Employment and Technical and Vocational Education and Training (TVET). For Team Europe in Kenya, the Agric-business sector is a key source of income for many Kenyans. Denmark and the EU are partnering with the Kenya Climate Innovation Centre (KCIC) to promote new climate technologies through innovations by entrepreneurs. KCIC has supported over 520 clean tech businesses (31% of which are women-led) from five thematic areas which include water management, renewable energy, commercial forestry, agribusiness and waste management. Over 497,569 customers have been reached by these businesses with low-carbon products which have also helped improve health and living standards. In addition, over 350,000 tonnes of CO_2 equivalent have been mitigated by the innovative technologies developed by Kenyan companies (GoK, 2021).

The jobs created in the solar PV and ecooking sector could be direct formal, direct informal, indirect formal or indirect informal. Direct formal jobs entail direct engagement with renewable energy technologies, such as operating, maintaining, installing, or manufacturing them. Indirect formal jobs support the renewable energy sector through activities such as specialised services, supply chain, research, or policy (IRENA, 2023). For example, a solar panel installer is a direct formal job, while a solar panel manufacturer is an indirect formal job. Both contribute to employment. Direct informal jobs are usually created to fulfill the demand for renewable energy products or services, for example installing solar panels or operating wind turbines. Indirect informal jobs usually support the direct jobs, such as manufacturing the equipment, providing the materials, or delivering the goods. They are described as informal because they are not regulated by formal contracts, social security, or labour laws.

11 https://ypckenya.org/wpcontent/uploads/2021/06/Unlocking_the_Solar_Photovoltaic_Value_Chain_Potential_for_Enhanced_Job_Creation_in_Kenya_-_DP231.pdf

The Solar PV sector is emerging as an important contributor to high job intensity through the promotion of low carbon technologies with a high potential for job creation. A study by Kenya Institute of Public Policy Research and Analysis (KIPPRA) indicates that the annual job growth potential in the solar PV sector will be 26% between 2018-2024, down from 51% in 2012 to 2018 (Mutuku and Mbatia, 2020). The sector has the potential to create 48,306 jobs in Kenya by 2024 (**Table 1**) in the areas of operation & maintenance (40%), construction and installation (40%), manufacturing (12%), distribution (5%), and R&D (3%) along the value chain.

There are only two firms engaging in the manufacturing of solar PV systems, while the majority of the firms actively engage in the distribution, installation, operation, and maintenance phases of the value chain. Solinc Limited, has a manufacturing capacity of 140,000 solar panels per year while Chloride Exide (K) Ltd manufactures batteries that are part of a solar PV system (Mutuku and Mbatia, 2020). The European Photovoltaic Industry Association (EPIA) estimates 3-7 direct jobs per PV module at the manufacturing stage, 12-20 indirect jobs per MWp at the installation stage. Ortega et al. (2015) observe that jobs created at the operation and maintenance stage are stable, entail significant local component, and have an intermediate level of specialization. Further, given that O&M activities are run through the project lifetime, the O&M induce permanent jobs which start the first year of plant operation and last till the plant expires.

M-Kopa has the largest footprint and has sold 500,000 PAYG units. Mkopa employs 1,000 full-time staff and 2,100 active direct sales representatives in East Africa (Mutuku and Mbatia, 2020). **Table 4**-1 indicates the employment creation potential along the solar PV value chain in Kenya. There has been an increasing progression of job creation between 2012 and 2018. This is a clear indication that given the right amount of focus to solar PV as one of the main sources of energy in Kenya, it could easily become a major employer of youth in Kenya thereby helping address the high unemployment rates,

With respect to job creation in the solar PV sector, the Green Mini-grids contribute to 9.5 Full Time Equivalent (FTE) jobs in design, feasibility and construction; 2.8 FTE jobs in Operation and Maintenance and 652 jobs indirect and induced employment (not necessarily FTE jobs) in agriculture, manufacturing and services (Oyuma et al., 2023). Women account for about 20% of the total. Every EUR 1 million invested, could create 58 FTE jobs annually, mostly unskilled. Solar PV shows promise as a renewable energy source for cooking in Kenya (Cardoso et al., 2023). **Table 2** shows an estimate of jobs created in the mini-grids.

Another study by RTI estimated that an average of 344,000 direct and indirect jobs will be created through 2040, based on increased uptake of renewable energy by Kenya Power, compared to 110,000 if

Table 1. Employment creation potential along the solar PV value chain

Year	Installed Capacity (MW)	R&D	Manufacturing	Distribution	Installation	O&M	Total
2012	12	24	120	48	396	396	996
2013	27	54	270	108	891	891	2,241
2014	47	94	470	108	1,551	1,551	3,901
2015	68	136	680	272	2,244	2,244	5,644
2016	88	176	880	352	2,904	2,904	7,304
2017	112	224	1,120	448	3,696	3,696	9,296
2018	143	286	1,430	572	4,719	4,719	11,869
2019	198	396	1,980	792	6,534	6,534	16,434
2020	250	500	2,500	1,000	8,250	8,250	20,750
2021	252	504	2,520	1,008	8,316	8,316	20,916
2022	422	844	4,220	1,688	13,926	13,926	35,026
2023	492	984	4,920	1,968	16,236	16,236	40,836
2024	582	1,164	5,820	2,328	19,206	19,206	48,306

Source: Mutuku and Mbatia, 2020

KPLC were to rely on the grid alone by 2030. Currently Kenyan schools do not have the requisite capacity to deliver the skill sets required for advancing the solar PV sector, for example, technicians, engineers, environmental scientists and social scientists among others.[12] . Available 2019 data indicates that 5,600 EPCs valued at USD 60,000 were sold in Kenya (Rousseau & Scott, 2021). Data from six online retailers for the six months in the second half of 2019 indicates the ecooking imports in Kenya as summarized in **Table 3**. The volume of imports and source country is not available.

The ecooking market In Kenya is still nascent. Manufacturing of e-cooking appliances is nascent as well with only Burn Manufacturing venturing into the production of induction cookers and electric pressure cookers. The Kenyan market has the following ecooking products: electric ovens, electric pressure cookers, slow cookers, electric kettles, hotplate, induction stoves, microwave ovens, air fryers, and electric rice cookers.

It is estimated that the clean cooking sector contributed to about 19,000 direct, formal jobs and potentially 15,000 to 35,000 direct, informal jobs in 2019 (Lee et al., 2021). Of the 19,000 jobs, 9,100–17,000 are in the LPG sector, 700 in the bioethanol sector, 800 in the biogas sector, and 200 in the electric cooking sector. The 200 jobs in the electric cooking sector were in the importing, wholesale, retail sales and distribution activities of EPC. The level of compensation and retention for these jobs is low. In sales and distribution jobs form the biggest part of the workforce in the LPG and electric cooking sectors. The majority of the clean cooking sector's direct, formal workforce is reported to be skilled. Management, finance and legal, and product development and research are the most difficult skills to recruit for. Women's participation is lower than 30% in the clean cooking sectors cited, and managerial positions have higher women's participation than nonmanagerial ones. The electric pressure cooker (EPC) is the most commonly promoted electric cooking technology and is perceived to be viable for rural weak-grid and off grid areas due to its high efficiency to cook energy-intensive foods. EPC is an emerging technology and largely imported with little local assembly or manufacture. Currently, there is no manufacturing activity of EPC in Kenya, but Kenya Power (KPLC) has formed key partnerships to raise awareness and pilot electric cooking initiatives in rural areas. There are already players on the market that are

12 https://www.rti.org/impact/measuring-green-jobs-creation-kenya

Table 2. Direct jobs in Kenyan mini-grid development

	Parameters	FTE Jobs
Average mini-grid site	Jobs in design and feasibility phase (temporary)	0.7
	Jobs in construction and commissioning phase (temporary)	8.8
	Jobs in operation and maintenance phase (permanent)	2.8
	Total Direct jobs (temporary plus permanent)	12.3
For 33 GMG sites	Permanent jobs	92
	Temporary jobs	314
	Total jobs (temporary plus permanent)	406
Future connection targets	Estimated jobs creates if 35000 households served	1439
	Estimated jobs created if 1.1 million households served	45100

Source: Oyuma et al., 2023

Table 3. Value of imports of ecooking devices from selected retailers in Kenya

Type of ecooking device	No of Models	Unit Price range USD	Value USD
Kettles	1700	10-50	70,000
Ovens/cookers	24	50-100	8,400,000
Electric rice cookers	384	30-100	148,000
Hotplates	160	10-40	110,000
Electric Pressure cookers	15	60-100	N/A

Source: Rousseau & Scott, 2021

exploring the possibility of manufacturing of EPC as domestic demand picks up. The employment factors and job estimate for the EPC are presented in **Table 4**. As with economic activities, transport sector investment is estimated to support the majority of the additional jobs. The sector directly supports around 100,000 jobs in the construction (25%) and maintenance (75%) of electric vehicles, charging and hydrogen fueling infrastructure as well as 5,000 indirect and 12,000 induced jobs in the supply chain and wider economy. Similarly, power sector investment also supports a significant number of additional jobs. The investment directly supports 178,000 jobs in the construction of renewable generation assets as well as 57,000 indirect and 130,000 induced jobs ((Ministry of Energy & Petroleum, 2023).

The direct formal jobs in the clean cooking sector are highly skilled, and for those in the LPG and electric cooking sectors, more than 80% are skilled jobs. Short retention periods of about 20 months have been reported in the electric cooking sector compared 18 months in the LPG sector, 24 months in the

Table 4. Employment factors and jobs estimates of the e-cooking sector

Electric cooking value chain activities	Direct formal employment factor	Direct informal employment factor	Direct formal jobs estimate	Direct informal jobs estimate
EPC manufacturing and assembly	0 jobs per 1000 stoves	0 jobs per 1000 stoves	0	0
EPC import and wholesale	3 jobs per 1000 stoves	0 jobs per 1000 stoves	10	0
EPC retail sales and distribution	50 jobs per 1000 stoves	9 jobs per 1000 stoves	210	770

Source: Lee et al., 2021

Table 5. Skill sets required for the electric cooking job market in Kenya

	Skillset	Responsibilities	Desired qualifications/ attributes
1	Sales and distribution	Marketing, promotion, selling, delivery, installation	Communication, negotiation, customer service, knowledge of the products and their benefits
2.	Manufacturing and assembling	Producing, assembling, testing	Technical, mechanical, electrical, quality control and safety standards. Ability to work with machines, tools and follow instructions
3	Product development and research	Designing, developing, and testing new or improved electric cooking appliances and solutions	creative, analytical, and problem-solving skills, as well as knowledge of the market needs and preferences, ability to work with data and technology and collaborate with other experts and stakeholders
4	Management, finance, and legal	Planning, organizing, and overseeing the operations and activities of the electric cooking sector	Management, finance, and legal workers need to have leadership, strategic, and decision-making skills, as well as knowledge of the business environment and regulations. They also need to be able to work with numbers and budgets and manage risks and challenges.

Soure: Leary et al., 2022

Table 6. Skills required for solar PV market

	Skillset	Responsibilities	Desired qualifications/attributes
1	Technical	design, install, operate, maintain, and troubleshoot solar PV systems and components	electrical engineering, electronics, physics, mathematics, and computer science. Familiarity with the relevant codes, standards, regulations, and safety practices that apply to solar PV projects. Depending on your role and level of responsibility, you may need to obtain specific certifications or licenses
2	Soft skills	collaborate effectively with different stakeholders, such as customers, suppliers, contractors, regulators, and colleagues.	communication, teamwork, problem-solving, creativity, and adaptability
3	Business skills	plan, execute, and evaluate solar PV projects, from feasibility studies and proposals to budgeting and reporting	project management, finance, marketing, and entrepreneurship
4	Environmental	align your work with the global goals and values of renewable energy, such as reducing greenhouse gas emissions, enhancing energy security, and promoting social equity.	sustainability, climate change, and environmental justice
5	Learning	keep up with the rapid changes and innovations in the solar PV industry, such as new technologies, materials, applications, and standards.	curiosity, research, and continuous improvement

Sources: Various online sources

bioethanol sector, 36 months in the biogas sector. The non-managerial jobs pay USD 200 per month or more in the LPG and electric cooking sectors (80%) of workers), while for bioethanol sector it is only 50% and biogas sector 20%. Managerial employees more than USD 500 per month, as compared to just over 40% in the bioethanol sector and barely 20% in the biogas sector. Women's participation is higher in managerial positions than non-managerial positions; it is also higher in the bioethanol and electric cooking sectors, compared to the LPG and biogas sectors. This is explained by the fact that many direct formal, non-managerial jobs in the sector are labor-intensive. The electric cooking sector has a large share of its workforce in sales and distribution.

The inadequacy of skills in the solar PV sector is demonstrated by a skills availability ratio for the certificate and diploma education level below the ideal ratio of 10. A large skills availability ratio is an assurance that the skills required by the sector will be accessed while a low skills availability ratio indicates uncertainty as to the whether the skills available can be attracted by that specific sector. The most in demand skills in ecooking and LPG are sales and distribution while in bioethanol and biogas sectors, manufacturing and assembly are the most common job functions. The solar PV and ecooking sectors require different skillsets as summarized in **Table 5 and 6**.

In 2013, Kenya imported electrical apparatus for switching or protecting electrical circuits or for making connections to or in electrical circuits; electrical resistors, other than heating resistors; printed boar from the EU worth USD 3 Billion Article (SITC) 752.

THE POLITICAL ECONOMY OF GREEN INDUSTRIALIZATION AND JUST ENERGY TRANSITION IN KENYA

Overview

Kenya's drive for green industrialization and a just energy transition is influenced by political economy issues such as the national development vision, the international commitments, the environmental challenges, and the economic opportunities. The aspiration is to become globally competitive and to ensure high quality of life for its citizens under Vision 2030 (Government of Kenya Ministry of Environment and Forestry, 2016). Kenya needs to balance economic, social and environmental objectives using a green economy approach, particularly with respect to industrialization and the creation of green jobs, enhancing resource efficiency and reducing environmental degradation. Kenya has committed. to international agreements and frameworks that promote green growth and climate action, for example, the Paris Agreement, the 2030 Agenda for Sustainable Development, and the African Union Agenda 2063 (Government of Kenya Ministry of Environment and Forestry, 2018). These commitments require the country to institute policies and measures towards reducing greenhouse gas emissions, thereby minimizing the effects of climate change which have global effects. The adoption of green industrialization strategies could be useful in minimizing the environmental pressures, improving adaptive capacity and creating jobs. The independence of the country in charting its own energy development path is influenced by levels of aid dependence, trade ties, their status as energy importers/exporters and how much scope they have to impose conditions on investors around employment and local content requirements. We examine how each of these factors affects the development of solar PV and ecooking in Kenya.

With regard to aid dependence, donors and multilateral development banks (MDBs) have used the climate change narrative as a rationale for market-led private transitions to open up markets to 'clean

energy' investment while presenting state utilities as lacking the finance and experience to undertake them efficiently and effectively for example in the solar PV sector. Focusing on private sector led low-carbon development validates the need for power sector reforms and the unbundling of existing service providers as has happened in the Kenyan power sector (Newell & Lane, 2020).

Trade ties between the EU and Kenya have both negative and positive consequences. EU provides valuable support and opportunities for solar PV development in Kenya on one hand but imposes trade barriers and influences that may hinder the growth and diversity of the solar PV sector in Kenya. The EU is a major market for Kenyan exports, such as flowers, tea, and coffee. The EPA signed between EU and Kenya is an opportunity to that enables Kenya to enjoy duty-free and quota-free access for Kenyan products to the EU market. This could enable the development of incentives for Kenyan producers to adopt solar PV as a way to reduce their energy costs and carbon footprint, and to comply with the EU's environmental standards.

Trade ties with the EU can be useful in addressing challenges of affordability, availability, unreliability of electricity supply, lack of consumer awareness and policy gaps by facilitating the import of high-quality and energy-efficient e-cooking appliances, reducing the cost of e-cooking equipment and services, and supporting the development of local manufacturing and distribution networks. These ties also facilitate knowledge and technology transfer, as well as access to funding and technical assistance for e-cooking innovation and scaling up (Byrne et al., 2020). While trade ties are useful, there are also risks relating to the potential exposure of the local market to unfair competition, creating dependency on foreign products and standards, and undermining the development of indigenous solutions and capacities. Other potential negative effects relate to environmental and social impacts, such as increasing the demand for electricity and the generation of electronic waste, as well as affecting the livelihoods of those involved in the traditional cooking sector.

Investors impose different conditions on development sectors depending on their interests. For the solar PV sector, investors usually wish to see a positive return on investments that generates stable cash flows (International Solar Alliance, 2023). The factors considered include the levelized cost of electricity (LCOE), the power purchase agreements (PPAs), the feed-in tariffs (FITs), the tax incentives, and the subsidies that affect the profitability of the solar PV projects. They also look for high quality and reliability considering factors such as the solar resource potential, the module efficiency, the system design, the operation and maintenance (O&M) costs, and the degradation rates that affect the output of the solar PV projects[13]. Lastly they are keen to see that solar PV projects are as environmentally friendly as possible (International Solar Alliance, 2023). Factors considered include greenhouse gas (GHG) emissions, water consumption, land use, the waste management, the labor standards, and the community engagement that affect the sustainability.

For the ecooking sector conditions are imposed depending on the context, the type of investment, and the stage of development of the e-cooking enterprise. A thorough market assessment and clear business plans are advised before entrepreneurs seek investment (Global Alliance for Clean Cookstoves, n.d.). The e-cooking sector is an emerging market. Some of the conditions imposed include the market maturity, where investors would like to find clear standards, demand, a policy environment for e-cooking services and products and evidence of their social impacts. Assessments for affordability are also conducted to inform the development of innovative financing and delivery models such as pay-as-you-go, leasing or bundling for enhanced access particularly by low-income segments (ESMAP et al., 2020). Investor interest is in some cases drawn to supporting the development of the whole value chain by providing loans, grants, equity and technical assistance[14]. Other points of interest by investors is to understand consumer behavior with respect to their perceptions, preferences and practices, gender and culture and how these influence decision making at household level (Leary et al., 2021).

13 https://www.iea.org/reports/solar-pv-global-supply-chains/executive-summary

14 https://ifmrlead.org/moving-the-clean-cookstoves-sector-forward-six-principles-for-investors/

Stakeholder analysis

Development partners such as European Union, the World Bank, the African Development Bank, and Solar Cookers International are a key source of financial and technical aid for the expansion of solar PV and e-cooking. Each partner has different priorities, for example EU priorities on solar PV include large-scale solar PV projects the EU-funded Emerging Africa Infrastructure Fund (EAIF) which provided a USD 35 million loan for the 40 MW Kesses solar project in Eldoret, which is expected to be completed by the end of 2023[15]. EU funds solar PV mini-grids, for example the Kudura power project which targets the installation of 22 solar PV mini-grids in Kenya (Oyuma et al., 2023). EU also promotes cooperation and coordination among different actors by participating in the Kenya-EU Energy Cooperation Group through dialogue and information exchange on energy issues.

The government through the Ministry of Energy and Petroleum is the key policy maker and has enacted various policies and incentives to support the deployment of solar PV and e-cooking. The Energy and Petroleum Regulatory Authority is the regulator. The government has set ambitious targets to increase the share of renewable energy in the generation mix to 100% by 2030 (Republic of Kenya, 2016) and to achieve universal access to modern cooking energy services by 2028 (Ministry of Energy, 2019a). The government owns the grid through Kenya Power which purchases electricity from independent power producers and distributes it to consumers. The government collaborates with development partners to access finance and technical assistance for solar PV Projects. Kenya is a regional hub for solar PV and has ridden on political stability and pro-capitalist interests to attract relatively high levels of foreign investment and development partner support. The government experiences challenges related to policy coherence, institutional capacity, political will and public awareness. Government efforts to curb the importation of substandard products have not been successful and this contributes to lack of trust and hinders uptake of solar PV.

The private sector includes local and foreign investors, community-based organizations and cooperatives. They invest and develop on-grid and off-grid solar and e-cooking projects in Kenya (Bhattacharyya, 2013). Private sector benefits from a favorable policy environment, the high solar potential, and the growing demand for electricity in Kenya. There has been intense competition between the private sector actors, with some using the state to impose formal standards which were not widely adopted in the market. Others have influenced policy (2004 and 2018 policies) to deliberately keep the tariff low, with support from government (Ockwell et al., 2017). Local private sector actors in ecooking include Hotpoint Appliances Ltd, Sayona Electronics, Nagoya Holdings Ltd, Philips East Africa and local supermarkets who operate retail stores in urban centres. Local manufacturers and distributors for e cooking appliances include as Kisambara Ventures Limited and Jikoni Magic, who produce and sell ecooking appliances that are tailored to the Kenyan cuisine and culture (Kalyonge & Leary, 2023).

International companies and organizations, such as Modern Energy Cooking Services (MECS) and Energising Development (EnDev), who support the development and promotion of ecooking appliances in Kenya through research, innovation, and capacity building have also been engaged in promoting appliances from different sources(Leary et al., 2022). There are also online platforms and retailers, such as e-commerce websites and supermarkets, who offer a range of ecooking appliances from different brands and countries[16]

The civil society comprises actors such as non-governmental organizations (NGOs), research institutions, media, and consumers. The civil society advocates for environmental and social justice, raises awareness and education, provides technical support and capacity building, monitoring and evaluation, and influences policy making (Muok & Kingiri, 2015). They represent the needs of different stakeholder groups including women, youth, and marginalized groups.

Community benefits from improved environmental, health, economic and social conditions (Shahsavari & Akbari, 2018). Environmental accrue from reduced emission of greenhouse gases, deforestation, land degradation, and biodiversity loss. Health benefits accrue

15 https://www.pv-magazine.com/2022/02/10/european-funds-back-40mw-kenyan-solar-field/AccessedOctober7th2023

16 https://www.6wresearch.com/industry-report/kenya-kitchen-appliances-market-2020-2026

from improved indoor and outdoor quality. Economic benefits are achieved through reduced energy costs, income generation, creation of employment opportunities. Social benefits are achieved mainly through empowerment of women and girls, reduced drudgery and time spent looking for firewood and cooking. Other benefits include education and communication.

Stakeholder Relations

Development partners have used their collective power to set the tone for energy policy in Kenya towards cleaner forms of energy generation, while maintaining support for fossil fuels which they extract for consumption in the global North (Newell & Phillips, 2016). The electricity market reforms conducted in the 1990s were mostly driven by donor goals for privatization, instead of regime goals (Sergi et al., 2018). Government and development partners favour geothermal generation compared to solar PV. This preference for geothermal is explained by the scalability, low carbon emissions, high potential and availability locally. The exploitation of geothermal energy however poses challenges, for example the long lead times for project development and the controversy surrounding the acquisition of land in Masai territory is an issue of concern (Newell et al., 2014b).

Governments and development partner support for solar PV development has been indirect in the form of exemption from import duties on PV components, enforcing systems of product quality standards, and supporting specific credit schemes to suppliers and customers (Hansen et al., 2015). For example, import duty was removed from all solar PV products between 1986 to 1991 (Bawakyillenuo, 2012), and this prevented high increase in the price of PV modules prices resulting in increased demand.

Institutional solar PV support is mainly by donors and government for the provision of lighting for example, the installation in public institutions in off-grid areas by the Rural Electrification and Renewable Energy Corporation. Mini-grids mostly receive support from development partners and government. Retrofitting of diesel powered mini-grids has been driven by the need to reduce the operating costs. Some mini-grids are owned and operated by local cooperatives under community-based systems. National utilities, foreign or national energy service companies (ESCOs) also own mini-grids. Generally, rural electrification receives substantial subsidies through rural electrification agencies or cross-subsidization within utilities. Viable options for government and donor interventions to support PV in rural electrification include the provision of project development support, subsidies and finance and, more indirectly, by providing the necessary regulatory set up for operators (Hansen et al., 2015). A lot of development partner support goes towards directly influencing policy through capacity-building and providing technical support to develop specific policy measures and legal frameworks such as FIT and auctions.

Large-scale capital-intensive plants are part of the 'grid-connected' PV market segment. These are owned and operated by utilities and private operators who are independent power producers (IPPs), often involving foreign investors. Government support for large-scale grid connected plants may be indirect in the form of feed-in tariffs, or direct through the management of bidding rounds and contractual arrangements with operators. Private sector perceives the PV tariff rates to be too low to attract domestic and foreign investors (Hansen et al., 2015). The Kenya government prioritizes urban electrification over rural electrification (Bawakyillenuo, 2012), and hence envisages a promising future for grid-connected PV.

Private sector mainly supports the installation of solar PV systems in the 'telecommunication and tourism' market segment for purposes of communications (Hansen et al., 2015). Government and donor support to this sector is limited to general VAT and duty exemptions for PV components as part of the enabling environment. Civil society organizations and missions promote solar PV-powered water pumps and vaccine refrigerators in health clinics to remote off-grid parts.

International support such as the International Finance Corporation and photovoltaic market transformation initiative (PVMTI) implemented by the World Bank in 1998-2008 and GIZ played a significant role in market development for solar home systems (Bawakyillenuo, 2012). These took the form of loans to consumers. Kenyan experiences in solar PV have spilled over to Uganda and Tanzania (Hansen et al., 2015). The drivers

of the SHS market include the growing demand from private households with increasing purchasing power, and VAT and import duty exemptions for imported PV components and various government and donor programmes. The annual number of homes electrified privately with PV in rural Kenya exceeds those being electrified through the grid (Bawakyillenuo, 2012). The opportunistic behaviour of the private sector and their willingness to bear risks has been a key factor in market growth. The dimming hopes of getting connected to the grid has been a driving factor in the growth of the SHS market (Bawakyillenuo, 2012; Hansen et al., 2015). The availability of a well- developed transport infrastructure in terms of road and rail link has facilitated the establishment of distribution channels and a PV supplier network.

The Ministry of Energy and Petroleum has incorporated ecooking into the national strategy for clean cooking and is collaborating with various partners in this respect. Cooking with electricity is also attracting attention from international agencies. For example, Sustainable Energy for All (SEforAll) is promoting integrated energy planning to cover both electricity and e-cooking access. 'Beyond the Grid Fund for Africa' and the Global Leap Awards, among others, are including e-cooking components for the first time. The World Bank E-cooking Fund is explicitly linking e-cooking projects with other energy programmes (MECS, 2022). World Bank supports a results-based financing (RBF) facility for e-cooking under the Kenya off-grid Solar Access Project. The growing interest is driven by the potential contribution of e-cooking to the SDGs. For example, the E-cooking Alliance aspires to elevate e-cooking in implementation for 10 of the 17 SDGs. German Gesellschaft für Internationale Zusammenarbeit (GIZ), Practical Action, Hivos East Africa and the Collaborative Labelling and Appliance Standards Program (CLASP) are some of the international development agencies in the e-cooking space. GIZ EnDev Programme is financing market development for EPCs in Kenya. Practical Action and Hivos advocate for the adoption of e-cooking solutions, while CLASP promotes quality standards and market development for solar and electric appliances. Instapot, Philips, Midea and Groupe SEB, are international private sector actors who have identified the potential of e-cooking in emerging markets.

There is no policy that explicitly mentions e-cooking, but this is bound to change with the upcoming national e-cooking strategy which takes a wholesome approach to cooking solutions including biogas, improved cookstoves, bioethanol, LPG and ecooking. The policy context for e-cooking is still weak but government has initiated the development of an electric cooking strategy which will link electricity and e-cooking policy (Byrne et al., 2020). There are many actors in the e-cooking sector, but they do not have an explicit focus on e-cooking except the EnDev-funded RBF. There is limited collaboration between these actors. The local media has consistently reported on e-cooking and advocated for removal of VAT on e-cooking solutions. There is a growth in market demand for e-cooking, which may extend beyond the wealthy and middle class, but importers are yet to reciprocate (Byrne et al., 2020).

Opportunities for Industrialization and Job Creation

The contribution of solar PV to green jobs and industrialization takes different shapes. Off-grid solar kits and PUE are increasingly used to power micro and small enterprises and small holder farm activities. Several technologies designed specifically for productive use are also now available (GOGLA, 2022). For example, 56 out of the 290 sub counties in Kenya are technically and economically viable for solar PV irrigation farming for maize, tomatoes and onions (Wamalwa et al., 2022), and solar PV is used for refrigeration in off-grid areas around the lake region (Okwach, 2022). Fishermen who previously relied on kerosene need to access solar lanterns and cold storage for fish preservation. Solar can also be used for drying and preservation of crops for income generation (Ahmad et al., 2022). Most of the jobs created in the off-grid solar PV sector are in the rural areas, hence they contribute to income generation. Off-grid solar also offers women the opportunity to participate in the energy sector, and this is useful in ensuring gender balance and addressing problems that are unique to women's participation in the energy sector. Increasing urbanization and emergence of business models such as PAYG signifies a potential to upscale the use of solar

PV in business enterprises especially with improved affordability and the growing use of technological innovations in data led and digital methods.

Opportunities exist for using solar powered cooling & refrigeration systems for cattle farmers, especially in Rift valley and Central Kenya in areas where grid access is limited. Solar cold storage system is another potential application to address post-harvest losses (Sh150 billion worth of food went to waste due to lack of off grid cold storage facilities) (George et al., 2019). The sales of solar PV system are higher than the rate of new last mile connection initiative. Solar generated electricity is the main alternative to grid-based rural electrification programme (George et al., 2019). Solar PV lighting has a major role to contribute to improvements in educational development in remote rural areas. These could be mitigated using recent technology innovations on metering and control processes, such as prepaid smart metering, mobile payments, load limits and remote monitoring/control. This is an opportunity to support consumers to acquire new appliances, the cost of which can be recovered through electricity sales. The rural areas of Kenya are a huge market for solar water pumping solutions (Efficiency for Access Coalition, 2021). There is a need for 100% network coverage to support rural access to the national economy via mobile money. This requires the installation of solar charging points for mobile phones and solar lamps for lighting, thus improving not only education, health, financial inclusion but also digital inclusion.

A report by GOGLA indicates that Kenya dominates the market for off-grid solar products in Sub-Saharan Africa. These include portable lanterns, multi-lighting and charging systems, solar home systems while the solar appliances include TVs, refrigerators fans, and solar water pumps. The 2019 market report indicates that Kenya accounted for 38 per cent of the total sales of off-grid solar lighting products and 43.4 per cent of solar appliances in Sub Saharan Africa (GOGLA, 2018).

The paths towards green industrialization through electric cooking include the reduction in emission of greenhouse gasses from the cooking sector; improved health and well-being through reduced indoor air pollution and drudgery that goes with reliance on traditional cooking solutions; stimulating the growth in electricity demand which also creates opportunities for renewable energy generation and grid expansion[17]; supporting local innovation and entrepreneurship in the development and distribution of energy efficient electric cooking appliances such as electric pressure cookers and improving gender equity through women empowerment as a result of increased availability of time to engage in more productive activities, income generation and education opportunities (Byrne et al., 2020).

Kenya has the potential to generate jobs in clean cooking by replacing liquefied petroleum gas with renewable based cooking solutions. Kenya can also stimulate the demand for electricity by bridging the gap between electricity policy and electric cooking policy. Increased demand for electricity is likely to drive the development of renewable energy resources for electricity generation while creating jobs for youth (Onsomu et al., 2022) in installation, operation and maintenance. This will help Kenya to fulfil its commitments to international frameworks such as SDG, Paris Agreement and the NDC while improving energy security. The manufacturing sector in Kenya has a high potential for creating employment and therefore stands to benefit from investment in ecooking through the production of ecooking appliances locally. This creates opportunities for SMEs and improves the value chain of ecooking. Food security can be enhanced through increased quality and quantity of the food processed, preserved and packaged (Atela et al., n.d.).

Challenges to Industrialization and Job Creation

Off-grid solar PV has the advantage of reducing the demand for grid supplied electricity but so far, its development has been left to market forces. Solar PV is mostly promoted as a cheap energy option for the rural areas in form of small, pico-scale market of solar lanterns and the larger household scale Solar Home Systems (SHS). Key challenges include high

17 https://nuvoniresearch.org/portfolio/kenya-national-electric-cooking-strategy-knecs/

upfront costs, policy and regulatory uncertainties, grid integration issues, and competition from other energy sources. Government also faces challenges in balancing stakeholder interests including consumers, producers, distributors, regulators, utilities, and investors. Some of these challenges include the lack of clear and consistent policies and regulations for the solar PV sector. This creates uncertainty and confusion for the local companies and investors. Solar PV is also subject to import duties and taxes which increase the cost of products and reduce competitiveness for the local companies. The market is dominated by international companies and donors leaving limited opportunities and reducing the bargaining power of local companies.

Challenges relating to the EU trade ties with Kenya in the promotion of solar PV technology revolve around trade defense measures, such as anti-dumping and anti-subsidy duties, imposed by the EU on solar PV products imported from China, which is the main supplier of solar PV modules and components to Kenya. These measures result in increased cost of solar PV equipment and affect the competitiveness of Kenyan solar PV companies. The EU has also been accused of using its development aid to promote its own solar PV industry, rather than supporting local manufacturers and suppliers in Kenya[18]. There are multiple actors in the solar PV and e-cooking sectors each with different interests and challenges. The power relations that govern their operations are dynamic and change over time.

There is inconsistency in the regulations, with respect to the application of VAT applies to solar PV and related products. For example, solar PV mini-grids regulation is still a grey area as the regulations are yet to be gazetted. The solar PV sector has operated on ad hoc licensing rules since 2015, agreed tariffs are temporary, and there is a lack of clarity on the question of integrating existing mini-grids with the main grid(Bhamidipati et al., 2021). For commercial and industrial systems, there are unclear regulations regarding the process of securing licensing permits and the systems that are exempt from the permit. For utility scale PV, there is inconsistency in the application of regulations to negotiations for power purchase agreements. Institutions in the energy sector operate in silos and hence interpret same regulations differently. There is a lack of clarity regarding regulations across all market segments, as they are still under development (mini-grid draft regulations, Commercial and Industrial Power Purchase Agreements/leasing conditions, net metering, draft policy for an auction scheme) but projects continue to be rolled out (Bhamidipati et al., 2021). Local companies spend a lot of resources in seeking clarification- leading to delays in implementation and imposition of charges and fines retrospectively by the revenue authorities.

Officially PV products are exempt from import duties and VAT, however in reality, there limited clarity on how these affect individual pico products, system parts or home systems (Bhamidipati et al., 2021). The result is higher charges on the products and lower margins for the companies and higher product prices for consumers. This affects demands well as market size. The VAT percentage rate is constantly being changed, with new terms set nearly every financial year, which also leads to unpredictability and uncertainty, over and above the absolute cost implications.

The 2010 Kenya Constitution bestows the function of policy formulation to the national government, while energy planning is devolved to County level. Under this arrangement, county governments expect more control over policy at the local level (Ockwell et al., 2017) which may have implications for resource flows and autonomy over energy developments. There are some conflicts occasioned by land rights, benefit sharing and resettlement agreements between investors and the local communities. There are also gaps in the legal and institutional framework that governs the energy sector. These gaps hinder the effective implementation of clean energy policies at subnational level. For example, Article 191 (2) of the constitution of Kenya provides for concurrent jurisdiction of both levels of government on energy matters but also stipulates that the national legislation prevails over county legislation in case of conflict. This is likely to result into tension and affect the coordination and cooperation processes necessary for promoting low carbon technologies.

18 https://www.pveurope.eu/markets/manufacturing-european-pv-industry-against-solar-trade-defence-measures

Solar PV companies are mostly MSMEs, and therefore not considered as part of industrial policy. It could be beneficial to strengthen the linkages between energy policies and industrial development policies and from targeted interventions cutting across the two ministries, for purposes of developing synergies (Bhamidipati et al., 2021).

The promotion of e-cooking faces challenges including low awareness and limited availability of electric cooking appliances and technologies particularly in rural areas. This calls for consumer education and marketing campaigns to raise awareness and demand for electric cooking. Potential consumers get discouraged by the high upfront costs of e-cooking appliances and still find it cheaper to continue using solid biomass fuels. Affordable financing options and quality assurance mechanisms could be instituted as a means of improving affordability. The country does not have dedicated quality assurance standards for e-cooking appliances, but efforts are underway to initiate this through Strathmore Energy Research Centre.

Winners and Losers

Winners include consumers who are able to access clean, reliable, and affordable electricity; entrepreneurs and innovators who are able to conduct their businesses while creating new markets and jobs; and development partners and investors who can support the implementation of development projects from electric cooking and solar home systems to grid connected systems (Lomax et al., 2021).

Losers are the producers and distributors of biomass fuels, such as firewood and charcoal, because of loss in income occasioned by competition from solar PV use in lighting, heating and cooking. The environment and climate could suffer from the negative impacts of solar PV and e-cooking production and disposal, such as resource depletion, pollution, and waste. Policy makers and regulators may face difficulties in balancing the different interests of stakeholders for example tariffs, subsidies, taxes, standards, quality, awareness, demand, supply, and innovation (Lomax et al., 2021).

GREEN INDUSTRIALIZATION IN KENYA: KEY ISSUES, TENSIONS AND OPPORTUNITIES TO STRENGTHEN EUROPE-KENYA RELATIONSHIP

Overview

The EU is a key partner in the implementation of Kenya's development blueprint Vision 2030 and its five-year Medium-Term Plans (MTPs), guided by SDGs. Behind this relationship is the private sector in Kenya and Europe contributing to an improved investment and business climate in the implementation of SDG, and climate financing, while mitigating risks related to debt sustainability (European Union, 2021). The European Investment Bank (EIB) and the European Development Finance Institutions (EDFI) have important roles in leveraging climate finance and impact in Kenya. However, issues that could be a cause for concern in the EU-Kenya relationship include the implementation of the EPA, because of the different levels of development and integration among the East African Community (EAC) members, the alignment of EPA with the African Continental Free Trade Area (AfCFTA) and the development ties fostered between China and Kenya, and EU's implementation of the Carbon Border Adjustment Mechanism (CBAM) policy. We explore the implications of these issues to the solar PV and ecooking sectors in subsequent sections.

The Economic Partnership Agreement: The EPA between Kenya and EU provides opportunities to increase trade in goods and open up economic opportunities in the area of solar PV whereby Kenya can access duty free, quota free market access as well as gradual opening of solar PV imports from the EU (Schaik et al., 2022). The solar PV sector stands to gain through access to EU markets, technologies and

standards to fulfil mutual interest in climate related goals and environmental protection. This is also an opportunity to enhance technology transfer through mobilization of financing for solar PV and other renewable energy projects. For example, Kenya targets to attain 600MW of solar PV up from 100MW. The ecooking and solar PV sectors are bound to gain in terms of reduced cost and increased availability of electric cooking appliances such as electric pressure cookers, solar PV products and induction stoves among others (Byrne et al., 2020). The EPA is likely to stimulate demand for electricity through price reductions occasioned by the increased solar PV generation and this could translate into increased investments (Byrne et al., 2020). International trade offers more productive businesses, pays higher wages and adds value to the economy. The agreement has strong and binding provisions on maintenance and enforcement of labour standards, climate change and biodiversity, and gender equality and hence will be transformational to the conduct of business in the solar PV sector in Kenya.[19] The EPA does not address some of the challenges relating to cultural and behavioural factors such as cooking preferences, habits, traditions and perceptions. Neither does it guarantee the reliability, affordability and accessibility of electricity which are identified as some of the most pressing constraints to increasing the adoption of ecooking. On the flipside, the EPA could expose the local ecooking industry to stiff competition from the EU. This could pose negative effects on quality, innovation and affordability of the products.

The AfCFTA creates a single market for goods and services in Africa and could stimulate the demand for clean and affordable energy such as solar PV particularly in rural areas[20]. It could also enhance competitiveness and innovation of solar PV manufacturers and service providers through improved access to a more diversified market and reduced tariffs. The AfCFTA could strengthen regional integration and cooperation in the solar PV industry through sharing of best practices, technologies and standards, regulations and enhanced cross border trade in solar PV products among others. Energy services are a part of the priorities in regional value chains while digital solutions in business, which rely on energy are part of the priority services under Kenya's National AfCFTA Implementation Strategy 2022 - 2027 (Ministry of Industrialisation and Enterprise development, 2019). There could be challenges in implementing the AfCFTA in relation to the solar PV industry, for example: the need to harmonize and align national policies, laws and institutions within the AfCFTA framework including ensuring effective implementation and enforcement. The competition and pressure from other countries who have more advanced or cheaper products or services could cause concern. Scaling up the use of solar PV could come at a cost of compromising environmental sustainability and social impacts thereby leading to land use conflicts, improper waste management and local community involvement.

For the electric cooking sector, the AfCFTA holds the potential to lead to reduced tariffs and non-tariff barriers for e-cooking products and components thereby increasing their accessibility and affordability. Through regional integration, it is possible to enhance the exchange of best practices, standards and regulations and innovations (Ministry of Industrialisation and Enterprise development, 2019). Further demand and supply of renewable electricity could lead to lower costs of both grid and off-grid electricity which could improve access by households[21]. E-cooking entrepreneurs, investors and manufacturers stand to benefit from new opportunities to invest and the ability to tap into bigger and diverse markets.

Some of the challenges that could be faced in promoting ecooking under AfCFTA include competition from lower quality products from other countries; dealing with complex and inconsistent trade rules and regulations poses the risk of increased transaction costs. Kenya may need to balance tradeoffs between ecooking and other development priorities such as food security, education, and health. It is also not clear how the AfCFTA could help in addressing social and cultural barriers to adopting ecooking such as consumer preferences, cooking habits, gender norms and awareness creation.

19 EU-Kenyaagreementexplained(europa.eu)

20 EuropeanfundingforsolarminigridsinKenya–pvmagazineInternational(pv-magazine.com)

21 Unlockinge-cookinginKenyathroughastrategicmulti-stakeholderapproach-AfricanCentreforTechnologyStudies(ACTS)(acts-net.org)

Kenya – China relationship: Kenya's close relationship with China has had a positive impact on the solar PV industry through the implementation of several projects including the Garissa Solar Power Plant (55MW) which is the largest grid-connected solar power plant in East and Central Africa[22]. The Project was financed by the export-import Bank of China and built by China's Jiangxi Corporation for International Economic Technical Cooperation; The Tiger Neo solar panels launched by Jink Solar which offers higher efficiency and lower costs[23]; and the One Belt Road Initiative which supported the Kesses Solar Power Plant and the 40MW Malindi solar power plant[24]. These projects have contributed to Kenya's goal of diversifying the energy generation mix and reducing reliance on fossil fuels for power generation. They have also contributed to the creation of employment, boosted local businesses and contributed to the Nationally Determined Contributions. The implications of Kenya's relationship with China on EU support for the solar PV sector depend on the level of cooperation or competition between China and the EU, the alignment or divergence of their interests and values and the agency and preferences of Kenya and other countries divergent interest. It could create more opportunities for EU cooperation with China and Kenya on renewable energy especially given that the three have committed to the Paris Agreement, SDGs and have investment interests in the solar PV sector in Kenya. There is also the possibility that China and EU will compete for influence and relevance in the solar PV sector in Kenya. The EU could encounter difficulties in promoting its standards and norms for environmental and social safeguards, governance and human rights and democracy as China has China may offer more flexible or favourable terms or may choose to ignore or undermine EU values and principles. China's support for solar PV generation could become a key factor in the integration of solar PV with the national grid.

There are positive and negative effects of China's engagement with Kenya on the ecooking sector. The positive is that China's infrastructure projects could be of benefit for increased electricity access which would enable increased use of electric cooking solutions. Additionally, China could shape the demand and preferences of Kenyan consumers and producers for clean cooking products through trade, investment and cultural exchange. China's interests in the clean cooking sector are not yet clear but they could influence the policy (either support or hinder) through sharing of best practices but this depends on their agenda in the ecooking sector[25].

The CBAM policy could impact the solar PV sector through encouragement of more investments in the solar PV sector based on previous relationships in the energy sector. It could create some challenges relating to compliance with the reporting and verification requirements of the CBAM regulation and adjusting to the potential changes in the pricing of solar PV products from the EU (Pauw et al., 2022). Possible effects of the CBAM include increased cost of importing ecooking appliances from countries that are subject to the policy, hence reduced affordability and accessibility. There is also the possibility of increased electricity prices especially that which is imported and generated from fossil fuels in countries that are subject to the CBAM. It could also turn out as an incentive for Kenya to decarbonize the electricity sector and result in lowering the carbon intensity of ecooking while providing an opportunity to export low carbon electricity to markets that adopt similar policies. The production of ecooking products could avoid the carbon levy and compete with imported appliances thus enhancing the creation of jobs, generation of income and fostering innovation.

Tensions in the EU-Kenya relationship

There are concerns about the EU having free access to the Kenyan market, reduction of tariffs over a 25-year period, and flooding of Kenyan markets with goods to the detriment of local industries. However, the extent to which the EPA will result in flooding of Kenyan markets with solar PV and ecooking products is not yet clear. EU disagrees that a threat to local

22 Feature:Chinese-builtsolarplantboostingKenya'scleanenergyaspirations-China.org.cn
23 ChinesefirmlaunchessolarphotovoltaicpanelsinKenyatoboostelectrificationrate-Chinadaily.com.cn
24 KenyalaunchessolarplantasChinesetechnologyputsAfricaongreenenergymap-Chinadaily.com.cn
25 China-Kenyarelations:Economicbenefitssetagainstregionalrisks|Merics

industries exists, because the agreements allowed either side to reintroduce safeguards against flooding of goods. EPA has been criticized for imposing a one solution fits all to 80 African, Caribbean Pacific (ACP) countries (Bachmann, 2013). The European approach of threatening to cut aid to the countries that do not wish to comply and breaking solidarity to make them weaker negotiating partners has been termed economic imperialism. The original intention of EPAs was to maintain access for European countries to raw-materials from their former colonies, but it has slowly transformed into the need to maintain market access for European companies.

The EU is concerned with the deep economic engagement between China and Kenya, particularly the trade imbalance and debt sustainability of Kenya's relations. Kenya risks falling for the 'debt-trap diplomacy' by China (Schaik et al., 2022). Kenya and China signed six bilateral trade agreements in January 2022, with the goal of reducing tariffs and other trade and non-trade programmes (Newcomb, 2020). The availability of Chinese financing could stimulate a shift in the geopolitical 'landscape' that shapes both technology choice and the policy autonomy of the Kenyan state (Newell & Phillips, 2016). Domestic solar PV companies are uncomfortable with the due diligence procedures which are extremely cumbersome, lasting more than a year. Various documentation is requested as proof of bankability, legal status, shareholder structure, tax compliance, technical competence and client referrals. International standards and benchmarks such as environmental, health and safety standards are used by many financiers in lending. (Bhamidipati et al., 2021). Most DFIs and impact investors focus on large projects and investments with high returns and large impact metrics. Working capital for local entrepreneurs is typically small in the range of 50,000 USD to 1 million USD (Bhamidipati et al., 2021). Transactional costs for international commercial banks or debt financiers in administering loans or grants are similar, and are not affected by the size of the loan. This is a disincentive to local entrepreneurs in the solar PV space who feel that there should be consideration based on the loan sizes. Further, the limited knowledge of the country by international investors distorts the perceptions they have relating to local entrepreneurs, the profitability of domestic companies and the high risks allegedly involved. The local PV companies are perceived as high risk customers, especially if they have limited or no record of projects, a perception attributed to limited information on the solar PV market in the banking sector, as well as of renewable energy markets at large, particularly in the retail banking sector (Bhamidipati et al., 2021). Further, the preference by international investors for companies that have a foreign partner or equity shareholder or that are owned by a parent company overseas discourages purely local companies.

The requirement for either a guarantee or collateral in form of an asset such as land, property or a car to provide security for a loan strongly deters local companies from obtaining loans since the do not own assets of that nature. Interest rates are high with commercial banks charging 10-15% or even higher in some instances. International financiers charge 7-10% on Euros or Dollars, excluding currency conversion charges (Bhamidipati et al., 2021). This discourages borrowing among local solar PV companies and they resort to operating with a very low margin of economic security and in the worst-case scenario opt to forgo the projects altogether.

Opportunities to Strengthen Kenya EU Relationship

The EU and Kenya's climate goals are aligned. Both have made commitments to the Paris Agreement and the 2030 Agenda for sustainable Development, and have adopted an economic model that combines sustainable growth with environmental effort. In 2018, the EU and its member states and the European Investment Bank launched the Joint Cooperation Strategy (JCS) under which USD 4.5 billion in combined aid was supported (European Court of Auditors, 2020). The JCS presents the overarching umbrella approach that guides the EU to enhance partnership with Kenya and ensure greater development effectiveness and impact. Under the motto 'Working Better Together', the JCS has provided a ground for an ambitious Team Europe approach to cooperation, partnerships, and dialogue. Already, two Team Europe Initiatives cover the themes of the Green Deal and Human-Centered Digitalization (European Union, 2018). The cooperation aims at boosting sustainability and job creation opportunities,

especially so for the ever-growing youth demographic. It also prioritizes youth and women target groups, who are by far the most vulnerable under the impacts of the climate crisis (Council of the European Union, 2022). Job creation is expected to be realized in renewable energy, sustainable agriculture, green manufacturing and ecotourism. The EU also supports micro, small and medium enterprises in Kenya to reduce their carbon waste foot print, access credit, acquire green infrastructure and access the EU market (IRENA et al., 2018).

The energy security interests of the EU in Kenya relate to the high potential for renewable energy, trade and investment, regional integration and cooperation and innovation and technology. The EU has advanced technology for which they are interested in opening new markets. EPA provides Kenya with free access to the EU market by removing tariffs and quotas on all Kenyan exports of goods while Kenya commits to open its market partially and very gradually to imports from the EU. It sets the ground for creating new economic opportunities, with targeted cooperation to enhance Kenya's economic development and renewable energy sector. One of the targets is to facilitate the export of LPG and other e-cooking technologies from the EU to Kenya, which underpins the Kenya's plan to make LPG the primary cooking fuel[26]. The EU has a wealth of experience in digital technology and platforms that enhance efficiency, transparency, and accountability in the renewable energy sector and could share best practices with Kenya. There are is the possibility of collaborating in research and development of new technologies and solutions for renewable energy technologies.

Globalization and regionalization processes have deepened the relationship between Kenya and the EU especially after Kenya was elevated from a Least Developed Country to a low developed country. Kenya is likely to be among the next group of countries to seek international finance for a Just Energy Transition, after South Africa announced an USD 84 billion investment plan to transition from coal to clean energy, including USD 8.5 billion of funding from the EU and the United States. This is mainly because of its ambitious climate goals including: reducing the emission of greenhouse gases by 32% compared to business as usual (Ireri, 2018); commitment to achieve 100% electrification by 2030; and the high share of renewable energy in the generation mix. Kenya still has challenges of transitioning away from fossil fuels, especially coal which could generate negative impacts on the environment and the local communities (Brandt, n.d.) in the form of GHG emissions. Kenya is also exposed to price volatility associated with the reliance on imported oil and gas for transport and cooking. International finance in therefore necessary for helping Kenya invest in clean energy infrastructure and phase out fossil fuels.

Possible sources of finance include the Just Energy Transition Partnerships (JETP) proposed by the EU to support phasing out of coal, Multilateral Development Banks such as World Bank the African Development Bank, and the International Finance Corporation. They could support to mobilize loans, grants, guarantees, equity and policy advice (Calice & Demekas, 2023). Additional financing could be secured from private sector who could provide capital, innovation and expertise, for example HSBC, Prudential plc and Sumitomo Mitsui Banking Corporation.

In 2023, Kenya co-hosted the inaugural Africa Climate Summit (ACS) with the African Union Commission (AUC) in Nairobi from 4th to 6th September 2023. The ACS brought together leaders from Africa and beyond; development partners; intergovernmental organizations; private sector; academia; civil society organizations; women and youth to design and catalyze actions and solutions for climate change in Africa by providing a platform to deliberate on the nexus between climate change, Africa's development reality, and the need to push for increased investment in climate action globally, and specifically in Africa (GoK, 2023). The Summit outcomes that will be of help in pushing Kenya's energy transition and global positioning include a declaration on green growth and climate finance agenda, pathway to a new global financial deal, investment commitments and tangible announcements on major climate action initiatives. The Summit also saw the launch of the African School of Regulation (ASR) incubate by the Africa Capacity

26 https://documents.worldbank.org/en/publication/documents-reports/documentdetail/955741536097520493/kenyas-strategy-to-make-liquefied-petroleum-gas-the-nations-primary-cooking-fuelAccessed6thOctober2023

Building Foundation and backed by several resource and technical partners, to strengthen the African energy sector's capacity in support of the Agenda 2063 goals for sustainable development on the continent.

Challenges

The mismatch of skills and competencies of the local companies with the market demand. This affects the quality and reliability of solar PV services and products. Gaps in human capacity and skills in some aspects of green economy and industrialization require both the private and public sectors to work together and bridge this gap through collaboration with the education sector and institutions of learning (Adwek George., 2019). The low demand for off-grid technologies and lack of awareness among the citizens about the effectiveness of off-grid solutions have a lot to contribute to the hindrance of demand creation. Many potential consumers still have the mentality that solar power cannot provide adequate electricity. This has resulted in demand and supply side challenges that have prevented the renewable sector from attaining its potential with the consequential outcome that fossil fuel is still viewed as a legitimate source of energy in Kenya (Owino, 2018).

Small and medium enterprises, which are the majority of the market, are generally incapable of accessing international funds, which makes it difficult to compete in the local market (Kariuki, 2022). Additionally, off-grid technologies are still expensive as players heavily rely on imports of solar products from China. Currently there are few standards for green technologies, and this stifles technology transfer and adoption. Efforts have been observed in setting minimum efficiency standards for certain appliances. The prominence of the EU in Africa's trade implies that the latter's exports are affected by the decisions, standards and regulations set by the EU. These decisions, standards and regulations will shape export markets and, in the process, create both winners and losers, while ensuring a just and green process in production processes (Byiers et al., 2023).

Like most countries, Kenyan price and policy regimes do not adequately account for external costs associated with technologies, products, and practices that are environmentally friendly thus downplaying any demand there is for green alternatives (Sovacool, 2021). There's a need for developing policy instruments such as public expenditure on green infrastructure, pollution charges, subsidies, grants, and feed-in tariffs. Tariffs for example, help level the playing field with fossil fuel energy sources.

Kenyan laws allow foreign investors to benefit from the same treatment as national investors from administrative and judicial authorities. However, high levels of corruption, uncertainty about the capital constitution of foreign companies, land ownership, minimum foreign investment deposit, slow judicial system, high unemployment rate, and poverty as well as security issues related to terrorism and crime, inert-ethnic tensions, and high cost of skilled labour, energy and poor infrastructure still pose serious challenges.

Kenya's energy transition is marred with conflicts, trade-offs, and opportunities simultaneously trying to reconcile poverty, mitigation, and adaptation needs. The relations of power explain why some sources and technologies are privileged over others in terms of their fit with the interests of powerful domestic and external actors. For example, solar PV addresses rural energy access where grid access is very limited, electricity supply, unreliable and the cost of electricity unaffordable. This aligns very well with government and development partner and private sector interests and therefore solar takes precedence over small wind as a technology option for electrification in Kenya (Johannsen et al., 2020).

The political landscape of solar and e-cooking is shaped by donors and international businesses with mandates around low carbon emission pathways and green growth (Byrne et al., 2018). Donors provide financing, technical assistance, policy advocacy and contribute to the growth of the solar PV market. Donor dominance presents challenges of competing interests and ideologies at the global and national levels. This has got implications on the need for a more nuanced understanding of the political economy of low carbon transitions in Kenya. They deliver different support towards energy sources and technologies with a high degree of alignment among them and government priorities such as the desirability and necessity of market-based approaches to tackling energy challenges (Economist Intelligence, 2023).

Currently, local content requirements are not a strict part of the tendering and funding criteria. Local content requirements such as the extent of local employment benefit, and transparent reporting requirements this are also lacking. A number of donor and government-supported financial guarantee schemes and concessional loan schemes in collaboration with commercial banks already exist but are underutilized by international companies operating with large ticket-sizes. There is need to understand the reason behind this underutilization and to design schemes that target the specific needs of domestic companies. Local solar PV companies experience heavy bureaucracy, corruption, red tape and lengthy paper work and procedures, when seeking permits and licensing procedures, during importation, customs procedures and the various permissions and certifications involved, which are both complicated and time-consuming, involving major cost burdens and project delays (Bhamidipati et al., 2021). For both technologies there are risks of market distortion which could potentially create artificial demand and incorrect pricing, create dependency and reduce accountability among the project beneficiaries and implementers as well as promote corruption, rent seeking and misuse of funds (Bhamidipati et al., 2021). Furthermore, if external aid is poorly coordinated or misaligned with national priorities, it could discourage domestic investment and innovation.

RECOMMENDATIONS

This paper sought to identify the key aspects of Kenya-EU politics with regard to green industrialization/climate action in Kenya, and energy security and climate action by the EU. We explored the Kenyan context for industrialization and job creation in relation to the EU in pursuit of the net zero targets. We undertook a review of the situation in the solar PV and ecooking sectors, including policies, stakeholder relations, the potential to create jobs, opportunities and challenges. We explored the tensions in the Kenya-EU relations, opportunities and challenges and their implications on stronger relations.

We find that Kenya is well positioned with respect to climate targets and strategies particularly the pursuit of universal access to electricity and e-cooking. A number of policies and strategies have been developed to enhance access to electricity and polies for e-cooking are being developed as well. Kenya still has challenges towards achieving the set ambitions for both electrification and e-cooking and requires financial support to advance its climate change goals. There is growing interest among actors including government, development partners, private sector and civil society in solar PV and e-cooking to enhance the benefits of solar PV and e-cooking in the interest of industrialization and job creation. There is promising potential for Kenya to industrialize using solar PV and e-cooking as explained in section 3.2 and opportunities as explained in section 4.4, particularly in the rural areas, and the possibility of strengthening the e-cooking policy by linking it to the electrification policy. Both sectors however face challenges that could be supported through increased investments and capacity building among other interventions.

Solar PV contribution to industrialization and job creation in Kenya could be realized through the provision of reliable and affordable electricity for manufacturing. Business entities benefit through reduced operation costs, increased productivity and competitiveness (Mutuku and Mbatia, 2020). Solar PV can create direct and indirect jobs along the value chain from manufacturing, distribution, installation, operation and maintenance of systems. Solar PV contributes to the stimulation of innovation and entrepreneurship in the renewable sector and other sectors where solar PV applications are used for example agriculture, health, education, and water (Mutuku and Mbatia, 2020). The youth, particularly women have to opportunity to enhance their skills and earn income.

Electric cooking on the other hand has potential to contribute to improved health and well-being, stimulating electricity demand, supporting local entrepreneurship and improving gender equality. All these contributions are relevant for Kenya's quest to

fulfil its commitment to international agreements and statutes such as the SDG framework, the NDC and Paris Agreement on the one hand and EU's desire to address promote renewable energy and mitigate the effects of climate change in the interest of environmental sustainability.

In view of the identified tensions, relating to the EPA signed between Kenya and EU, alignment of EPA with the AfCFTA, Kenya-China economic engagement, and the EU's CBAM policy as well as the opportunities and challenges, there is need to identify ways in which the relationship between EU and Kenya could be strengthened in their pursuit of industrialization, job creation and energy security. Given Kenya's long-term trade and economic relations with the EU, it is imperative that the tensions that could affect the quest for industrialization be dealt with. We therefore recommend as follows:

1. There is a great opportunity for trade in Energy under the AfCFTA to contribute to sustainable development[27]. Solar has already demonstrated good potential for electricity generation and bringing down electricity prices (KIPPRA, 2020). Kenya needs to focus on promoting investment in solar energy, trade in energy through integration of power grids, allocation efficiency, technology and innovation sharing'' as well as ''facilitate affordability of electricity for low-income households''. The AfCFTA offers opportunity for Kenya to work with other African countries to harmonise and coordinate energy regulation; cooperate on investment, intellectual property rights and competition policy; expand movement of skilled labour and develop a dispute resolution mechanism. Harmonization of energy laws in other trade communities globally suggests that harmonization results in increased efficiency and approvals for the energy sector (African & Law, 2017). There is still need for strong policies that incentivize private sector investments in solar PV, as an intervention tool for poverty alleviation where policy permits individuals and enterprises in poverty-stricken rural areas to set up PV power stations and supply power to the grid. There is need to fast track the legal framework for renewable energy auctions to enable competitive bidding of FiT projects as proposed in the National Energy Policy 2018. Energy auctions would promote competition among developers and investors to offer lower prices, which would translate to lower prices for consumers, thereby facilitating the growth of the industry.
2. EU can turn the potential threats from the Kenya China relationships into opportunities. Europe has long-standing bilateral relationships with Kenya. Europe to position itself strategically if it organizes its political instruments towards the core of its strategy with Kenya towards the green transition.
   - EU could enhance support to the small and medium enterprises in accessing international funds to enable them increase their contribution to industrialization processes. SMEs are subject to the EU standards and regulations and therefore their capacity to understand and conform could make a big difference in how they contribute to green industrialization and the creation of jobs. This is useful for ecooking which is still nascent with limited local manufacturing and therefore new entrants can be introduced early to standards.
   - For the solar sector, the adjustment of lending requirements such as collaterals and interest rates to accommodate the needs of local companies could improve their borrowing power and business performance. Further there is need for to devise means of accommodating local companies with low working capital as opposed to focusing on large projects while differentiating the transaction costs between large and small companies to incentivize the latter.
3. It would be good to have local content requirements as part of the tendering and funding criteria by development partners. Coupled with this is the requirement for the beneficiaries of donor funds to report on local employment benefit generated as part of their funding modalities and introduce transparent reporting requirements regarding them. This inclusiveness will help promote the development of more domestic solar PV companies, but it could also lead to more local spillovers

27 HowAfCFTAcanhelpsolarpowerpenetrationinAfrica|UnitedNationsEconomicCommissionforAfrica(uneca.org)

of services local suppliers, sub-contractors, local repairers, among others – thus creating potential scope for local assembly. Development partners could also introduce local content requirements for domestic banks and offer long-term working capital (or patient capital) as they disburse concessional loans for clean energy projects (Bhamidipati et al., 2021).

4. Kenya needs to deal with the mismatch of skills and competencies in local companies with the demand. This could be achieved by integrating renewable energy modules and apprenticeships into vocational training courses. This is important for facilitating the development and enhancement of skills through coordination between the Technical and Vocational Education Training (TVET) and the renewable energy sector. Employer demand for solar PV skills could be stimulated through the provision of incentives that accelerate localization of the portions of the value chain, particularly the manufacturing of solar PV systems by leveraging the domestic content. This requires policies that promote knowledge and technology accumulation, new business incubation, promoting industrial clusters, and provision of supportive infrastructure. Decentralised off-grid solar PV offers tremendous opportunities for women involvement in the solar PV and ecooking value chains. Realizing these opportunities requires social and economic policies that address legal and social barriers as well as gender-specific barriers including limited access to finance, inequity in ownership of assets, insufficient skills, and training opportunities that would limit the participation of women in the solar PV and ecooking value chains.

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Appendix

Table 7. Funding under KOSAP KOSAP procurement strategy 2017(KIPPRA, 2020)

Component	Implementing agencies	Funding	Targets
Mini- grids	KPLC REREC	Implemented under PPP agreement at a cost of US$ 40 million.	Construct 120 green-field mini-grids and construction of distribution network. Connect 28,000 households.
Solar home systems (SHS) and cooking solutions for households.	Ministry of Energy	US$ 42 million for SHS US$6 million for the cooking energy	250,000 households
Standalone solar systems and solar pumping for community facilities	KPLC and REREC	Private-sectors contractors competitively selected to supply, install, and maintain standalone solar systems at a cost of US$ 40 million.	Electrification of 1,100 community facilities including health centres and schools. ... Provision of 620 solar water pumps
Implementation support and capacity building.	Ministry of Energy	US$ 22 million	Consumer education and awareness for the beneficiaries of the various components across the 14 counties. Implementation support and capacity building for the sector across the counties

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