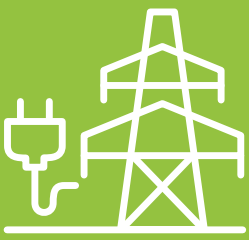




MINISTRY OF ENERGY

Kenya National Energy Efficiency and Conservation Strategy



2020



MINISTRY OF ENERGY

Kenya National Energy Efficiency and Conservation Strategy

2020



Preface

Energy is an enabler for the realization of Kenya's Vision 2030, which seeks to transform Kenya into a newly industrializing middle-income country that provides a high quality of life to its citizens. Furthermore, the Government's "Big 4 Agenda" – comprised of Food and Nutrition, Manufacturing, Affordable Housing and Healthcare, and unveiled by the President in 2017 – is dependent on the provision of adequate and competitively priced energy.

Energy efficiency and conservation measures aim to foster the use of less energy to produce goods and services without compromising quality and quantity. Energy efficiency entails the use of technology that requires less energy to perform the same function. Energy conservation involves using less energy through changing behaviour and habits.

The Ministry of Energy, the Kenya Association of Manufacturers and other stakeholders have championed energy efficiency in Kenya since the early 2000s in both the public and the private sectors. However, the gains have been suboptimal because of limited information, motivation, expertise and finances required to adopt emerging energy efficiency and conservation technologies and innovations. This necessitated development of a robust plan of action to optimize energy efficiency and conservation gains in the country. The Kenya National Energy Efficiency and Conservation Strategy (NEECS) is the roadmap towards achieving energy efficiency goals that will have an overall positive impact on Kenya's economy.

Improving energy efficiency will help reduce the demand for fossil fuels and related greenhouse gas emis-



sions. It will also enhance the potential of renewable energy sources to meet a larger portion of the country's energy needs and its contribution to achieving the Paris Agreement and Sustainable Development Goal 7.

At the continental level, the African Union has developed Agenda 2063 as Africa's blueprint and strategic framework to deliver inclusive and sustainable development. One of the key goals of the Agenda emphasizes environmentally sustainable and climate resilient economies and communities. The key priorities of this goal include sustainable consumption and production patterns in addition to renewable energy.

It is therefore imperative to develop and implement a national energy efficiency and conservation strategy.

A handwritten signature in black ink, appearing to read "Charles Keter". The signature is fluid and cursive, with a large initial "C" and a long horizontal stroke.

Hon. Charles Keter, EGH
Cabinet Secretary,
Ministry of Energy

Acknowledgements

The Kenya National Energy Efficiency and Conservation Strategy is the product of concerted efforts by the NEECS Technical Committee comprising officials from key energy sector institutions under the strategic leadership of the NEECS Advisory Committee. The Ministry of Energy provided policy direction, while the Copenhagen Centre on Energy Efficiency provided technical support. I acknowledge their efforts in providing the country with a framework to achieve her energy efficiency targets and goals for the next five years.

Special appreciation goes to the Kenya Association of Manufacturers for supporting this process through the Centre for Energy Efficiency and Conservation, and for championing energy efficiency initiatives in the country.

I also acknowledge the work of reviewers, who included energy experts drawn from the private sector, industry, academia and development partners. These reviews enriched this strategic document. The many stakeholders reached through the validation process also provided valuable input.

Last but not least, I appreciate the officials from the Directorate of Renewable Energy, led by Secretary Re-



newable Energy, Eng. Isaac N. Kiva, for facilitating the process and ensuring the strategy's high standard.

I encourage all stakeholders to participate in the implementation of this strategy.

A handwritten signature in green ink, appearing to read 'J. Njoroge'. The signature is stylized and written over a light green circular background.

Dr. Eng. Joseph K. Njoroge, CBS
Principal Secretary,
Ministry of Energy



Acronyms

ADC	Advisory Committee
AEPEA	Association of Energy Professionals Eastern Africa
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BAU	Business as Usual
BRT	Bus Rapid Transit
CAP	Country Action Plan
CCAK	Clean Cooking Association of Kenya
CDACC	Curriculum Development, Assessment and Certification Council
CDM	Clean Development Mechanism
CEC	County Executive Committee
CEEC	Centre for Energy Efficiency and Conservation
CFL	Compact Fluorescent Lamp
COG	Council of Governors
EACREE	East African Centre of Excellence for Renewable Energy and Energy Efficiency
EBK	Engineering Board of Kenya
ECM	Energy Conservation Measure
EE	Energy Efficiency
EMA	Energy Management Awards
EMCA	Environmental Management and Coordination Authority
EPRA	Energy and Petroleum Regulatory Authority
ERC	Energy Regulatory Commission
ESCOs	Energy Service Companies
GDC	Geothermal Development Company
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GESIP	Green Economy Strategy and Implementation Plan
GHG	Greenhouse gas
GPOBA	Global Partnership for Output-Based Aid
GWh	Gigawatt hour
ICT	Information and Communication Technology
IFC	International Finance Corporation
IPPs	Independent Power Producers
JICA	Japanese International Cooperation Agency
JKIA	Jomo Kenyatta International Airport
KAM	Kenya Association of Manufacturers
KCEP	Kigali Cooling Efficiency Programme
KEBS	Kenya Bureau of Standards
KEMP	Kenya Electricity Modernization Project
KENAFF	Kenya National Farmers' Federation
KENGEN	Kenya Electricity Generating Company
KeNHA	Kenya National Highways Authority
KERRA	Kenya Rural Roads Authority
KETRACO	Kenya Electricity Transmission Company
KGBS	Kenya Green Building Society
KICD	Kenya Institute of Curriculum Development

KIRDI	Kenya Industrial Research and Development Institute
KNBS	Kenya National Bureau of Statistics
KNES	Kenya National Electrification Strategy
KOSAP	Kenya Off-grid Solar Access Project
KPLC	Kenya Power and Lighting Company
KRA	Kenya Revenue Authority
KURA	Kenya Urban Roads Authority
kV	Kilovolt
kWh	Kilowatt-hour
LCPDP	Least Cost Power Development Plan
LEDs	Light Emitting Diodes
LMCP	Last Mile Connectivity Project
LPG	Liquefied Petroleum Gas
MEPS	Minimum Energy Performance Standards
MoE	Ministry of Energy
MtCO ₂ e	Metric tonnes of CO ₂ equivalent
MTIHUD	Ministry of Transport, Infrastructure, Housing and Urban Development
MTP	Medium Term Plan
M&V	Measurement and Verification
MW	Megawatt
NAMA	Nationally Appropriate Mitigation Action
NAMATA	Nairobi Metropolitan Area Transport Authority
NCA	National Construction Authority
NCCAP	National Climate Change Action Plan
NDC	Nationally Determined Contribution
NEECS	National Energy Efficiency and Conservation Strategy
NEMA	National Environment Management Authority
NITA	National Industrial Training Authority
NIUPLAN	Nairobi Integrated Urban Development Master Plan
NMS	Nairobi Metropolitan Services
NMT	Non-motorized Transport
NTSA	National Transport and Safety Authority
PPRA	Public Procurement Regulatory Authority
REREC	Rural Electrification and Renewable Energy Corporation
RISE	Regulatory Indicators for Sustainable Energy
SDGs	Sustainable Development Goals
SE4ALL	Sustainable Energy for All
SMEs	Small and medium-sized Enterprises
TC	Technical Committee
TSOF	Three-Stone Open Fire
TVETA	Technical and Vocational Education and Training Authority
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNOPS	United Nations Project Service Office



List of contents

Executive Summary	viii
1. Introduction	1
1.1. Current Energy Efficiency and Conservation Initiatives	1
1.2. Professionals in Energy Efficiency.....	2
1.3. Standards in Energy Efficiency.....	2
1.4. Formulation process.....	3
2. Country Context, Policy and Legislative Background on Energy Efficiency and Conservation.....	4
2.1. Importance of energy efficiency to Kenya’s overall development goals.....	4
2.2. Energy Consumption in Kenya	4
2.3. Key Drivers of Energy Efficiency in Kenya	6
2.4. Policy and Legislation.....	6
3. Institutional Framework for Implementation	10
3.1. The Role of County Governments in Promoting Energy Efficiency and Conservation ...	11
4. Strategic Targets and Actions	12
4.1. Economy-wide Targets	12
4.2. Sectoral Status Assessments and Recommended Actions	12
4.2.1. Households.....	12
4.2.2. Buildings	20
4.2.3. Industry and Agriculture.....	26
4.2.4. Transport.....	32
4.2.5. Power Utilities	40
5. Recommended Cross-cutting Actions	44
5.1. Strategy Implementation Risk.....	48
5.1.1. Risk and Mitigation for Energy Efficiency	48
6. Communication for Energy Efficiency Programme	49
7. Resource Mobilization for Energy Efficiency Programme	51
7.1. National Government Resources	51
7.2. County Energy Resources	51
7.3. Other Devolved funds	51
7.4. Development Partners.....	51
7.5. Non-governmental Actors.....	52
7.6. Public Private Partnerships (PPPs).....	52
7.7. Private Sector Resources.....	52
8. Monitoring and Evaluation.....	53
9. Annexes	60
9.1. Annex 1 – Summary of Recommended Actions.....	60
9.2. Annex 2 – Stakeholder Consultations.....	63
10. References.....	64

List of Tables

Table 1: Kenya’s National SE4ALL targets by 2030.....	5
Table 2: Overview of Policy and Legislation on Energy Efficiency.....	7
Table 3: Economy-wide targets.....	12
Table 4: Institutional framework for the energy efficiency strategy for households.....	15
Table 5: Household Grid Electricity Consumption for 5 years.....	16
Table 6: Projected Household Electricity Consumption.....	16
Table 7: Household Sector Targets.....	18
Table 8: Household Sector Actions.....	19
Table 9: Agreed Targets in the Building Sector.....	24
Table 10: Proposed Actions in the Building Sector.....	24
Table 11: Agreed Targets in the Industrial and Agriculture Sector.....	30
Table 12: Proposed Actions in the Industry and Agriculture Sectors.....	30
Table 13: Agreed Targets in the Transport Sector.....	37
Table 14: Actions in the Transport Sector.....	38
Table 15: Objectives and Targets for the power utilities sector.....	42
Table 16: Actions for the power utilities sector.....	42
Table 17: Cross-cutting Objectives and Actions.....	44
Table 18: Risk Matrix for the NEECS.....	48
Table 19: M&E Framework.....	53

List of Figures

Figure 1: National Energy Efficiency and Conservation Strategy (NEECS) Formulation Process.....	3
Figure 2: Primary Energy Consumption in Kenya by Source – 2017 ^a	5
Figure 3: Electricity Generation by Source.....	5
Figure 4: Proposed Institutional Framework for the Strategy.....	10
Figure 5: Household Lighting Energy Sources – KNBS, 2019.....	13
Figure 6: Household Cooking Energy Sources – KNBS, 2019.....	13
Figure 7: Household Energy Consumption Trends.....	14
Figure 8: Household Electricity Demand Projections for Scenario under ‘Business as Usual’ and under Policy Intervention.....	17
Figure 9: Household Electricity associated CO ₂ Emissions for Scenario under Business as Usual and under Policy Intervention.....	17
Figure 10: Percentage CO ₂ Savings as a result of Policy Intervention in Household Electricity Consumption.....	18
Figure 11: Changes in floor area, population, buildings sector energy use and energy related emissions globally 2010-18.....	20
Figure 12: Market growth for Building Stock.....	21
Figure 13: Trend of Buildings Growth in Nairobi.....	22
Figure 14: Projected Growth Based on MTP 3 (2018-22).....	26
Figure 15: Domestic Sale of Petroleum Fuels (2014-18).....	27
Figure 16: Coal & Coke Consumption (2014-22).....	27
Figure 17: Petroleum Fuel Consumption by Sector in Kenya, 2019.....	32
Figure 18: Petroleum Fuel consumption in Transport by category in Kenya, 2018.....	33
Figure 19: Trends in Petroleum Fuel Consumption in Transport,.....	33
Figure 20: Projection for Fuel consumption over the years 2018-2025.....	34
Figure 21: Trends in Fuel Consumption and CO ₂ Emissions over the period 2010–12.....	35
Figure 22: Trends in CO ₂ Emissions in the period 2010-12.....	36
Figure 23: System Losses Trend.....	41



Executive Summary

Energy Efficiency and Conservation is one of the key pillars of sustainable development in Kenya. The government has placed it as one of the priority areas of improvement in its efforts to enhance the quality of life of its citizens. Improving energy efficiency and conservation helps to improve energy security, reduces the expenditure of foreign currency reserves on energy imports, lessens the strain on the national grid during peak times and lowers the cost externalities associated with emissions.

The country has several initiatives aimed at improving energy efficiency and conservation. These initiatives are drawn from policies such as Sessional Paper No. 4 of 2004 on Energy, Vision 2030, Energy Act 2019, Sustainable Energy for All (SE4ALL) Initiative, the Energy (Energy Management) Regulations 2012 and the Energy (Appliances' Energy Performance and Labelling) Regulations 2016. These initiatives have helped improve energy efficiency and conservation in commercial, domestic, industrial and institutional sectors of energy consumption. However, these initiatives adopt a disparate approach, with a lack of central coordination, and do not cover all the essential areas outlined in the Big Four Agenda. This agenda encompasses food security, affordable housing, manufacturing, and affordable healthcare for all with energy playing a central role in all four. It is therefore essential for the country to have a strategy that spells out energy efficiency targets in vital sectors and coordination mechanisms among private and public entities.

The Kenya National Energy Efficiency and Conservation Strategy (NEECS) was developed to further enhance ongoing efforts, by providing a roadmap towards setting and achieving energy efficiency goals. A Technical Committee (TC) was formed to spearhead the development of the strategy. The TC drew members from the Ministry of Energy, agencies in the energy sector and private sector players, represented by the Centre for Energy Efficiency and Conservation (CEEC) of the Kenya Association of Manufacturers (KAM). The Advisory Committee (ADC) provided policy guidance to the TC.

The NEECS development process consisted of five stages. The first stage involved situational analysis of the five thematic sectors that were identified for improvement of energy efficiency and conservation: Households, Buildings, Industry and Agriculture, Transport and Power Utilities. The sectors were selected on the basis of their high energy demand and possible energy saving potential.

The second stage involved consultation with stakeholders through five regional workshops, a workshop with experts in energy efficiency and a review by the TC. At this stage, the zero draft was developed with efficiency targets and recommended strategies. The zero draft was reviewed by the Ministry of Energy, Copenhagen Centre for Energy Efficiency, the TC, other development partners and the energy efficiency experts. This process was iterative and resulted in the development of the final draft.

This strategy has established targets in the five thematic sectors to be accomplished within a five-year timeline up to 2025. The targets for all thematic sectors are relative to 2019 as the baseline year with the exception of the Utilities Sector which is relative to 2020.

The Household Sector has two targets. It aims to increase the number of household appliances subjected to Minimum Energy Performance Standards (MEPS) from six to ten. This is projected to increase energy efficiency in domestic power consumption by three per cent. The additional appliances are television sets, computers, cookers and Light Emitting Diode Lights. Lastly, NEECS targets the use of improved efficient biomass cookstoves at 50 per cent of all households currently using biomass cookstoves. A separate Bioenergy Strategy is being formulated to address the cooking sector technology.

There are six targets to be met in the Building Sector. First, there should be 10% share of newly built floor area compliant with energy efficiency requirements in the total building stock from the current baseline of zero. Second, two per cent of the buildings should have adopted American Society of Heating, Refrigerating

and Air Conditioning Engineers (ASHRAE) Standards for energy efficiency of buildings, or equivalent. Third, energy loads due to lighting in public buildings will be reduced by 50 per cent. Fourth and fifth, 20 per cent of public buildings and 25 per cent of the affordable houses the government is planning to build should be green, respectively. Lastly, the sector should develop Minimum Energy Performance Standards (MEPS) for buildings.

This strategy has also set two targets for the Industry and Agriculture Sector. The sector is expected to increase the number of energy audits carried out from the current 1,800 to 4,000. Implementation of the recommendations of the audits is essential to achieve efficiency targets. The sector is expected to implement the recommended energy conservation measures to save 100 MW of power demand, 250 million litres of heavy fuel oil and 9 million litres of industrial diesel oil; relative to the current baseline of 20 MW of power demand saved, 51 million litres of heavy fuel oil and 1.8 million litres of industrial diesel oil. To achieve these targets, the sector should have 120 licensed energy auditors and five registered ESCOs¹ from the baseline of 7 and 0 respectively.

In the Transport Sector, three targets have been set. The first is the improvement of fuel economy. Increasing the share of electric vehicles in the transport sector has been identified as the second target, aiming to reach five per cent. Lastly, NEECS targets to increase the number of passengers using commuter trains from 116,000 to 150,000 per day.

In the Utilities Sector, the strategy identifies the need to reduce transmission and distribution system losses from 23 to 15 per cent. Strategies for system stabilization have also been recommended with a target to install 1 MW of energy storage given that there is no such facility currently. Lastly, the strategy sets targets for the utility to invest five billion shillings for the implementation of energy conservation measures. This is envisaged to run on a Super Energy Service Company (ESCO) model.

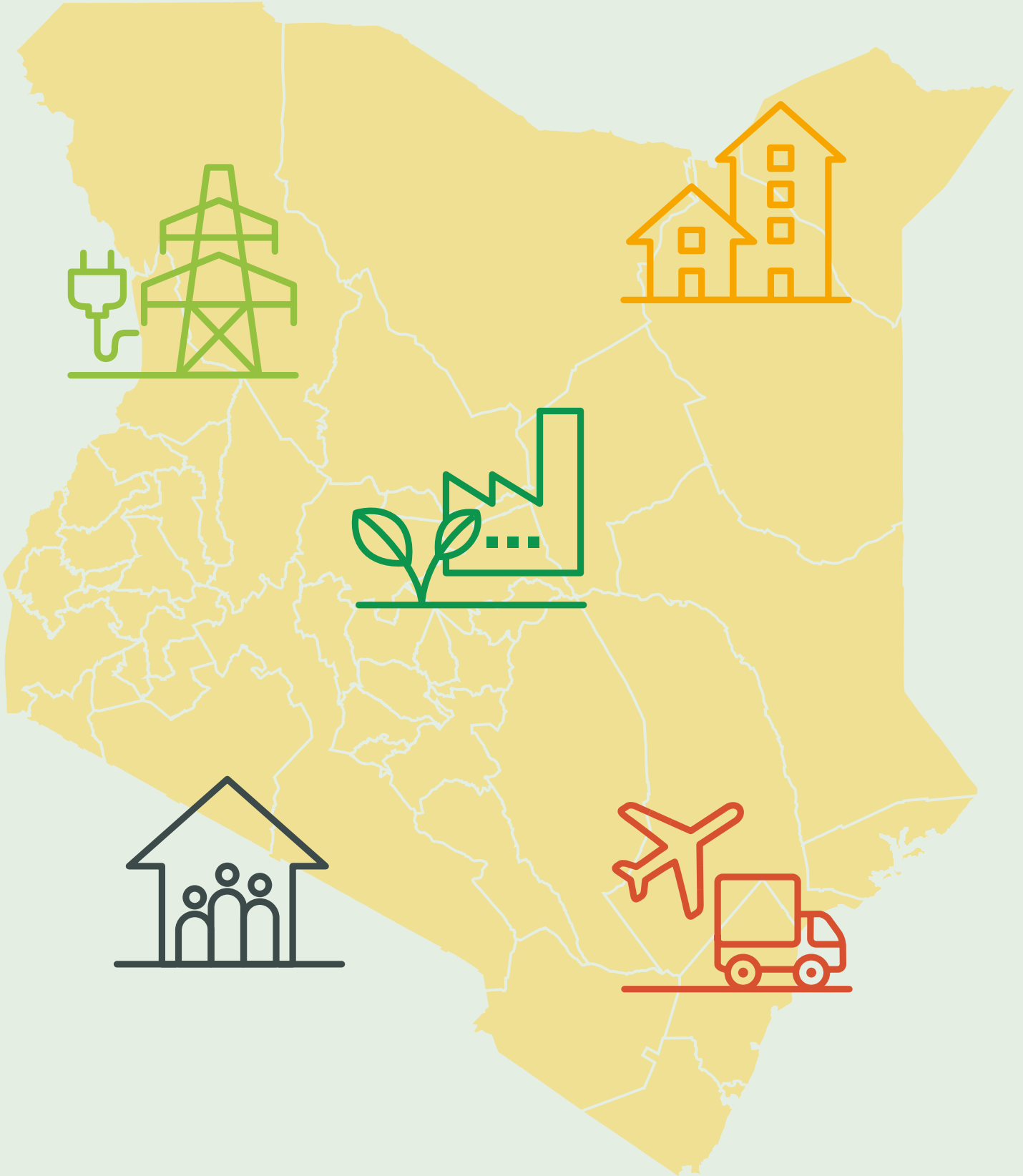
Alongside the above sectoral targets, this strategy sets out targets and aspirations cutting across various government agencies. First, all involved government agen-

cies should carry out resource mobilization to improve access to finance for energy efficiency projects. There is need to improve the Centre for Energy Efficiency and Conservation (CEEC) to accelerate the actualization of the targets set by this strategy. Second, gender-focused stakeholder engagement should be carried forward in implementation, with state agencies using participatory approaches to ensure that gender mainstreaming has been adopted in energy efficiency. Additionally, awareness creation, citizen engagement, training and capacity-building in energy efficiency and conservation is central to meeting the targets.

Lastly, this strategy calls for private and public sector players to mainstream energy efficiency and conservation in education by establishing a long-term mechanism to achieve a high level of public awareness on their importance including amongst all national and county government agencies. This will be accomplished by bolstering relationships and engagements among ministerial, inter-ministerial, county government, national government and climate change units in the country.

The Ministry of Energy shall publicize the NEEC strategy, mobilize both technical and financial resources, and provide leadership in its implementation. An Implementation Action Plan will form a base for the success of this strategy and therefore, its formulation shall be a priority.

¹ For the definition of an ESCO refer to IEA (2018), *Energy Service Companies (ESCOs)*, IEA, Paris <https://www.iea.org/reports/energy-service-companies-escos-2>





1. Introduction

There is an increasing need for production in the country to use energy optimally by embracing energy efficiency. Energy efficiency in this context refers to optimizing the amount of energy used to produce goods and services without compromising quality and quantity. The benefits of energy efficiency include reduced demand and consumption of fossil fuels in electricity generation, improved manufacturing competitiveness, improved energy security, reduced overall energy demand, lower costs for the end user and mitigation of climate change through lower greenhouse gas emissions. The country, through various initiatives, has been championing the adoption of the efficient use of energy in all sectors. The Constitution of Kenya, Article 69 (1) states that the government shall ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources. This is the supreme document from which the government draws its actions on the improvement of energy efficiency.

The government, in cooperation with several development partners, is promoting energy efficiency improvements in multiple ways, including through enacting energy regulations and implementing programmes and projects at institutional level. Among these is the Energy Act 2019, the Energy (Energy Management) Regulations 2012, the Energy (Appliances Energy Performance and Labelling) Regulations 2016, Vision 2030 and the Sustainable Energy for All Initiative. Even though these approaches have been useful, they have adopted a disparate approach, with no integration point for all energy-consuming sectors. There was therefore a need to come up with a strategy to harmonize efforts on improving energy efficiency.

The National Energy Efficiency and Conservation Strategy provides a road map in five identified priority sectors – households, buildings, industry and agriculture, transport and power utilities – to realize the goal of sustainably transforming Kenya to an industrialized middle-income nation by the year 2030, as envisioned in Kenya Vision 2030. This will support the achievement of the country's commitments under the Paris Agreement on climate change and the Sustainable Development Goals. This strategy is a key framework policy

document of the Government to enhance its efforts and the effectiveness of the efforts to improve the national energy efficiency outlook. It is cognizant of existing initiatives and will build on them to achieve its objectives.

1.1. Current Energy Efficiency and Conservation Initiatives

Intervention measures for energy efficiency improvement in Kenya consist of both state and non-state sponsored efforts. The Ministry of Energy (MoE) issued the Sessional Paper No. 4 on Energy in 2004.² The Paper described the challenges facing the country's energy sector and the MoE vision 'To Promote Equitable Access to Quality Energy Services at Least Cost while Protecting the Environment'. It articulates short-term (2004-2007), medium-term (2004-2012), and long-term (2004-2024) implementation plans for different components of the energy sector. Energy efficiency and conservation is identified as a cross-cutting issue and one of the specific objectives for the energy sector. From this policy, the Energy Act 2006 was gazetted. The Energy Act 2006 specified the measures that should be taken to improve efficiency and led to the establishment of the Energy Regulatory Commission (ERC). The ERC was further restructured and became the Energy and Petroleum Regulatory Authority (EPRA).³ So far, two regulatory instruments have been developed and are used by EPRA to meet efficiency goals. These are the Energy (Energy Management) Regulations 2012 and the Energy (Appliances' Energy Performance and Labelling) Regulations 2016.

Kenya has championed energy efficiency since the early 2000s in both the public and private sectors. One of the main projects was the Global Environmental Facility – Kenya Association of Manufacturers (GEF-KAM) project titled 'Removal of Barriers to Energy Conservation and Energy Efficiency in Small and Medium Scale Enterprises (SMEs)'. The international development

² Ministry of Energy, Session Paper No. 4 on Energy. May 2004. https://renewableenergy.go.ke/downloads/policy-docs/sessional_paper_4_on_energy_2004.pdf

³ <https://www.vashmedia.co.ke/kenyas-erc-changes-its-name>

partners who provided support under this project consisted of the United Nations Development Programme (UNDP), the Global Environment Facility (GEF), and the United Nations Office for Project Services (UNOPS). The project started in 2001 and ended in 2006. It ran under the Ministry of Industry and Trade. Its final project report revealed that the potential for energy efficiency improvement in industrial SMEs ranged from 10 to 30 per cent. The low efficiency was due to lack of information, motivation and expertise, and the existence of financial constraints in adopting emerging energy efficiency and conservation technologies and innovations.⁴ In 2006, the MoE and Kenya Association of Manufacturers signed a Memorandum of Understanding to establish a Centre for Energy Efficiency and Conservation (CEEC). The CEEC was the successor to the GEF-KAM Energy Efficiency Project. Key activities of the CEEC included undertaking energy audits on behalf of the MoE in mainstream industries, SMEs and public institutions, provision of capacity-building in energy efficiency and conservation, public education and awareness activities as well as administration of the Energy Management Awards (EMA) annual event. From the initiatives by CEEC, more than KES 13 billion (USD 152.8 Million)⁵ of energy cost saving has been realized, equivalent to 2014.8 GWh. These energy savings translate into a deferment of a 230-MW power plant, equivalent to running the Gitaru Power Station for one year.

1.2. Professionals in Energy Efficiency

The long-term success of energy efficiency will be determined by the capacity and competence of professionals implementing the programme. The Association of Energy Engineers, through its local chapter (Association of Energy Professionals Eastern Africa-APEA), has been certifying energy professionals in the region from early 2000. These certifications included Certified Energy Manager (CEM) and Certified Measurement and Verification Professional (CMVP); Certified Energy Auditor (CEA) Certified Water Efficiency Professional (CWEP); Renewable Energy Professional (REP) and Certified Sustainable Development Professional (CSDP). The domestication of the association

and its certification programmes has been supported the Ministry of Energy, German Agency for International Cooperation (GIZ), Strathmore Energy Research Centre (SERC), Kenya Electricity Generating Company (KenGen), Energy Training Foundation (EnTF), African Centre of Excellence in Phytochemicals, Textile and Renewable Energy (ACE II) and other stakeholders. KenGen was instrumental in funding the start-up capital for the local chapter of APEA from 2013. APEA is spearheading energy efficiency and conservation capacity-building.

1.3. Standards in Energy Efficiency

EPRA enacted the Energy (Energy Management) Regulations in 2012 to institutionalize energy audits and energy efficiency in designated facilities. The government also spearheaded the Standards and Labelling Programme, targeted at the development of Minimum Energy Performance Standards (MEPS) for selected appliances in Kenya. The five-year project was supported by UNDP and the GEF. The resulting standards have been enforced through the Energy (Appliances' Energy Performance and Labelling) Regulations 2016.

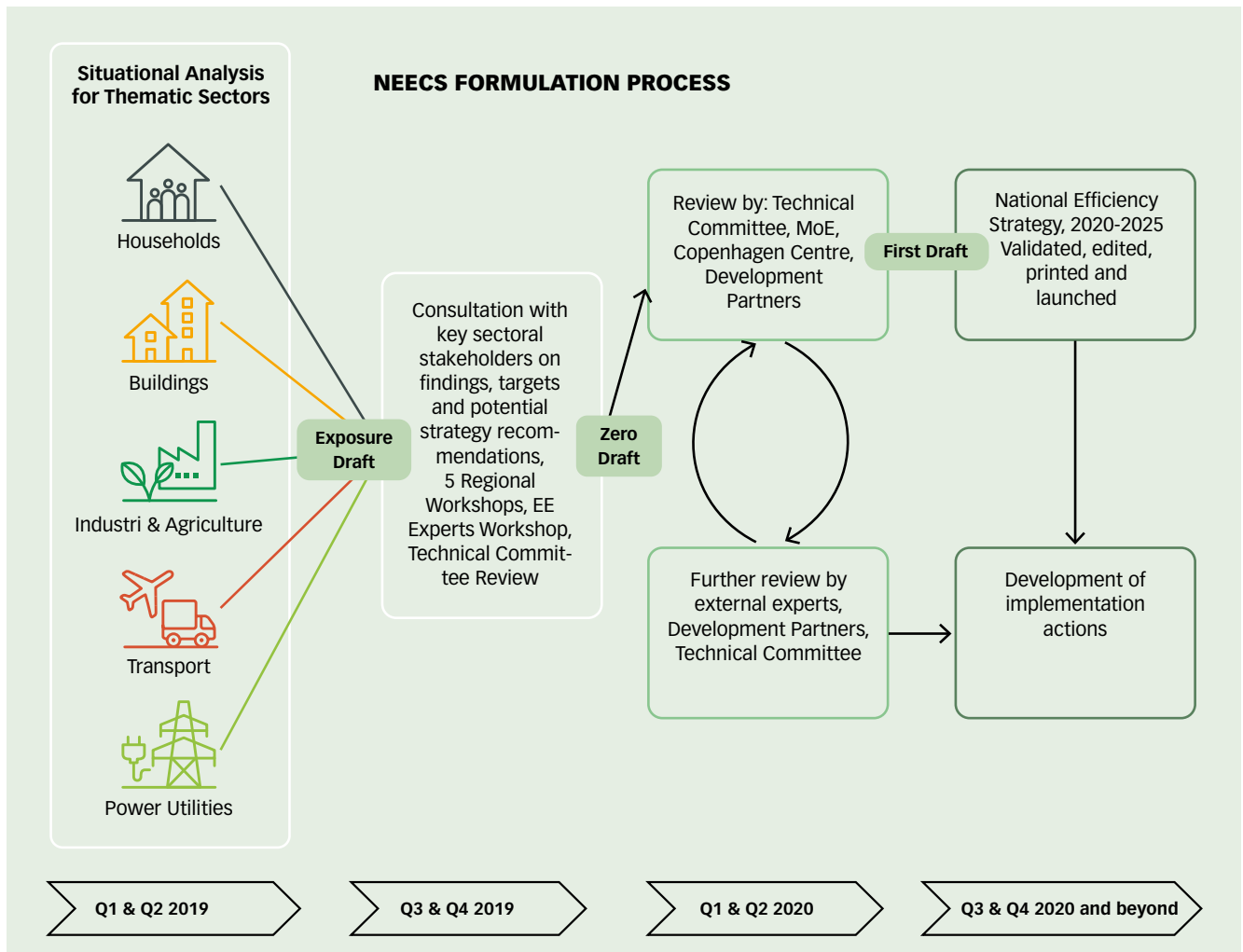
Kenya Power and Lighting Company (KPLC) has also undertaken Demand Side Management activities to improve energy efficiency. Key activities included Compact Fluorescent Lamps (CFL) roll out in the residential sector. Over four million energy saving bulbs were distributed in two phases, resulting in substantial energy and monetary saving for consumers. In Phase 1 (2010), 1.25 Million CFL bulbs were distributed, while in Phase 2, 3 million were distributed to KPLC customers. The demand savings were equivalent to 50 MW and 105 MW respectively.

There have also been energy efficiency initiatives related to biomass cooking and heating. The country developed and implemented the Kenya Country Action Plan (KCAP) in 2013. The Clean Cookstoves Association of Kenya (CCAK) was established to spearhead activities in the clean cooking sector.

The 'Kenya Higher Tier Cookstoves Market Acceleration project', which is funded by DFID through the Energising Development (EnDev) programme, is currently being implemented by Netherlands Development Organisation (SNV). In addition to the above initiatives,

⁴ Final Evaluation of the UNDP-GEF Project. <https://eartheval.org/sites/ceval/files/evaluations/125%20Removal%20of%20Barriers%20to%20Energy%20Efficiency%20and%20Conservation%20in%20Small%20and%20Medium%20Enterprises%20in%20Kenya.pdf>

⁵ 1 USD = KES. 85.1 (2011)

FIGURE 1: National Energy Efficiency and Conservation Strategy (NEECS) Formulation Process

the Ministry of Energy is at an advanced stage of formulating a bioenergy strategy for the clean cooking sector.

The previous initiatives have resulted in varying degrees of success, but there is low sector-wide adoption of energy efficiency measures. This strategy will concretize the previous initiatives and accelerate the implementation of proposed energy efficiency actions in Kenya to achieve the set targets in five selected thematic sectors.

1.4. Formulation process

The Ministry of Energy spearheaded the formulation of this strategy through a Technical Committee (TC) with technical assistance from the Copenhagen Centre for Energy Efficiency. An Advisory Committee (ADC) provided overall oversight and policy guidance to the TC during the entire process.

The TC and ADC members were nominated in 2018 and come from both the public and private sectors. The draft strategy document went through the consultative process as stipulated in the constitution. National and county governments, together with the public, were engaged in various forums countrywide. They gave feedback that enabled the team to produce an exposure draft which was subsequently reviewed by development partners, a team of selected energy experts, Ministry of Energy staff and experts from the Copenhagen Centre on Energy Efficiency, leading to the production of the first draft. Validation exercises were undertaken involving national and county governments and other stakeholders.

The Ministry, with assistance of Development Partners, intends to prioritize publicity of the Strategy through a webinar in July 2020 and formulation of a strategy implementation Action Plan. The process is shown in Figure 1.



2. Country Context, Policy and Legislative Background on Energy Efficiency and Conservation

2.1. Importance of energy efficiency to Kenya's overall development goals

The Sessional Paper No. 4 on Energy developed by the Ministry of Energy, laid the policy framework upon which cost-effective, affordable and adequate quality energy services shall be made available to the domestic economy on a sustainable basis over the period 2004-2023. The session paper recognized the need to remove barriers and constraints to the adoption of energy efficiency and conservation technologies and specified measures to remove these barriers.

The Kenya Vision 2030 aims to transform Kenya into a newly industrializing and middle-income country that provides a high quality of life to all its citizens by 2030 in a clean and secure environment. Over the last ten years, significant progress has been made in fulfilling the goals of Vision 2030. The next phase of Vision 2030 will be implemented through the Third Medium Term Plan, which is conceptualized by the Big Four Agenda: food security, affordable housing, manufacturing and affordable healthcare for all. Energy shall continue to play its enabling role to catalyse development in these sectors.

This strategy is to guide the country towards achieving its established Energy Efficiency (EE) goals,⁶ which include:

- i. Reducing the national energy intensity by 2.8% per year; and
- ii. Enabling the country achieve a 30 per cent emission reduction by 2030 relative to Business as Usual (143 MtCO₂e) and meet its national targets for Sustainable Development Goal 7 by 2030.

Kenya joined the Sustainable Energy for All (SE4ALL) Initiative in 2014 and developed its national SE4ALL Action Agenda and Investment Prospectus. The national SE4ALL Action Agenda, developed jointly by the Ministry of Energy (formerly the Ministry of Energy and Petroleum)⁷ and SE4ALL, with support from multiple donors, specified the country's targets for achieving universal access to modern energy access services, doubling the global rate of energy efficiency improvements, and doubling the share of renewable energy in the global energy mix by 2030 (see Table 1). In addition, an institutional arrangement was created to support SE4ALL efforts in the country, which includes the country focal point at the Ministry of Energy (MoE) and the SE4ALL Steering Committee. Under the SE4ALL Action Agenda, it was envisaged that the Ministry of Energy would work with stakeholders to develop and implement a National Energy Efficiency and Conservation Strategy (NEECS).

This strategy is part of the SE4ALL Action Agenda implementation and a further step toward delivering the country's energy efficiency and conservation targets.

The development of a National Energy Efficiency and Conservation Strategy (NEECS) is crucial for setting quantitative targets on energy efficiency improvements in key economic sectors and identifying specific actions to achieve them.

2.2. Energy Consumption in Kenya

While the energy sector in Kenya has been expanding rapidly to meet growing demand, it remains characterized by limited access, unstable and unreliable supply.

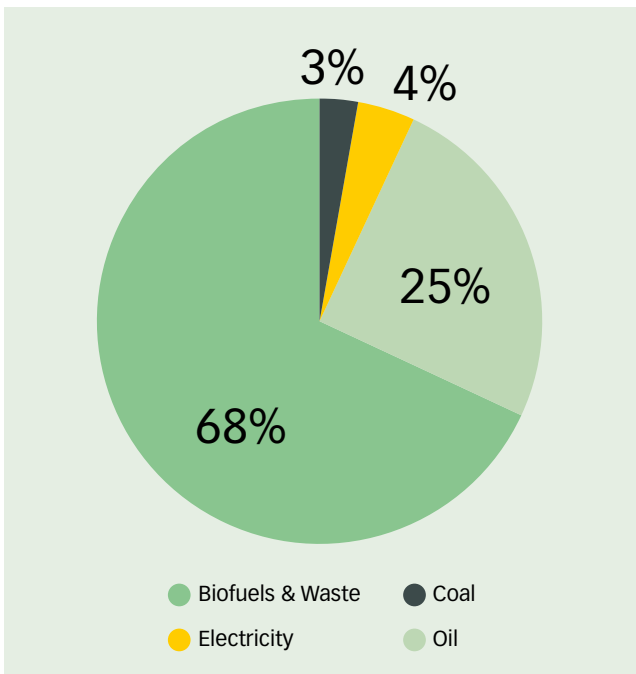
⁶ The goals have been established under SE4ALL initiative.

⁷ During the Kenya Government Reorganization in June 2018, the Ministry of Energy and Petroleum was replaced with the Ministry of Energy, while the governance of petroleum went to the Ministry of Petroleum and Mining.

TABLE 1: Kenya’s National SE4ALL targets by 2030 (Source: Kenya SE4ALL National Agenda, 2016)

Universal access to modern energy services		Doubling the global rate of improvement of energy efficiency	Doubling share of renewable energy in global energy mix	
Percentage of the population with electricity access	Percentage of population with access to modern cooking solutions	Rate of improvement in energy intensity	Renewable energy share in Total Final Energy Consumption	
			Power	Heat
100% ²	100%	-2.785%/year	80%	80%

FIGURE 2: Primary Energy Consumption in Kenya by Source – 2017^a

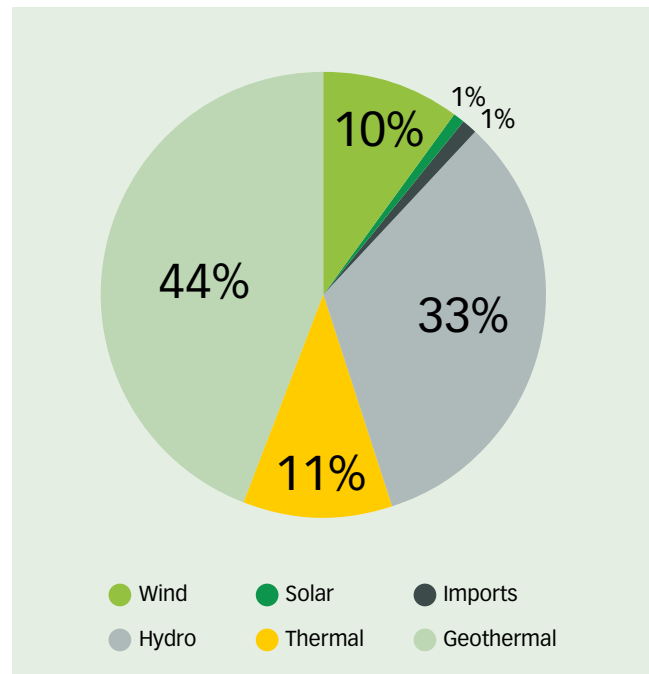


^a <https://www.iea.org/>, 2017

Kenya’s energy mix is strongly dominated by traditional biomass, which accounts for more than two-thirds of the country’s final energy consumption (see Figure 2). The high traditional biomass consumption is mainly due to household use of wood fuel for cooking and heating.

Expansion of agricultural land and population growth creates a substantial shortfall in fuel wood supply (about 20 million tonnes per year⁸), leading to illegal practices for fuel wood and high rates of deforestation, droughts, desertification, famine and land degradation.

FIGURE 3: Electricity Generation by Source



Source: KPLC Annual Financial report 2019

Electricity accounts for only 4% of the primary energy consumption in Kenya. However, as electrification rate increases in Kenya, embracing energy efficiency will be a cost-effective way to improve existing system capacity.

From Figure 3, Kenya’s electricity generation by source in 2019 was 44 per cent geothermal, 33 per cent hydropower, 11 per cent fossil fuels, 10 per cent wind, and 2 per cent from other sources.⁹ It is projected that by 2031, hydropower will account for only five per cent of the electricity generation mix in the country.¹⁰ More than one-eighth of Kenya’s electricity generation comes

⁸ GTZ (2007): Eastern Africa Resource Base.

⁹ KNBS, 2019. Economic Survey 2019.

¹⁰ IAEA, 2012. Kenya’s Energy Demand and the role of Nuclear energy in future energy generation mix

2. Country Context, Policy and Legislative Background on Energy Efficiency and Conservation

from fossil fuels. The reliance on fossil fuels increases national energy import expenditures – about 40 per cent of Kenya’s foreign exchange earnings are being spent on importing refined oil and other petroleum products. The use of thermal power has a direct relationship to the high cost of electricity in Kenya. The government is implementing a gradual phase-out of expensive diesel power generators to provide cheaper and cleaner energy.

Kenya is home to the largest wind farm in Africa (the Lake Turkana Wind Farm) of about 310 MW. The country is ranked number eight worldwide in geothermal energy production with an aggregate capacity of about 865 MWe. The country has a potential in excess of 10,000 MWe.¹¹

The country is one of the most viable commercial solar photovoltaic markets in Africa. In 2018, solar power generated 13.7 GWh from an installed capacity of about 50.7 MW (on-grid). The total Installed Solar PV System is 150 MW (both on and off-grid).¹²

2.3. Key Drivers of Energy Efficiency in Kenya

The following factors can be identified as key drivers of energy efficiency and conservation in Kenya:

- i. High energy prices, e.g. electricity and charcoal prices, are forcing energy consumers to consider energy efficiency and conservation measures to lower their energy costs.
- ii. Adverse environmental and health impacts, as a result of using highly polluting fuels that are responsible for rising greenhouse gas (GHG) emissions.
- iii. The ever-increasing mismatch between the supply and demand of some energy sources is motivating governments to come up with measures to make good use of available resources. This is especially true for biomass, which is a primary source of energy for approximately 68 per cent of Kenyans.
- iv. High level of awareness of energy efficiency and conservation by governments and the international community, thus contributing to the international energy efficiency and conservation agenda.

- v. Legal and policy interventions. The Energy Act 2019 and energy policy requires the adoption of energy efficiency and conservation measures.
- vi. Decrease in cost of energy-efficient technology. In the past, the high cost of such technology has been cited as a key barrier to EE adoption.

2.4. Policy and Legislation

Various policies and legislative acts have been developed, while others are in process at national and county levels to address energy efficiency in Kenya. Enabling reforms are continuously implemented, targeted at improving the sustainability of the national economy and reducing GHG emissions. These are geared towards supporting the implementation of the Paris Agreement and achieving Kenya’s climate targets, set out in its first Nationally Determined Contribution (NDC).

Table 2 presents a summary of the relevant national policies and legislation in Kenya related to energy efficiency. This strategy is founded on the following policies and regulatory instruments.

¹¹ Geothermal Exploration in Kenya- Status Report and Updates, 2019.

¹² EPRA, 2018. Rencon Report.

TABLE 2: Overview of Policy and Legislation on Energy Efficiency

Category	National framework	Year	Duration	Overview
High-level policy and strategic documents	The Constitution of Kenya	2010	-	The Constitution is the supreme law of the Republic and binds all persons and all State organs at both levels of government. It states that Kenya shall ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources. It created the devolved system of government, consisting of the national government and 47 county governments, and provides a framework for self-governance at the local level. County governments have a key delivery role in the planning and development of electricity and gas reticulation and energy regulation. Article 203(2) requires that county governments be allocated a minimum of 15 per cent of the annual national fiscal revenue, but the actual allocation often surpasses this minimum, which gives county governments considerable influence on investments in energy efficiency actions.
	Kenya Vision 2030 (issued by the Government of Kenya)	2008	-2030	Kenya Vision 2030 is the country's overarching development blueprint covering the period 2008 to 2030. It aims to transform Kenya into a newly industrializing "middle-income country providing a high-quality life to all its citizens by the year 2030." Under the Economic Pillar, Kenya aims to become the provider of choice for basic manufactured goods in East and Central Africa. This target will be achieved through improving competitiveness in manufacturing and promoting efficiencies. These measures necessitate energy efficiency in manufacturing.
	Big Four Agenda	2017	2018-22	The aim of the 'Big Four' Agenda is to make Kenya a globally competitive and prosperous country with a high-quality life for all Kenyans by 2030. The Agenda establishes four priority areas, which are Ensuring Food and Nutrition Security, Affordable Housing, Enhanced Manufacturing and Universal Health Coverage. The Ministry of Energy has identified strategic initiatives for the Big Four Agenda. The initiatives focus on the realization of improved energy access, energy efficiency and conservation.
Climate change-related regulations and strategies	Climate Change Act	2016		This document is the national legislation that sets a response framework to climate change and provides mechanisms and measures to achieve low-carbon and climate-resilient development. Regarding energy efficiency, it requires the adoption of a National Climate Change Action Plan. The Action Plan shall aim to enhance energy conservation and efficiency and the use of renewable energy among end-users, industrial, commercial, transport and domestic users and put in place measures for climate change mitigation.
	National Climate Change Action Plan (NCCAP) (issued by the Ministry of Forestry and Environment)	2018	2018-22	The Five-year Plan aims to guide Kenya's climate change actions. It identifies six priority mitigation sectors; the energy sector is one of them. These sectors are expected to reduce their GHG emissions, so that Kenya can meet its Nationally Determined Contribution goal of reducing its GHG emissions by 30 per cent by 2030, from the business as usual level. Improvement of energy efficiency and conservation is identified as one of the key action areas. The following results are expected by June 30th, 2023: <ul style="list-style-type: none"> • The number of companies participating in energy efficiency initiatives shall be doubled to 1,000 (including 1,000 energy audits). • Minimum Energy Performance Standards shall be developed for five more appliances; existing testing facilities shall be scale up to cover these five appliances. • The losses in electricity transmission and distribution shall be reduced from 18 per cent to 14 per cent. • 3.3 million Compact Fluorescent Lamps (CFLs) shall be distributed to households through the CFL initiative. • Energy efficiency and conservation projects shall be delivered, which focus on: <ul style="list-style-type: none"> – efficient lighting, – energy efficiency in buildings, – Minimum Energy Performance Standards, – the distribution of clean lighting

2. Country Context, Policy and Legislative Background on Energy Efficiency and Conservation

Category	National framework	Year	Duration	Overview
	Sessional Paper No. 4 on Energy (issued by the Ministry of Energy and Petroleum)	2004	2004-23	<p>The Session Paper provided a policy framework upon which cost-effective, affordable and adequate quality energy services should be made available to the domestic economy on a sustainable basis. One of the objectives was to promote energy efficiency and conservation through:</p> <ul style="list-style-type: none"> encouraging the private sector's participation in energy conservation and efficiency, enhancing the provision of energy audits and awareness-raising among industries and financial institutions on the benefits of energy efficiency, the establishment of energy and equipment testing laboratories for efficiency and accelerated equipment ageing testing, the promotion of cost-effective industrial energy efficiency and conservation measures, the dissemination of energy efficiency and conservation information to consumers, the development of standards and codes of practice on cost-effective energy use.
Energy-related regulations and strategies	The Energy Act (issued by Parliament)	2019	-	<p>The 2019 Energy Act created the Energy and Petroleum Regulatory Authority to replace the Energy Regulatory Commission. It aims to:</p> <ul style="list-style-type: none"> coordinate the development and implementation of national energy efficiency and conservation programmes, consolidate regulations and empower the Minister responsible for energy to promote energy efficiency policies and actions, such as the adoption of Minimum Energy Performance Standards and the integration of energy efficiency requirements into the Building Codes, prescribe the minimum qualification for energy auditors and energy managers.
	Energy (Appliances' Energy Performance and Labelling) Regulations (issued by the Ministry of Energy and Petroleum)	2016	-	<p>The Regulations require that specified appliances manufactured or imported in Kenya shall be tested for energy performance in an accredited laboratory, get registered with the ERC, and be affixed with appropriate energy star label.</p>
	Energy (Energy Management) Regulations (issued by the Energy Regulatory Commission)	2012	-	<p>This document requires that all commercial buildings, and industrial and institutional facilities, whose energy consumption exceeds 180,000 kWh per year should develop an energy management plan, carry out energy audits at least once every three years, and implement at least 50 per cent of the energy savings recommendations within three years.</p>
	Energy Management standards	2018		<p>The Kenya Bureau of Standards is developing energy management standards to cover energy management systems, energy auditing and energy efficiency performance measurement & verifications.</p>

Category	National framework	Year	Duration	Overview
Energy-efficiency specific regulations and strategies	Green Economy Strategy and Implementation Plan (GESIP) (issued by the Ministry of Environment, Natural Resources)	2016	2016-30	<p>The GESIP is a blueprint for enhancing low-carbon, resource-efficient, equitable, and inclusive socio-economic transformation. Furthermore, it focuses on eliminating the social-economic constraints to attaining Kenya Vision 2030 and is aligned with the outcomes of the United Nations Conference on Sustainable Development (Rio+20).</p> <p>The plan is to facilitate Kenya’s transition to a sustainable path through five thematic areas and strategies, which are promoting sustainable infrastructure, building resilience, sustainable natural resource management, promoting resource efficiency, social inclusion and sustainable livelihoods.</p> <p>The GESIP aims at guiding national and county governments and other stakeholders on the transition to sustainable development pathways to realize Kenya Vision 2030 and calls for a greater focus on green growth, a cleaner environment and higher productivity. The objectives for increasing national energy efficiency include:</p> <ul style="list-style-type: none"> • Develop sector-specific energy efficiency targets and benchmarks, • Roll out demand-side energy efficiency programmes in buildings and facilities, • Roll out supply-side energy efficiency programmes through system reinforcement, efficient transformers, and grid extension projects, • Adopt Minimum Energy Performance Standards for lighting and industrial products, • Develop technical and infrastructural capacity for energy audits, equipment testing and certification, • Review national and country policies to respond to new technology and innovation, and • Enhance the application of voluntary management approaches to energy efficiency, clean and renewable energy.
	Performance Standards for Cooking stoves	2019		New Performance Standards for cookstoves have been gazetted. CCAK is developing a voluntary star labelling scheme for cookstoves on sale based on these standards.

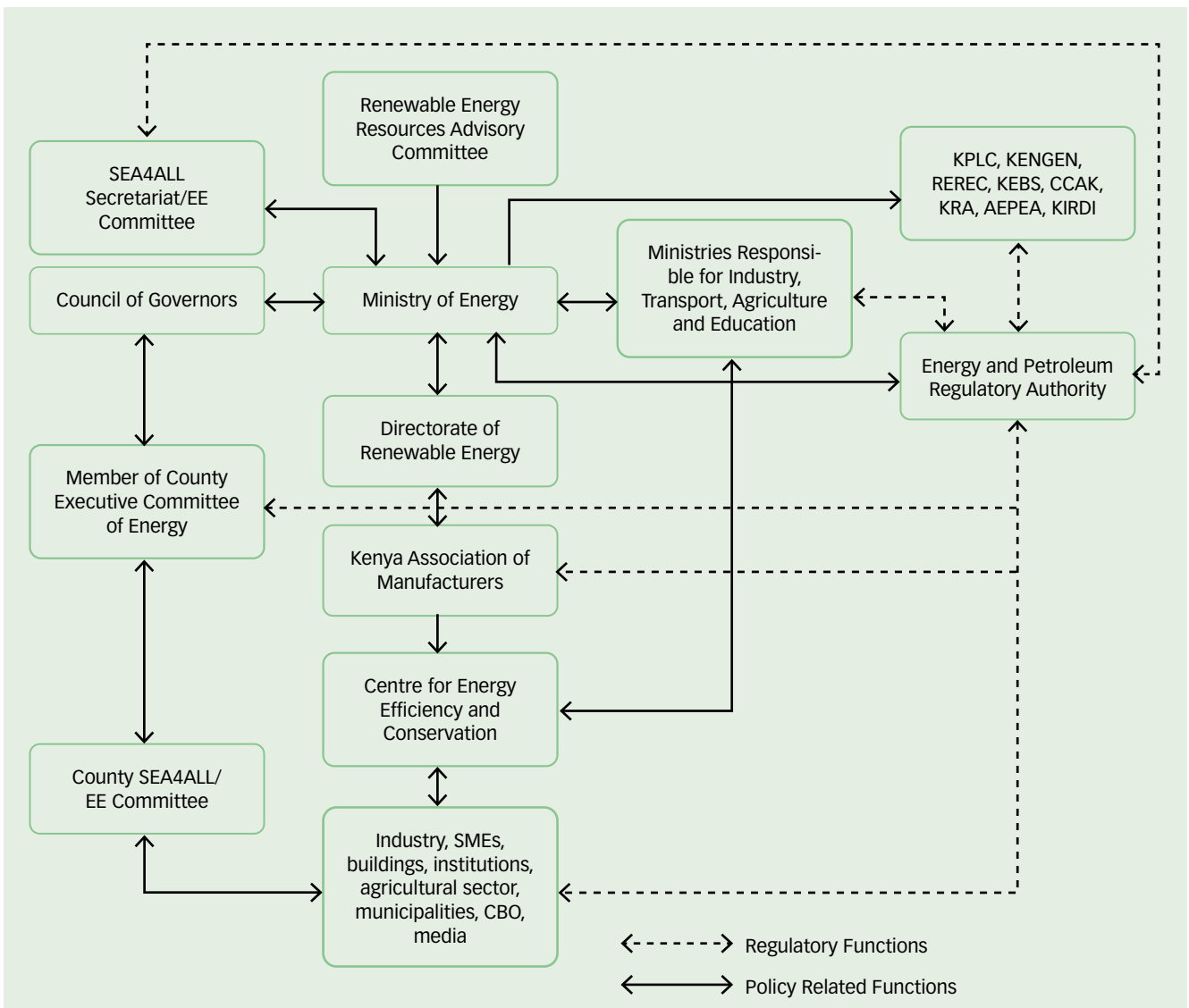
3. Institutional Framework for Implementation

Implementation of the NEECS will adopt a multi-sectoral approach, which will include state and non-state actors. The Ministry of Energy will play a central role in coordinating the programs, while EPRA will play the regulatory roles, as envisaged in the Energy Act 2019. Other agencies that are instrumental in program implementation are Kenya Electricity Generating Company (KENGEN), Kenya Revenue Authority (KRA), Rural Electrification and Renewable Energy Corporation

(REREC), Kenya Industrial Research and Development Institute (KIRDI), Community Based Organizations (CBOs), Association of Energy Professionals of Eastern Africa (AEPEA), Kenya Bureau of Standards (KEBS) and Clean Cooking Association of Kenya (CCAK).

Figure 4 illustrates the outline of the expected institutional framework for this strategy.

FIGURE 4: Proposed Institutional Framework for the Strategy



3.1. The Role of County Governments in Promoting Energy Efficiency and Conservation

The Constitution of Kenya, under the fourth schedule and the Energy Act 2019, recognizes the county government role in energy development. The two documents specify the roles of the national and county governments in relation to energy.

Part II section (3) of the Energy Act states that “each county government shall develop and submit a county energy plan to the Cabinet Secretary in respect of its energy requirements.” This provides an opportunity for county governments to identify measures to promote energy efficiency and conservation in the county.

Part VIII of the Energy Act 2019, section 193-196, proposes specific roles of county governments in promoting energy efficiency and conservation measures.

A county government may:

- a) With the approval of EPRA, amend the energy conservation building codes to suit the local climatic conditions and may, by rules made by it, specify and notify energy efficiency and conservation building codes with respect to the use of energy in buildings,
- b) Direct every owner or occupier of a building or building complex, being a designated consumer, to comply with the provisions of the energy efficiency and conservation building codes,
- c) Direct, if considered necessary for efficient use of energy and its conservation, any designated consumer referred to in paragraph (b) to have an energy audit conducted by an accredited energy auditor in such a manner and at such intervals of time as may be specified by the regulations,
- d) Take all measures necessary to create awareness and disseminate information for the efficient use of energy and its conservation,
- e) Train personnel and specialists in techniques for the efficient use of energy and its conservation,
- f) Take steps to encourage preferential treatment for the use of energy-efficient equipment or appliances,
- g) Direct any designated consumer to furnish the EPRA, in such form and manner and within such period as may be specified by rules made by it, with information regarding the energy consumed by such consumer,

- h) Specify the matters to be included for the purposes of inspection,
- i) Establish a fund for the promotion of the efficient use of energy and its conservation within the county,
- j) Appoint as many inspecting officers as necessary for the purpose of enforcing energy efficiency and conservation measures.

4. Strategic Targets and Actions

This strategy focuses on five thematic sectors and sets targets for energy efficiency and conservation in these key areas: Households, Buildings, Industry and Agriculture, Transport and Power Utilities.

The sectoral targets are supported by recommendations for action, some of which are cutting across the entire economy while others are specific to each thematic sector (refer to Annex 1). Many suggestions were received during the consultations; however, priority was given to recommended actions and initiatives achievable within the strategy timeframe (2020-25). In the long term, actions that are more ambitious could be considered, depending on the implementation and results of the prioritized actions for this first five-year period.

4.1. Economy-wide Targets

At the highest level, the NEECS intends to help Kenya reach its international commitments and national targets for cleaner energy and the reduction of greenhouse

gas emission as articulated in Kenya’s NDCs and in the country’s National Action Agenda for Sustainable Energy for ALL. With these overarching objectives in mind, this strategy proposes the following targets and metrics for the measurement and assessments of progress.

4.2. Sectoral Status Assessments and Recommended Actions

4.2.1. HOUSEHOLDS

For the purposes of this strategy, the definition of a household is adopted from the European System of Accounts. Here, a household is defined as a small group of persons who share the same accommodation, who pool some, or all, of their income and wealth and who consume certain types of goods and services collectively, mainly housing and food.¹³

TABLE 3: Economy-wide targets

	Objectives	Indicators	Status (2019)	Target (2025)
Ensure energy efficiency contributes to achieving Kenya’s NDC	Ensure energy efficiency contributes to achieving Kenya’s NDC	6.9 MtCO ₂ e (2015 baseline) Annual greenhouse gas emissions due to energy supply and consumption	6.9 MtCO ₂ e (2015 baseline)	7.6 MtCO ₂ e ^a
	Ensure energy efficiency contributes to achieving SDG7 and the objectives of Sustainable Energy for All	Annual rate of improvement in energy intensity	0.2% per annum	3% per annum ^b

^a This Figure was derived from the StarCK+ analysis, which projected the 2030 BAU emissions from energy demand, and assumed a 30 per cent reduction in emissions against the 2030 BAU baseline, as demanded by Kenya’s NDC. <http://www.starckplus.com/index.php/starck-components/technical-assistance/ndc>

^b This rate is consistent with global achievement of SDG7 Goals for a doubling in the improvement rate of energy intensity and is easily achievable under the initiatives in this strategy.

¹³ United Nations. Economic Commission for Europe, & Statistical Office of the European Communities. (2007). Rural Households’ Livelihood and Well-being: Statistics on Rural Development and Agriculture Household Income. United Nations Publications.



4.2.1.1. Status

OVERALL TRENDS

- Kenya’s population (2019) is 47.6 million.¹⁴
- There are 12,143,913 households.
- The population density is 92 people/km².
- The national electricity access rate is 69.8 per cent; 90.8 per cent in urban and 56.3 per cent in rural areas. Grid and solar constitute the majority of these connections with 50.4% of households connected to the national grid while an estimated 19.3% are connected to solar systems.
- 55.1 per cent of households in Kenya still use wood as their primary fuel for cooking, followed by LPG at 23.9, charcoal at 11.6, paraffin at 7.8, electricity at 0.9, biogas at 0.5 and solar at 0.2.¹⁷
- Firewood and charcoal supply 80 per cent of the 6.2 million households that use a single fuel source.
- 59 per cent of households in Kenya use the Three-stone Open Fire (TSOF). Although the proportion of household users has dropped from 76 per cent 20 years ago, the aggregate number has increased from 4.7 million households to about 7.3 million households.

- Currently, Minimum Energy Performance Standards covers six electrical appliances.
- 71 per cent of households in Kenya use woodstoves as either their primary or secondary cookstove, with a greater prevalence (92 per cent) in rural areas.
- The demand for charcoal, estimated at 16.3 million cubic metres (m³), is far above the supply of 7.4 million m³.¹⁵ By 2032, demand is expected to increase by 17.8 per cent while supply is expected to increase by 16.8 per cent,¹⁶ widening the supply-demand gap from 8.9 million m³ to 10.6 million m³.
- Figures 5 and 6 show the sources of energy used in households for lighting and cooking.

As shown in Figures 5 and 6, electricity is the leading source of energy for lighting, while firewood is the leading source of energy for cooking in households. In lighting, therefore, focusing on the efficiency of the lighting fixtures promises to reduce the energy used. For cooking, focusing on the efficiency of the cookstoves can help reduce the amount of firewood used.

FIGURE 5: Household Lighting Energy Sources – KNBS, 2019

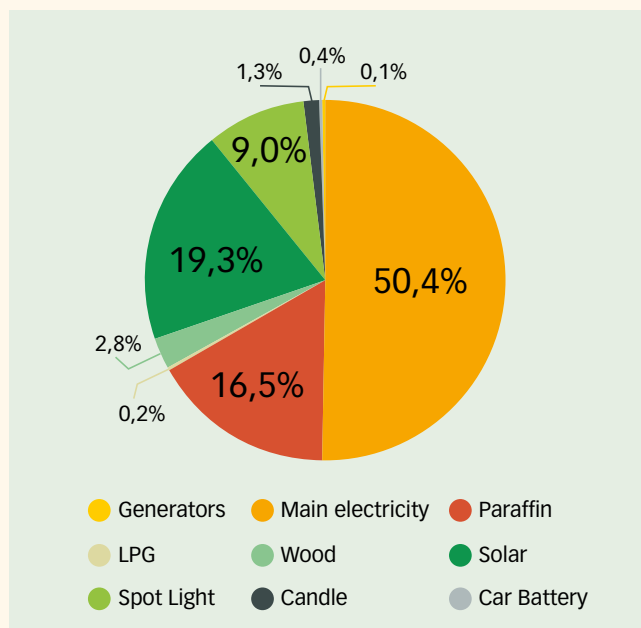
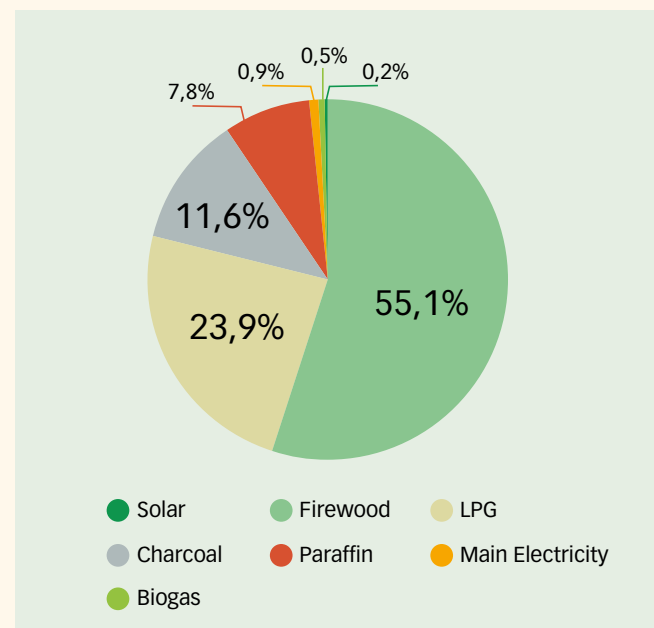


FIGURE 6: Household Cooking Energy Sources – KNBS, 2019



¹⁴ Kenya National Bureau of Statistics, 2019. Annual Report.

¹⁵ Wanleys Consultancy Services, 2013. Analysis of Demand and Supply of Wood Products in Kenya, Wanleys Consultancy Services 2013

¹⁶ Stockholm Environment Institute (SEI), 2018. Overcoming barriers to sustainable charcoal in Kenya.

The general household energy consumption trends for five years are as shown in Figure 7.

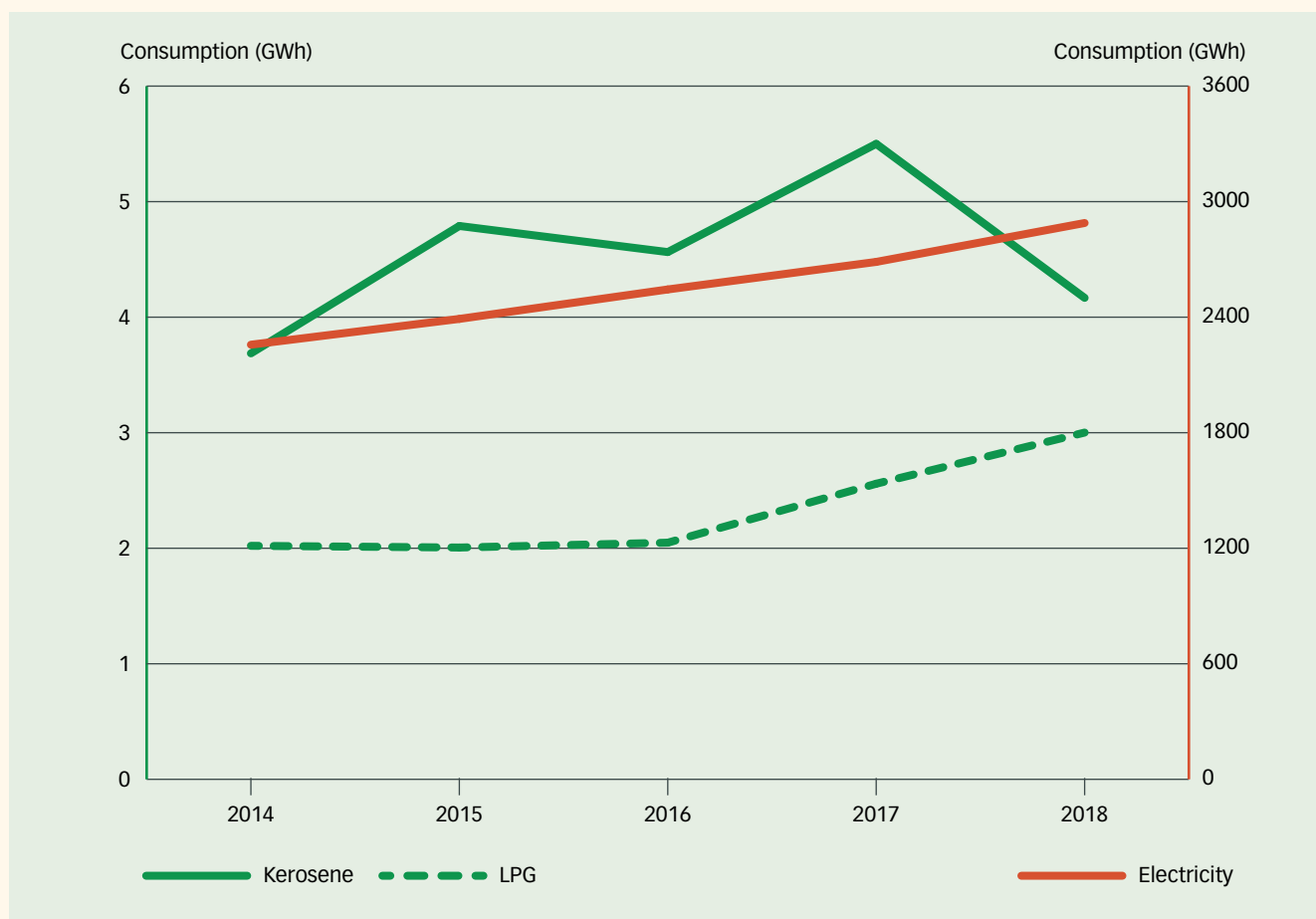
Figure 7 shows a drop in the use of kerosene from 2017 to 2018. This can be attributed to the introduction of an anti-adulteration levy, which has increased the price of the commodity. The use of LPG rose over the same pe-

riod, an indication that there might have been a switch in fuel use from kerosene to LPG.

INSTITUTIONAL FRAMEWORK

Table 4 shows a summary of the institutional framework for the energy efficiency strategy for households.

FIGURE 7: Household Energy Consumption Trends



KEY POLICIES AND INITIATIVES

- Kenya National Electrification Strategy (KNES) was adopted in December 2018 and identifies the least-cost options for providing access to electricity and achieving universal electricity access in Kenya by 2022 through grid extension and deploying off-grid solutions.
- Least Cost Power Development Plan (LCPDP) is an indicative long-term plan that outlines the energy needs of the nation to be met at least cost to the economy and the environment. It provides a framework for institutional, technical, economic and fi-

- nancial design and for implementation of specific programmes.
- The Kenya Country Action Plan (CAP) (2013) for Clean Cookstoves and Fuels identifies the main barriers to the widespread adoption of clean cookstoves and fuels in Kenya and specifies the targets to be achieved and the intervention options to be implemented. This CAP is currently under review.
- Kenya’s Minimum Energy Performance Standards (MEPS) and labels for electrical appliances aim to promote the use of energy-efficient equipment.
- The Kenya Off-Grid Solar Access Project (KOSAP) is a flagship project of the Ministry of Energy, financed



TABLE 4: Institutional framework for the energy efficiency strategy for households

Institution	Role
Ministry of Energy	Responsible for policy formulation in the energy sector.
Ministry of Environment and Forestry	Mandated to undertake national environmental policy and management, forestry development policy and management, development of re-afforestation and agro-forestry, restoration of strategic water towers, protection and conservation of the natural environment and pollution control.
REREC	Has an expanded mandate to spearhead Kenya's green energy drive, in addition to implementing rural electrification projects. Covers RE solar, small HEPs
KPLC	The dominant player in electricity distribution and retailing.
EPRA	Responsible for economic and technical regulation of the energy sector. Its mandate consists of the enforcement and review of regulations, the management of electric power tariffs and tariff structures. It is also involved in matters related to the sale of petroleum and petroleum products, including paraffin and LPG.
KEBS	The government agency responsible for the development of standards, metrology, conformity assessment, training, and certification services.
KFS	State agency with the mandate of enhancing the development, conservation, and management of Kenya's forest resources base in all public forests, and assisting county governments to develop and manage forest resources on community and private lands for the equitable benefit of present and future generations.
National Treasury	Responsible for managing Kenya's national and county levels of government finances.
County governments	Their activities are primarily geared towards achieving two main objectives: 1) involving the people in governance, and 2) allowing better supervision and implementation of policies at the grassroots level.
NEMA	Seeks to ensure a clean, healthy, and sustainable environment in Kenya through the supervision and coordination of all matters relating to the environment.

by the World Bank, aimed at providing electricity to the parts of the country that are not served by the national grid. The project is critical to achieving the Government of Kenya's goal of ensuring universal access to electricity essential for poverty reduction. KOSAP also seeks to promote the adopting of clean cooking solutions in these areas.

- The Government has imposed a ban on charcoal production due to the continued deforestation and destruction of the environment.
- The government has brought forward the target for universal access to clean cooking to 2028 ahead of the global goal of 2030. This is outlined in the 2019 report by the MoE on the assessment of the supply and demand of cooking solutions at the household level.¹⁷
- Under the SE4ALL, it is expected that widespread implementation of EE initiatives in households would significantly reduce GHG emissions, but also

produce additional comfort, health, environmental and economic benefits.

EXISTING SUPPORT AND CAPACITY CONSIDERATIONS

- Most local stakeholders and activities are related to increasing households' energy access rather than energy efficiency. However, some initiatives are exploring the integration of both.
- In the area of clean energy cooking, there are few players involved in stove production and dissemination, as well as local capacity-building. There is need to develop an awareness and communication strategy for the sector.
- Kenya Power is playing a key role in electrification through implementing the Last Mile Connectivity Project (LMCP) and the Kenya Electricity Modernization Project (KEMP). Some efforts have been made to improve lighting efficiency by providing efficient CFLs in the residential sector, with the goal of achieving 100 per cent efficient lighting by 2030.
- LED lighting is now gaining popularity in the country.

¹⁷ Ministry of Energy, 2019. Kenya Household Cooking Sector Study Report.



- High upfront costs for efficient lighting products are a barrier to wide adoption. Thus, consumers often opt for cheaper incandescent once the CFLs they have received for free burn out. There is a need to implement and enforce the existing MEPS, which only cover electrical appliances, and to extend the MEPS coverage to new product categories.
- KIRDI has a testing lab for a few cooking fuels and stoves.
- CCAK and partners have business support programmes for the clean cooking sector, including advocacy, capacity-building and technical support to development of policies and standards.
- There is inadequate research, innovation, and development in the clean cooking sector.
- The continued use of low efficiency cookstoves due to high upfront costs, preference and lack of knowledge of improved cookstoves and fuels leads to continued high consumption of charcoal and firewood.
- There is a need to review the solar water heating regulation and undertake a regulatory impact assessment to ensure legal approval and acceptance.
- The lack of testing lab for appliances, cookers and fuels is a compliance challenge, thus leading to high usage of inefficient appliances and fuels.
- There is need for enhancement of testing lab.

TABLE 5: Household Grid Electricity Consumption for 5 years

Year	2014	2015	2016	2017	2018
Electricity Consumption (GWh)	2257	2391	2544	2687	2889
Percentage increase		6%	6%	6%	8%

Kenya Power Annual Report, 2018/19.

TABLE 6: Projected Household Electricity Consumption

Year	2019	2020	2021	2022	2023	2024	2025
Projected demand (at 6 % growth) ^a (GWh)	3071.007	3470.143	4168.186	5322.065	7223.481	10421.88	15983.76

^a It is 6 per cent then reduced by a factor of 0.97.

4.2.1.2. Modelling of Benefits for the MEPS Intervention for Households Appliances

For a better view of the benefits to be realized under this policy intervention, energy electricity consumption data for households has been used to project future demand. The Kenya Annual Report data for the years from 2014 to 2018 has been used. Table 5 shows the consumption data. For other forms of energy refer to the Bioenergy Strategy.

To project increase in demand for 2019 to 2025, the percentage increase for the years in Table 5 has been averaged. The average increase has been determined to be 6.3 per cent. This has been used to model demand by compounding growth up to 2025. The projected demand for Business as Usual is shown in Table 6.

The Kenya National Energy Efficiency and Conservation Strategy seeks to improve energy efficiency of household appliances by 3 per cent compounded annually, using 2020 as the base year. Table 6 has been modified to accommodate the percentage reduction in consumption by 3 per cent. For example, the demand for 2021 was determined by:¹⁸

Demand for 2020 =

$$4168.186 \times (1 + 0.063)^1 \times 0.97 = 3366.038 \text{ GWh}$$

This formula has been used to compound the demand for the five years. The projected demands for Business as Usual and Policy Intervention have been compared.

¹⁸ This formula is derived from a model based on compounded growth of consumption, less 3 per cent. The 3 per cent results from the enacted efficiency and is represented by $(1-0.03)= 0.97$



The CO₂ abatement after this strategy intervention has been plotted too. These are shown in Figures 8, 9 and 10.

The projected CO₂ abatement projection used the Kenyan grid emission factor of 0.33 kg of CO₂ per kWh.

Figures 9 and 10 demonstrate that adopting the right policies will lead to a reduction of energy consumed and CO₂ emitted.

FIGURE 8: Household Electricity Demand Projections for Scenario under 'Business as Usual' and under Policy Intervention

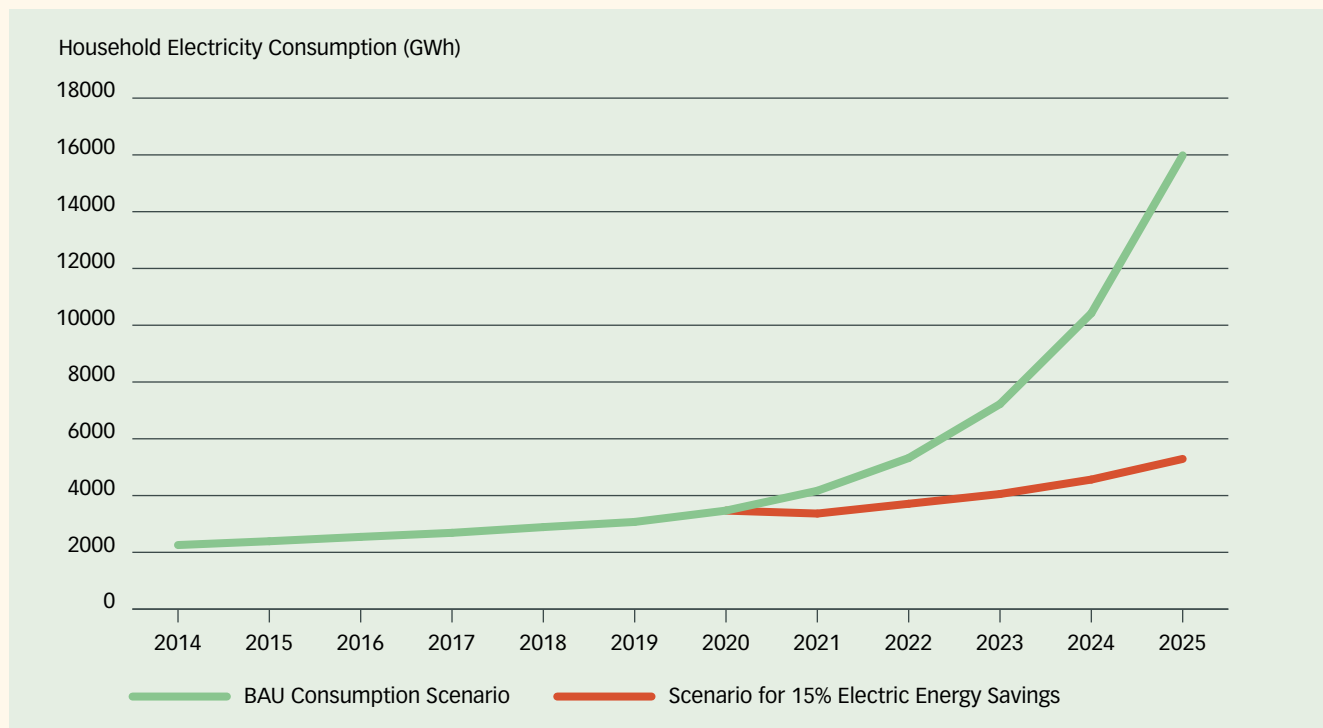


FIGURE 9: Household Electricity associated CO₂ Emissions for Scenario under Business as Usual and under Policy Intervention

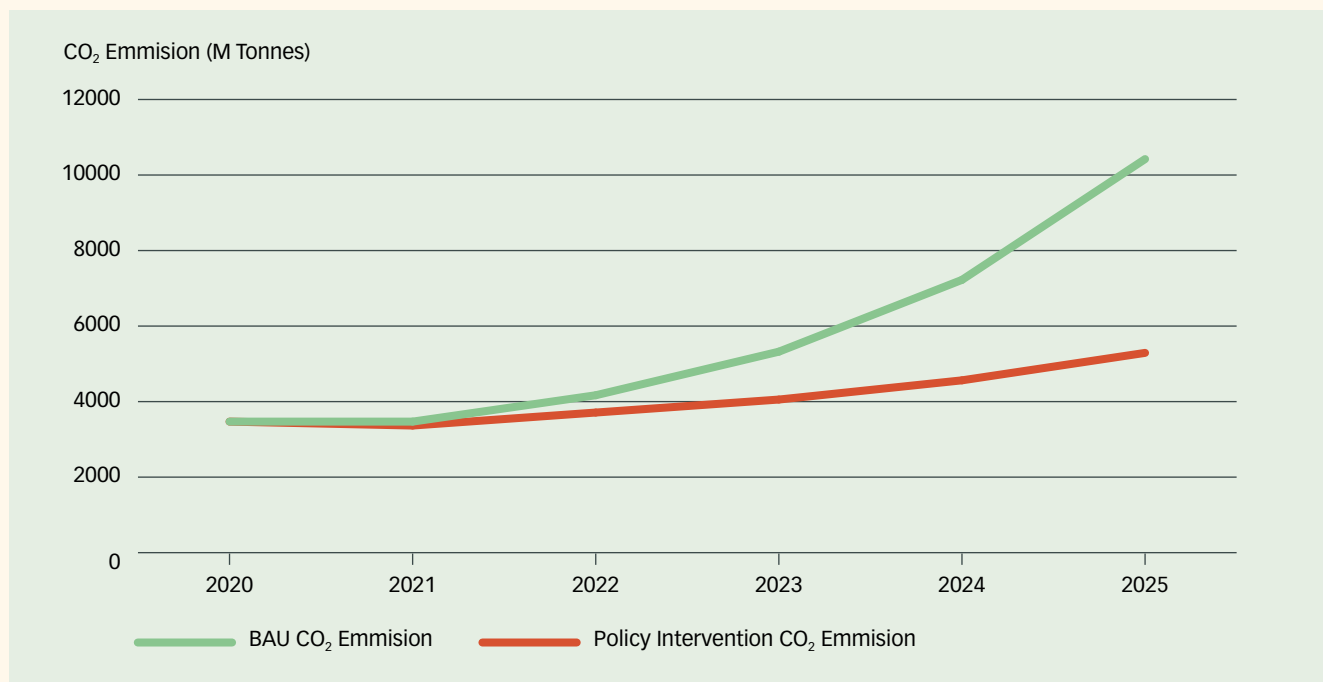
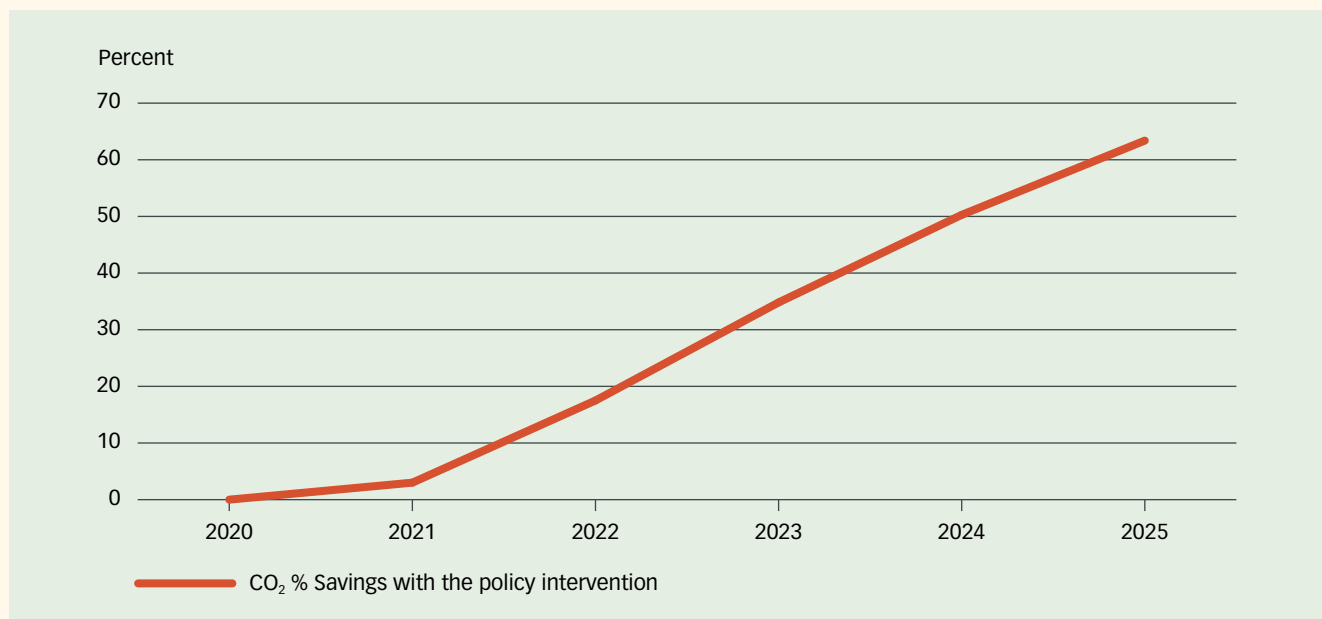


FIGURE 10: Percentage CO₂ Savings as a result of Policy Intervention in Household Electricity Consumption



4.2.1.3. Targets

TABLE 7: Household Sector Targets

Objectives	Indicators	Status (2019)	Target by 2025
Improve the energy efficiency of household electrical appliances	Electricity consumption of household appliances	961 GWh (6 kinds of appliances) ^a Projected target ^b	3% annual increase in efficiency to the base case level in 2020 (see Figures 7, 8 and 9 for the trends in Business as Usual and Policy Intervention Scenarios)
	Number of appliances covered by MEPS	6 MEPS, covering motors, air conditioners, fridges, CFLs, magnetic ballasts, and fluorescent lamps	10 MEPS – Additional MEPS for LEDs, computers, TVs, and cookstoves
Improve the energy efficiency of household thermal energy	1. MEPS for cookers 2. Standards for cookers and fuels 3. Testing lab for cookers and fuels 4. Communication and awareness strategy 5. Reviewed CAP 6. Bio Energy strategy formulated	70% households using biomass fuel	50% households utilizing clean energy

^a This Figure is based on the data from UNDP (2014), *Consultancy Services for Detailed Study on Impacts of Energy Performance Standards and Labels Implementation in Kenya*, for 6 analysed appliances.

^b This is not actual data – modelling



4.2.1.4. Actions

TABLE 8: Household Sector Actions

Objective	Actions
Improve the energy efficiency of household energy-using appliances	<p>• Minimum Energy Performance Standards (MEPS) for household appliances and equipment</p> <p><i>Description:</i> Develop MEPS for more product categories –cookstoves, fans, TVs, and computers – and ban the least efficient products from the market (e.g. 10 per cent^a of the least efficient products in each category, setting minimum requirements for energy efficiency)</p> <p><i>Key implementation partners:</i> Key responsible ministries for Energy, Industry, Environment and Forestry, Kenya Bureau of Standards (KEBS), Kenya Revenue Authority, EPRA, and Kenya Anti-Counterfeiting Agency.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> • Mandatory Minimum Energy Performance Standards (MEPS) and Test Methods for each of the product covered, stages and timelines of implementation and enforcement, • Amendment of the existing regulations for appliances and products not covered under the existing ones, • Awareness-raising campaigns to inform consumers about the benefits of energy-efficient appliances and to encourage their acceptance and preference for more energy-efficient products, • Capacity-building for implementing agencies, • Create linkages with East African Centre of Excellence for Renewable Energy and Energy Efficiency (EACREE), • Enhance the testing facilities of the Kenya Industrial Research and Development Institute (KIRDI) to support MEPS enforcement, • Accelerate the harmonization of Kenya MEPS with those of other countries in the region.
Improve the energy efficiency of household thermal energy	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Develop MEPS for more product categories, such as biomass cookstoves, gas and electric burners and appliances. • Develop standards for common domestic fuels and cookers. • Develop a testing lab for fuels and cookers. • Develop a clean cooking awareness and communication strategy. • Enhance research, innovation and development in the clean cooking sector. Develop economic incentives to promote the adoption of clean cooking technologies. • Review the CAP to incorporate the new targets and developments. <p><i>Key implementation partners:</i> Key responsible ministries for Energy, Industry, Environment and Forestry, Kenya Bureau of Standards (KEBS), KIRDI, The National Treasury, EPRA, and Kenya Anti-Counterfeiting Agency, CCAK</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> • New MEPS gazetted • Standards developed for fuels and cookers • Operating testing lab • Reviewed Country Action Plan (CAP) • Awareness and communication strategy for the sector formulated • Economic incentives • Bioenergy strategy

^a MEPS starts by setting an arbitrary target. From this, standards will be made, improving the existing indicators by 10 per cent.

4.2.2. BUILDINGS

For the purposes of this strategy, a building is defined as construction work that has the provision of shelter for its occupants or contents as one of its main purposes and is normally designed to stand in one place.¹⁹

4.2.2.1. Status

GLOBAL

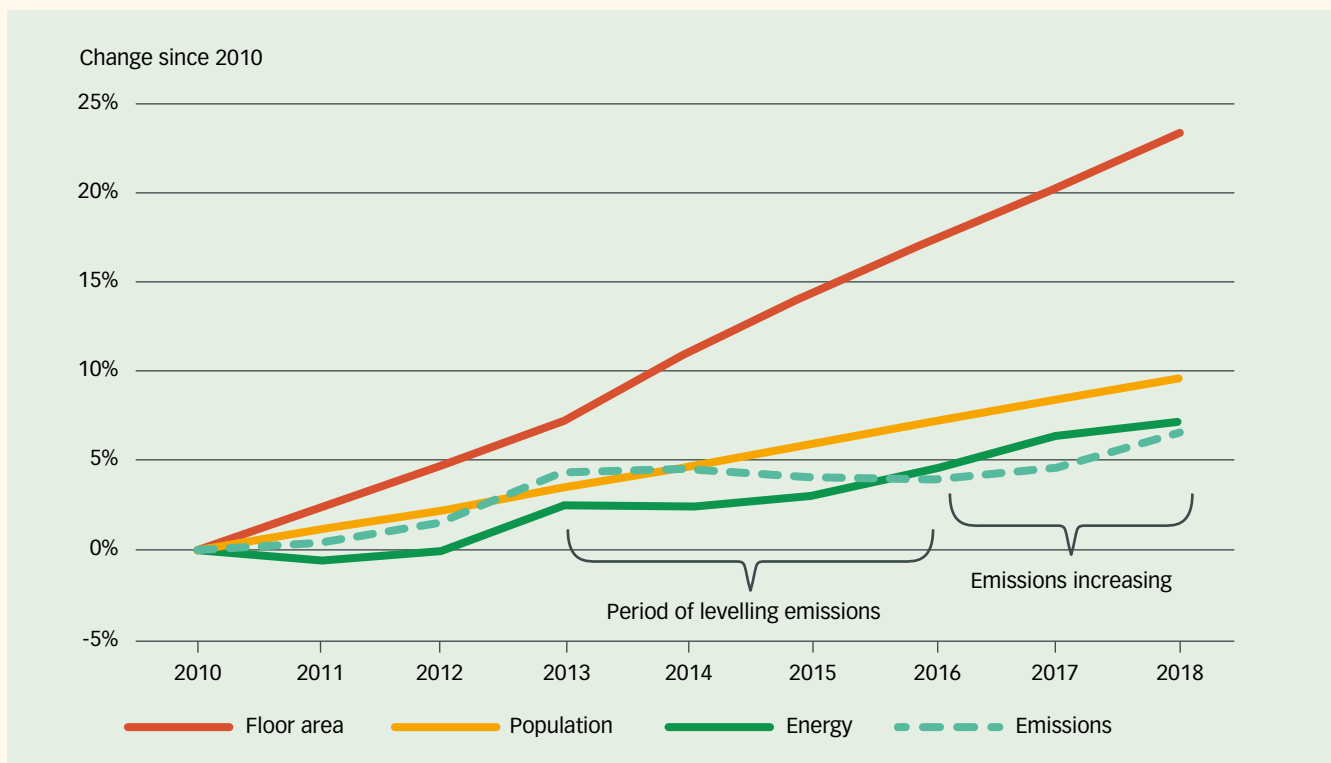
The buildings and construction sector accounted for 36 per cent of final energy use and 39 per cent of energy and process-related carbon dioxide (CO₂) emissions in 2018, 11 per cent of which resulted from manufacturing building materials and products such as steel, cement and glass. The key global buildings sector trends are:

- Global buildings sector final energy demand rose 1 per cent from 2017 and 7 per cent from 2010.
- Global building stock emissions continue to rise. In 2018, global emissions from buildings increased 2 per cent for the second consecutive year to 9.7 gi-

gatonnes of carbon dioxide (GtCO₂), suggesting a change in the trend from 2013 to 2016, when emissions had been levelling off. Growth was driven by strong floor space and population expansion, which led to a 1 per cent increase in energy consumption to around 125 exajoules (EJ), or 36 per cent of global energy use.

- While efficiency improvements continued to be made, they were not adequate to outpace demand growth.

FIGURE 11: Changes in floor area, population, buildings sector energy use and energy related emissions globally 2010-18



¹⁹ Building Authority of Kenya, 2017, National Building Regulations.

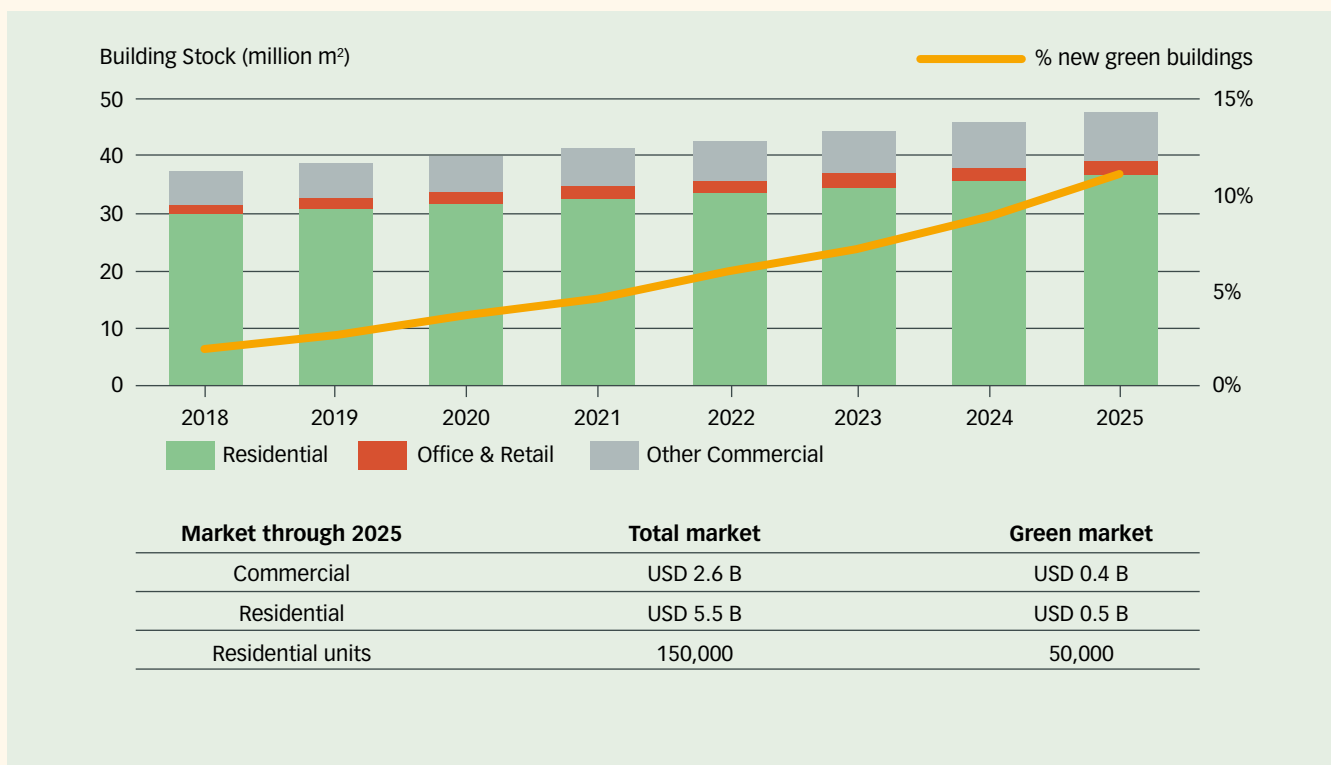
A major source of rising energy use by the global building stock is electricity, the use of which has increased more than 19 per cent since 2010. This indicates how crucial it is to make clean and renewable sources of energy accessible, and to use passive and low-energy designs more widely in building construction. From 2017 to 2018, energy intensity continued to improve for space heating (-2 per cent) and lighting (-1.4 per cent) but increased for space cooling (+2.7 per cent). At an 8 per cent increase in 2018, space cooling became the fastest-growing use of energy in buildings since 2010, though it accounted for only a small portion of total demand at 6 per cent.

KENYA

2017 projections show GDP growth to be approx. 6.4 per cent. With a 4.3 per cent urbanization rate, demand for affordable housing will remain strong. There are 51 banks providing financial services with mortgage rates at 17 per cent over ten years and at least 10 per cent upfront.

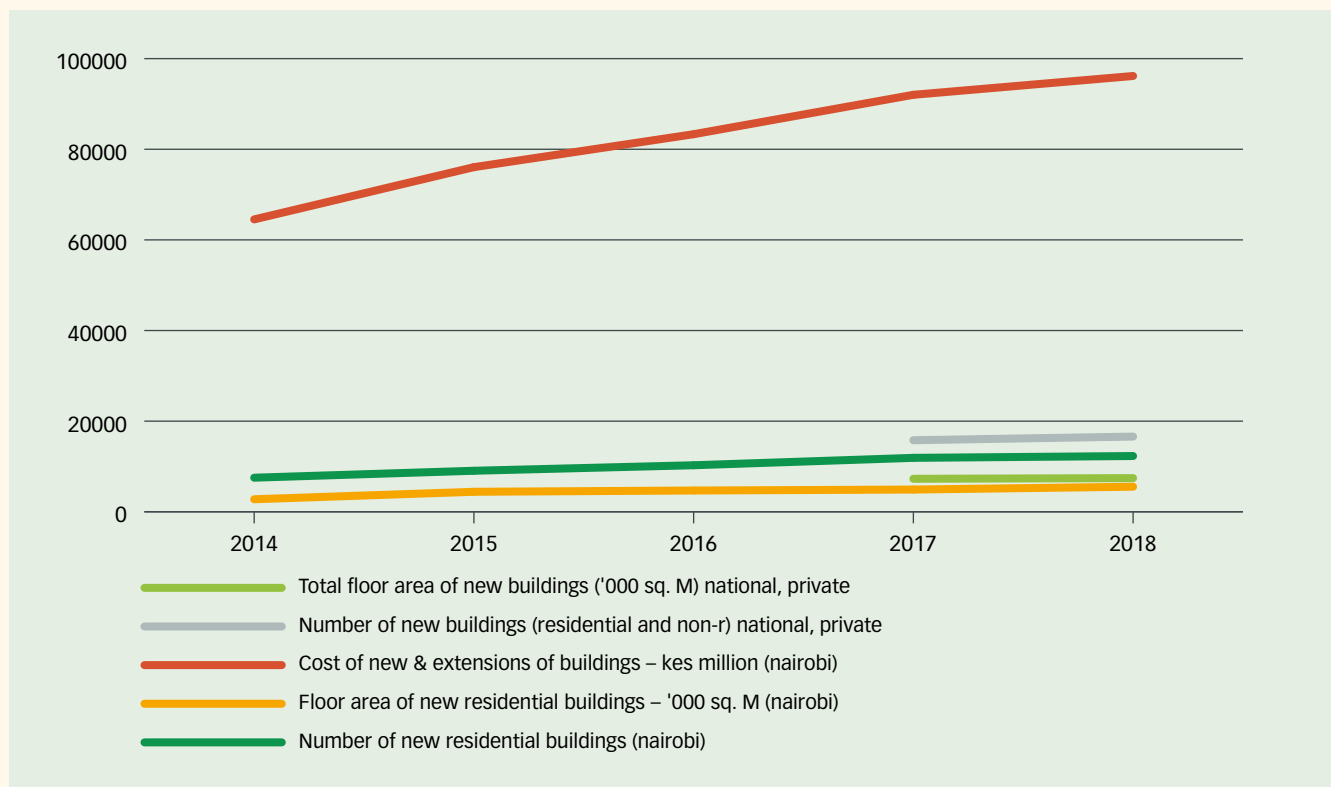
- Overall building stock in 2018 was 37 million m², comprised of:
 - 30 million m² of residential space,
 - 1.5 million m² of office and retail space,
 - 5.5 million m² of commercial buildings.²⁰
- Building stock is forecast to grow to approx. 47 million m² by 2025, with the largest growth coming from the hotel and institutional sub-sectors.
- Most modern buildings in the country are not designed and built to adapt to the local climate context.
- Building materials that are currently being used have a huge carbon footprint considering most are imported and therefore have high inbuilt energy.
- There exists a residential housing deficit of 2 million units in Kenya which has advised the focus by the government on affordable housing.

FIGURE 12: Market growth for Building Stock



Source: IFC Kenya Green Building Market Intelligence report

²⁰ Copenhagen Centre on Energy Efficiency, 2018, Energy Efficiency in Buildings.

FIGURE 13: Trend of Buildings Growth in Nairobi

INSTITUTIONAL FRAMEWORK

- The Ministry of Energy is responsible for energy policy formulation, overseeing national energy planning, and mobilizing financial resources for investments in the energy sector.
- The Ministry of Transport, Infrastructure, Housing and Urban Development is responsible for overall housing and urban development policy, the management of building and construction standards and codes, building research services, and the oversight of the construction industry.
- The National Construction Authority (NCA) is a statutory body under the Ministry of Lands, Housing and Urban Development. Its main functions are to regulate, streamline and build capacity in the construction industry. To do this, the authority registers projects, provides accreditation of supervisors and workers accreditation, and registers contractors.
- The Energy and Petroleum Regulatory Authority (EPRA) is responsible for the regulation of the energy sector.
- The construction industry in Kenya is regulated by county governments and the National Construction Authority. County governments issue the construction permit, but projects must be registered with the National Construction Authority which issues a compliance certificate, a prerequisite to commencing the construction work.
- The Ministry of Environment and Forestry is mandated to undertake national environmental policy and management, forestry development policy and management, the development of re-afforestation and agro-forestry, the restoration of strategic water towers, and the protection and conservation of the natural environment.
- The National Environment Management Authority (NEMA) promotes the integration of environmental considerations into development policies, plans, programmes and projects, to ensure the proper management and rational utilization of environmental resources on sustainable yield basis for the improvement of the quality of life in Kenya.
- The Ministry of Petroleum and Mining has been promoting clean cooking by supplying subsidized LPG cookers to marginalized communities.

KEY POLICIES AND INITIATIVES

- Kenya's Energy Act (2019) sets up the institutions and framework for the country's energy policy, empowering the Energy and Petroleum Regulatory Au-

thority (EPRA) to coordinate the development and implementation of a prudent national energy efficiency and conservation programme. It also endows the Authority with the power to designate factories and buildings and energy appliances by type, quantity of energy use or methods of energy utilization for the purposes of energy efficiency and conservation.

- The Energy Management Regulations (2012) require all commercial buildings, industrial and institutional facilities consuming more than 180,000 kWh of energy annually to develop an energy management plan, undertake an energy audit at least once every three years, prepare an energy investment plan and implement at least 50 per cent of identified savings. The Regulations also specify penalties for non-compliance and non-reporting.
- The 2106 Climate Change Act, Green Economy Strategy Implementation Plan and Vision 2030 Medium Term Plan include Green Buildings.
- The Kenya Green Building Society (KGBS) is assisting Nairobi with Green Building Principles.
- The 1958 Building Code and the Physical Planning Act 286 were revised through the Planning and Building Regulations, 2009. Currently, there is a new act known as the Physical and Land Use Planning Act, 2019.
- The Energy Act 2019 includes provisions for the planning, use, regulation and development of land and for connected purposes.
- By 2021, Kenya should finish switching from British Standard Codes to the Energy Performance of Buildings Directive 2010/31/EU. The codes consider energy efficiency and require consideration of passive design strategies (natural cooling methods, sun shading devices, use of natural lighting, proper orientation, local building materials) and renewable energy.
- The enactment of the Built Environment Bill and the Housing Bill is expected to promote energy and sustainability measures for residential housing and boost green buildings. The bills seek to establish standards and practices in the built environment during construction, maintenance and other associated works, to make provisions for matters connected therewith, to establish the National Building Inspectorate, and to give legal effect to the National Building Regulations.
- The Big Four Agenda by the government focuses on affordable housing.
- SDGs 7 and 11, and the UN New Urban Agenda, are important propositions for EE in buildings.

EXISTING SUPPORT AND CAPACITY CONSIDERATIONS

- In 2017, the International Finance Corporation (IFC) signed an agreement with the KGBS to promote a greener construction sector in Kenya. Through the agreement, the KGBS markets the IFC's EDGE (Excellence in Design for Greater Efficiency) green building software and certification programme to the Kenyan property industry and collaborates with the IFC on future technical training.
- The Centre for Energy Efficiency and Conservation, in conjunction with the Ministry of Energy, has been driving adoption, awareness and capacity-building on energy management in the industrial sector through training, Energy Management Awards and subsidized energy audits.
- Some development partners, including DANIDA, SUNREF, AFD and the EU, have been active in providing financing for efficient lighting rollout programmes, as well as credit lines to commercial banks to promote renewable energy and energy efficiency projects.
- Key challenges include:
 - The high cost of efficient appliances. This makes retrofitting a challenge, especially in residential buildings, because homeowners are reluctant to switch existing equipment and appliances with efficient ones.
 - Low enforcement and compliance with building standards.
 - Lack of Energy Use Index and a green building certification.
 - Small pool of architects and engineers well versed in the required building energy performance.
 - Access to appropriate technology and inadequate research.

4.2.2.2. Targets

TABLE 9: Agreed Targets in the Building Sector

Objectives	Indicators	Status (2019)	Target by 2025
Develop Minimum Energy Performance Standards for Buildings	1 Minimum Energy Performance Standard developed and gazetted	0	1
	Establish Baseline Energy Use Index for Buildings in Kenya	0	1
Improve the energy performance of new buildings in Kenya	Share of newly built floor area compliant with energy efficiency requirements in the total building stock	0	10%
	Adopt American Society of Heating, Refrigerating and Air-Conditioning Engineers buildings energy conservation standards or equivalent for public and commercial buildings	0	2
Improve the energy efficiency of lighting in existing public buildings	Lighting load in public buildings	0	50%
Promotion of new green public buildings	Design and construction of energy-efficient/green public buildings	0	20
	Ensure 25% of buildings under affordable housing are green buildings	0%	25%

4.2.2.3. Actions

TABLE 10: Proposed Actions in the Building Sector

Objective	Actions
Enhance the energy performance of new buildings in Kenya	<ul style="list-style-type: none"> • Minimum building energy performance standards for new buildings <p><i>Description:</i> Develop minimum energy performance standards for new buildings. These requirements will be included in the amendments to the Building Codes, which should be updated regularly (e.g. every five years). Building energy performance certification to indicate whether they meet the MEPS. The national and county governments will develop implementation strategies at the county level and offer training to building professionals to build local capacity for compliance. Adopt ASHRAE building energy conservation standards or equivalent for public and commercial buildings.</p> <p><i>Key implementation partners:</i> Ministry of Energy, State Department for Public Works, CG (County Governments), EPRA, KEBS, NEMA, NCA, Ministry of Health, Council of Governors (CoG).</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> • MEPS for buildings, • Energy Use Index, • Amendments to the Building Codes/legislation on the technical building standards, which will include requirements for building energy performance, • Established baselines for green buildings, • Adoption of regulations on building energy performance certification, • Implementation strategy for minimum building energy performance requirements and certification at the county level, • Training programmes for architects and other building professionals on building energy efficiency and green building design.

Objective	Actions
Improve the energy performance of existing buildings in Kenya through retrofits	<p>Programme for energy-efficient upgrade and renovation of existing buildings</p> <p><i>Description:</i> Adopt a nationwide programme for the energy-efficient upgrade and renovation of existing buildings. Old government and public buildings should be retrofitted with efficient appliances, including lighting, power factor correction, efficient motors and passive energy (e.g. natural light and ventilation). Sound implementation strategies at the national and county level will be critical. Training of building professionals will be key to improve compliance with the adopted requirements. Certification of retrofits. Enhance the capacity of EPRA to enforce the EMR 2012. Promotion of ESCOs to enhance implementation of EE recommendations. Develop an incentive and recognition scheme for facilities that transition to energy efficiency in buildings.</p> <p><i>Key implementation partners:</i> Ministry of Energy, State Department for Public Works, Ministry of Transport, Infrastructure, Housing and Urban Development, county governments, KAM.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> • Governmental Decree on the adoption of the programme for the energy-efficient upgrade and renovation of existing buildings and respective technical documentation, • Increased compliance with Energy Management Regulations 2012, which cover all designated facilities including buildings, • ESCO implementation strategies of the programme for energy-efficient upgrade and renovation of existing public buildings, • Training programmes for building professionals on how to perform energy-efficient building renovation.



4.2.3. INDUSTRY AND AGRICULTURE

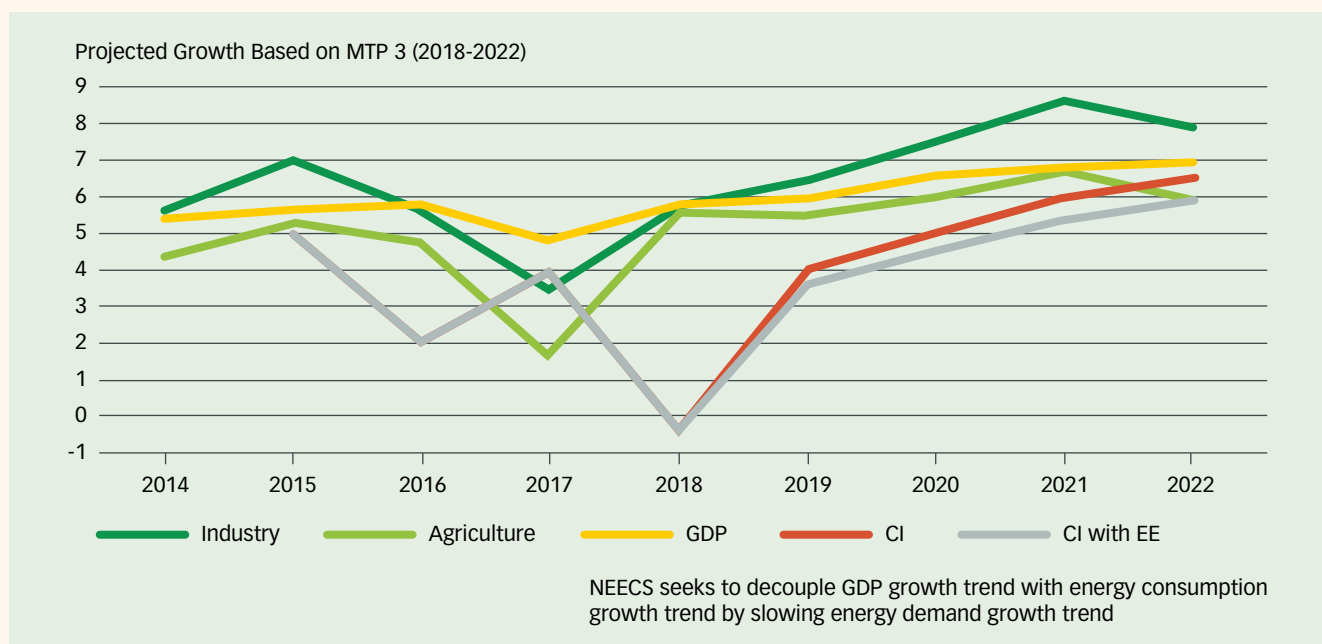
In the context of this strategy, industry refers to all activities involved in manufacturing/processing a product or provision of particular services, while agriculture refers to all activities involved in crop and animal production.

4.2.3.1. Status

OVERALL TRENDS

- In 2019, manufacturing contributed 7.7 per cent of GDP in Kenya while agriculture accounted for 34.2 per cent. In 2014, the contributions were 10 per cent and 27.5 per cent, respectively.²¹ The expansion of industry has largely stagnated since the 1980s due to high energy costs, regional competition and increased globalization, which opened the local market to cheaper imported products. However, the industry and manufacturing sectors have become increasingly important to the Kenyan economy due to the government's 'Buy Kenya-Build Kenya' initiative, which is expected to enhance the competitiveness of local firms and stimulate local production, promoting industrialization as a key priority area in Vision 2030.
- Under the MTP 2017 to 2022, manufacturing is one of the priority items under the Big Four Agenda.
- Large and Medium (commercial and industrial) consumers account for 50 per cent of the electricity demand in Kenya. The electricity consumption of commercial and industrial consumers increased from 4,199.0 GWh in 2017 to 4336.5 GWh in 2018. Most of the industries in Kenya are under this category of consumers (KNBS, 2019).
- Industrial energy efficiency is of great importance to expanding energy access, improving business competitiveness, and enhancing energy security.
- Agriculture contributed 34.1 per cent to Kenya's GDP in 2019²⁹ and remains an important economic sector in the country.
- With increasing utilization of solar energy in Kenya, productive use of energy for agricultural activities is rising as they tend to reduce energy consumption and operating costs.

FIGURE 14: Projected Growth Based on MTP 3 (2018-22)



²¹ KNBS, 2019. Economic Survey 2019.



- Some challenges exist in the agricultural sector for irrigation, processing and supply chain wastage. These have informed the development of most off-grid solar systems for productive use, including solar water pumping and cold storage.
- Figure 14 shows the projected growth of the two sectors in the Medium-Term Plan with respect to the GDP.
- Figure 15 shows trends of fuel sale in Kenya while Figure 16 shows the consumption and projected demand for coal and coke.

and industrial energy consumption growth corresponds with an increase in GDP, however, with the introduction NEECS this growth in energy demand will be slowed.

From figure 15, it is evident that the sale of petroleum has increased steadily from the year 2014 with a dip in 2018 whose explanation can be due to the general election in 2017.

Despite the overall increase in petroleum sale, the agriculture sector has experienced small steady increase.

From figure 14, it can be seen that the industry growth, generally corresponds with the growth in GDP, this trend is also maintained when looking at the relationship between Agriculture and GDP. The commercial

There is an increase in coal and coke consumption on the business as usual scenario while with the implementation of the strategy there is expected to be a reduction on coal and coke consumption.

FIGURE 15: Domestic Sale of Petroleum Fuels (2014-18)

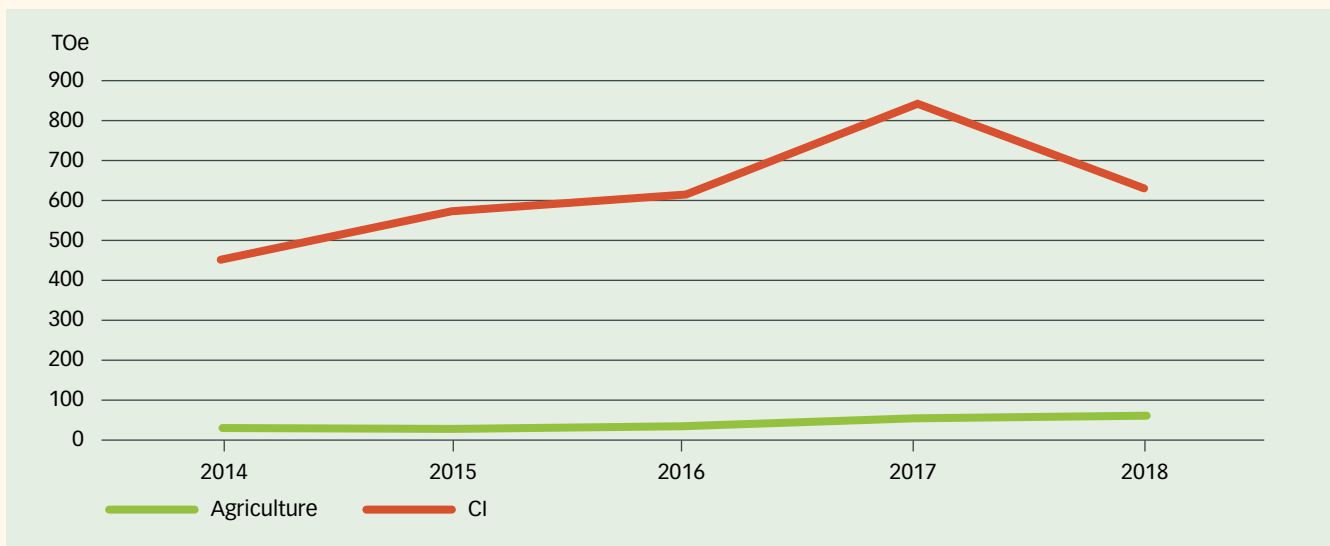
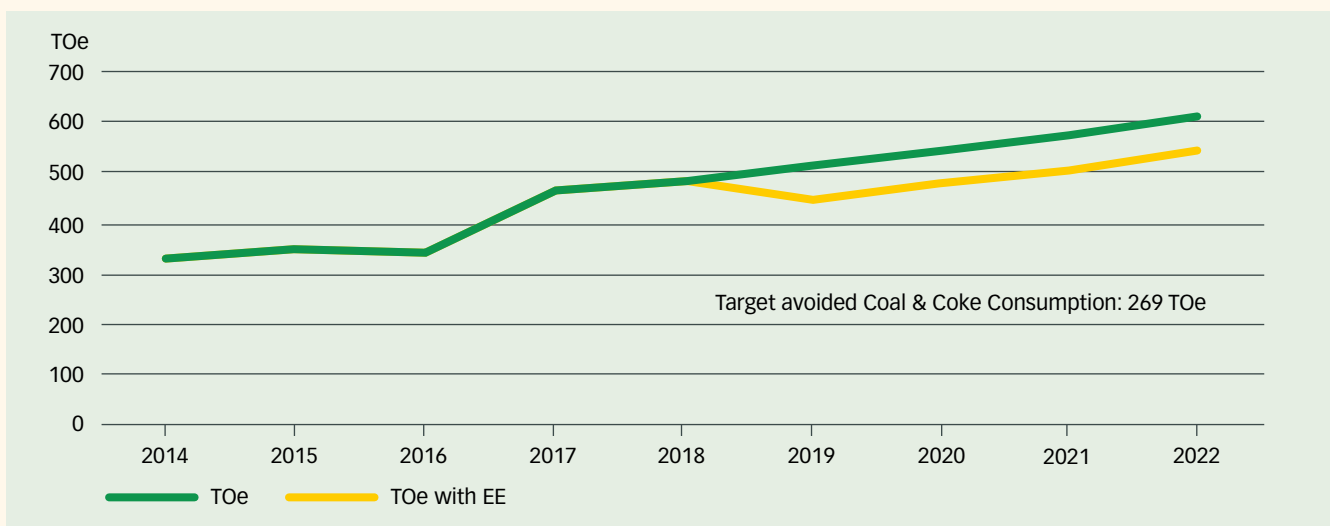


FIGURE 16: Coal & Coke Consumption (2014-22)



Data Source: KNBS Report 2018



INSTITUTIONAL FRAMEWORK

- The Energy Act 2019 mandates EPRA to take overall responsibility in coordinating the development and implementation of a national energy efficiency and conservation programme in Kenya. EPRA is legally mandated to license energy auditors and enforce the Energy Management Regulations of 2012. EPRA is also mandated to promote Energy Service Companies to implement energy efficiency solutions.
- In conjunction with the Ministry of Energy, the Kenya Association of Manufacturers (KAM) established the Centre for Energy Efficiency and Conservation (CEEC) in 2006, to run government-supported energy efficiency and conservation initiatives designed to help facilities identify energy wastage, determine saving potential and recommend the measures to be implemented.
- Major programmes run by KAM through CEEC include subsidized energy audits, training and certification, awareness-raising, and the Energy Management Award.
- The Ministry of Energy formulates, promotes and implements energy efficiency policies in collaboration with KAM and other key partners.
- Development partners have also played a key role in enhancing energy efficiency activities in Kenya.
- Minimum Energy Performance Standards have been developed and are available at KEBS.

KEY POLICIES AND INITIATIVES

- The Energy Management Regulations 2012 stipulated that industrial or commercial consumers using more than 180 MWh equivalent of energy per year must make a commitment to introduce an energy conservation policy and conduct energy audits at least once every three years. They should implement the recommended measures, achieve at least 50 per cent of the expected savings from the recommended measures and submit implementation reports to EPRA.
- EPRA reports that between 2012 and 2019, 1,800 out of the 4,000 designated facilities undertook energy audits.
- The Minimum Energy Performance Regulations were developed, making it mandatory for selected electrical appliances to achieve Minimum Energy Performance Standards (MEPS).
- KAM conducts regular impact assessment and gives annual Energy Management Awards. The verified monetary savings from implementation of EE meas-

ures since 2006 is equivalent to monetary savings of KES 13 billion.

- There is an increasing focus on industry and agriculture due to the government's prioritization of the Big Four Agenda, which focuses on food security, affordable housing, manufacturing and affordable healthcare for all
- EE is key to the realization of Kenya's climate targets, especially the Nationally Determined Contributions (NDCs) under the Paris Agreement.²² It is also central to the achievement of the country's Vision 2030,²³ the national development blueprint which aims to make Kenya a middle-income country by 2030.
- EE can play a great role in promoting sustainable development and human wellbeing. Assessments indicate that under existing policies, about 66 per cent of the economically viable EE potential available between now and 2035 will remain unrealized because EE is widely and significantly undervalued.²⁴

EXISTING SUPPORT AND CAPACITY CONSIDERATIONS

- Government support is critical for the success of EE improvement in the sector.
- There is a need to strengthen EPRA administrative capacity to enforce the 2012 Energy Management Regulations.
- The Energy Management Regulations can be enhanced to provide strong legal instruments to eliminate non-compliance. The enhancement should include punitive penalties. Implementation of the energy management regulations can be enhanced by building capacity for other agencies, so that licensing is linked to submitting energy audit reports. This can be done at various levels towards meeting full compliance. This needs more investment in capacity-building.
- Low compliance rates may be due to the high costs of quality audits.
- The Energy Act 2019 gives more authority to counties to set up energy efficiency funds and attract

²² UNFCCC, 2015, <http://meas.nema.go.ke/unfccc/>.

²³ Republic of Kenya, 2008, Kenya Vision 2030.

²⁴ International Energy Agency (IEA), 2014b. Energy efficiency: a key tool for boosting economic and social development [WWW Document]. International Energy Agency. URL <https://www.iea.org/newsroom/news/2014/september/energy-efficiency-a-key-tool-for-boosting-economic-and-social-development.html> (accessed 11.12.18).



funds from elsewhere. There is a need to build capacity of counties for energy officers in counties

- Existing county energy demonstration centres can be enhanced to make EE information more available.
- The insufficient implementation of identified EE measures is to some extent due to a lack of finances and technical capacity to undertake Measurement, Reporting and Verification (MRV) of energy savings. A robust MRV system and reliable data on energy saving and costs can improve industrial managers' confidence and interest in energy efficiency actions.
- It is important to improve access to finance, based on reduced energy expenses. There is need for a financing pipeline to support energy efficiency projects. This would lead to a vibrant ESCO model for accelerated EE implementation in Kenya.
- There is a need to enhance capacity-building of local financial institutions in implementing the ESCO models.
- Although there is a pool of qualified technical personnel, fewer than 80 experts have been licensed to practise as Energy Auditors. More than 230 have the necessary certification to apply for licensing by EPRA.
- While licensed auditors are competent to undertake audits in industries, there are some specialized sub-sectors that may require special expertise, which the existing auditors may lack, making it necessary to train and license specialized auditors. More qualified and specialized auditors will lead to improved quality of energy audits and more confidence from industries during implementation.
- Studies have shown that industries lack internal skills to implement EE measures and that there are few people skilled in energy management, despite the legislation requiring designated facilities to appoint an energy manager.
- There is a need to increase the awareness of EE benefits among the designated facilities' top management and financial officers.
- Currently, under one per cent of designated facilities have a licensed energy manager.
- Key challenges towards EE can be summarized as inadequate awareness on EE benefits, limited technical capacity, training, high upfront costs, few incentives and low awareness of the existence of credit facilities.
- There is a need for close collaboration among key agencies and organization like KENGEN, IPPs, KENTRACO KPLC, EPRA, KAM and AEPEA. Such collaboration should be institutionalized for greater benefits to the country.



4.2.3.2. Objectives and Targets

TABLE 11: Agreed Targets in the Industrial and Agriculture Sector

Objectives	Indicators	Status (2019)	Target by 2025
Increase the reach of successful industrial energy efficiency programmes	Number of audited facilities	1,800	4,000
Improve the acceptance of energy audits and implementation of energy audit recommendations	Number of certified energy efficiency professionals	70 licensed EE professionals	120 licensed EE professionals
Enhance the implementation of recommended EE measures	Estimated industrial energy savings	Current estimated annual savings level from programmes: 177,000 MWh/20MW demand/51m litres heavy fuel oil/1.8m litres industrial fuel oil ^a	885,000 MWh/100MW demand/250m litres heavy fuel oil/9.0m litres industrial fuel oil ^b
	No. of ESCOs created and undertaking EE projects	0	5
Improve EE in the agricultural value chain in off-grid areas	Demonstration projects for EE in Productive Use of Energy activities in agricultural value chain in off-grid areas. Target projects include pumping water systems, cold chains, and grain milling.	0	5

^a These Figures derived as estimates based on Rencon (2019), *Study to Assess and Ascertain the Impact of Energy Audits on Implementation of Energy Efficiency Measures, Savings Achieved and Barriers to Implementation for selected Firms in Kenya*, Draft Final Report, and May 2019. Savings for 51 firms were extrapolated 30-fold to represent the 1,500 audits already conducted, and then discounted by a factor of 50 per cent, to account for the fact that many sites not included in the study are likely smaller and/or less likely to implement ECMs than those included in the study.

^b Targets derived by assuming a 333 percent increase in number of audited sites, and an increase in implementation rate from approx. 45% in the study to an assumed 75 per cent by 2025.

4.2.3.3. Actions

TABLE 12: Proposed Actions in the Industry and Agriculture Sectors

Objective	Actions
Increase the adoption of energy efficiency programmes	<p>Enhance EPRA capacity to monitor compliance with existing Energy Management Regulations 2012 for all designated facilities.</p> <p><i>Description:</i> There is low compliance with EMR 2012. Fewer than half of the targeted designated facilities have undertaken mandatory audits. EPRA currently has insufficient capacity to ensure adequate compliance. There is still a low number of licensed EE auditors in the country.</p> <p><i>Key implementation partners:</i> EPRA, KAM, AEPEA, KENAFF, Others: banks/financing/county governments/DSM-KPLC.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> • Related analysis on the streamlining of ISO 50001 and its integration into the revised Energy Management Regulations, • Introduce white certificates, which are a tradable asset and proof that a certain percentage of energy savings has been achieved relative to a baseline, • A study on energy efficiency benchmarks for Kenya's industrial sector, • The development of fiscal incentives to promote EE with payback period up to five years.



Objective	Actions
<p>Improve the acceptance of energy audits and implementation of energy audit recommendations</p>	<ul style="list-style-type: none"> • Improvement of competence and number of professionals trained to carry out energy audits and verify energy savings <p><i>Description:</i> It is necessary to strengthen the competence and number of audit professionals and to improve industry confidence in implementation processes through the availability of stronger M&V and facilitation skills.</p> <p><i>Key implementation partners:</i> MoE, KAM (CEEC), NITA, EPRA, RREC, AEPEA.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> • Tailored energy management, audit and M&V training curricula that match the Kenyan conditions, • Established local accreditation programmes for certified investment grade auditors and certified energy savings verifiers, drawing on international standards and materials, • At least ten training courses delivered to accredit increased numbers of professionals (across energy management, auditing and M&V)/ accreditation of institutions, • Dissemination of energy efficiency and conservation information through seminars targeting energy managers and decision-makers in the industry, • More professionals trained in new curricula.
<p>Enhance EPRA and CEEC activities</p>	<ul style="list-style-type: none"> • Support EPRA for enforcement and compliance activities <p><i>Description:</i> Increase oversight and enforcement to improve compliance with Energy Management Regulations and allocate resources to facilitate implementation activities. The EPRA should take a more directive role to enhance programme impact.</p> <p><i>Key implementation partners:</i> EPRA, KAM.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> • Compliance Report on the existing Energy Management Regulations, including any recommendations for remedial actions, • Industry EE benchmarks are established, • Analysis report is produced on existing audits to shape future interventions in commercial and manufacturing sectors and to quantify potential future savings, • Dissemination of energy efficiency and conservation information through seminars targeting energy managers and decision-makers in industries, including expanding EPRA's presence and communications outreach at the county level.
<p>Promote the use of efficient off-grid Productive Use of Energy</p>	<ul style="list-style-type: none"> • Increase the use of efficient off grid productive uses of energy (PUE) especially in the agricultural sector <p><i>Description:</i> Promote the use of efficient off-grid Productive Use of Energy in the agriculture sector. Key areas include solar hydroponics; solar-powered irrigation (drip and pumping); solar- or biogas-powered cold storage and dryers; micro grids providing decentralized power for fish hatcheries, irrigation, and other agricultural businesses; solar-thermal passive aeration systems for aquaculture; and various hybrid systems including hybrid-powered tractors.</p> <p><i>Key implementation partners:</i> Ministry of Agriculture, county governments, RREC, EPRA, Farmers organizations, off grid appliances suppliers, mini-grid developers.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> • Market Analysis Needs Report focused on mapping agricultural value chains where off-grid solutions will be utilized, • Capacity-building programmes by county governments on agriculture value chains, • Credit schemes and concessional loans, and improved results-based financing.

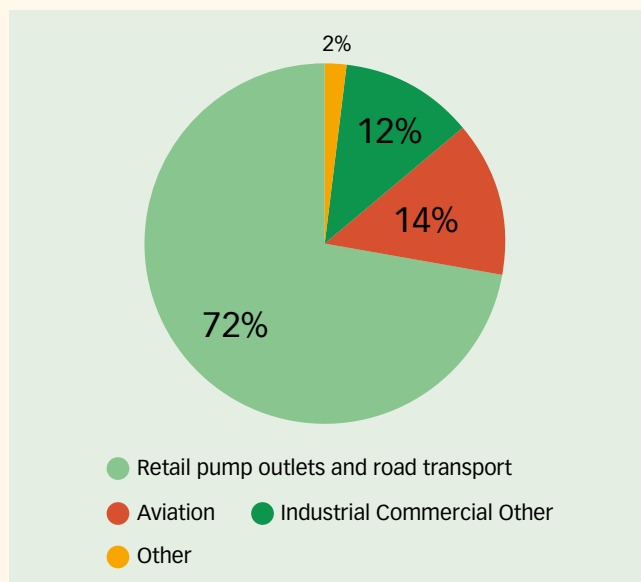
4.2.4. TRANSPORT

4.2.4.1. Status

OVERALL TRENDS

- The transport sector consumes about 72 per cent of all the petroleum products imported into Kenya (figure 17).
- Figure 18 shows an upward trend in petroleum fuel consumption in the transport sector from 2014 to 2018. With the intervention of this strategy, there will be a reduction in the consumption of petroleum fuel consumption as indicated in the projection in Figure 19.
- Road transport sectors accounted for 84.5 per cent of the petroleum fuels demand followed by the air transport sector at 15.1 per cent (Figure 17).
- Railway freight transport more than tripled from 1,147 tonnes in 2017 to 3,544 tonnes in 2018, mainly due to the introduction of freight transport services on the standard gauge railway (SGR). Similarly, passenger journeys increased by 45 per cent from 3,096,000 in 2017 to 4,487,000 in 2018.
- Water transport sector: total cargo handled at the Mombasa port increased by 2 per cent from 30.3 million tonnes in 2017 to 30.9 million tonnes in 2018. The volume of container traffic handled increased by 8.3 per cent from 1.2 million twenty-foot equivalent units (TEUs) in 2017 to 1.3 TEUs in 2018.

FIGURE 17: Petroleum Fuel Consumption by Sector in Kenya, 2019



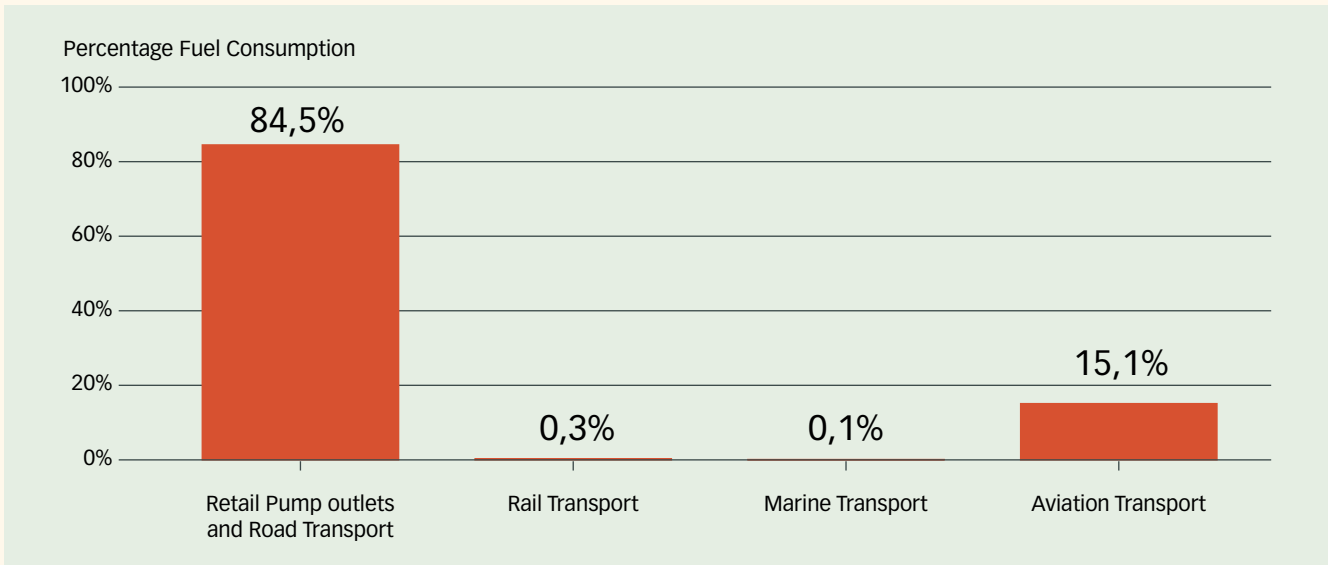
- The LAPSETT Project, which includes the new Lamu Port, is expected to increase energy demand. High energy demand requires EE intervention actions.
- Air transport: the total number of passengers handled increased by 16.8 per cent from 10.1 million in 2017 to 11.8 million in 2018. The volume of commercial cargo traffic handled increased by 23.3 per cent from 290.8 thousand tonnes in 2017 to 358.7 thousand tonnes in 2018.
- Kenya currently has about two million vehicles, of which about 98 per cent use petrol and diesel.
- There has been less focus on efficiency in the sector as the motor vehicle inspection focuses on safety issues.
- The transport sector contributed 8 per cent to GDP in 2019.²⁵ Road transport accounted for 5.5 per cent, while air transport accounted for 0.5 per cent.
- Road transport accounts for over 80 per cent²⁶ of domestic freight and passenger traffic.
- The road vehicle fleet has expanded by up to 400 per cent since 2008, due to liberalization policies that have encouraged importing used vehicles. Imported second-hand vehicles accounted for 85 per cent of Kenyan car purchases in 2017.
- In 2018, a total of 102,036 motor vehicles and 195,253 motorcycles (and tuk-tuks) were registered. This means that the average monthly registration is about 8,500 motor vehicles and 16,270 motorcycles.
- It is estimated that 30 per cent of all the vehicles operating in Kenya are more than 15 years old. As vehicles get older, their efficiency declines and their operating cost increases.²⁷
- Most people in Kenya depend on public transport for mobility. Public transport is dominated by matatus (buses, minibuses, and vans), motorcycles (bodaboda), bicycles and tricycles.
- Currently, about 80 per cent of the demand for urban public transport is met by matatus, which number over 100,000.

²⁵ KNBS, 2019. Economic Survey 2019.

²⁶ Moraa G., 2018. Exploring Public Road Passenger Transport In Kenya

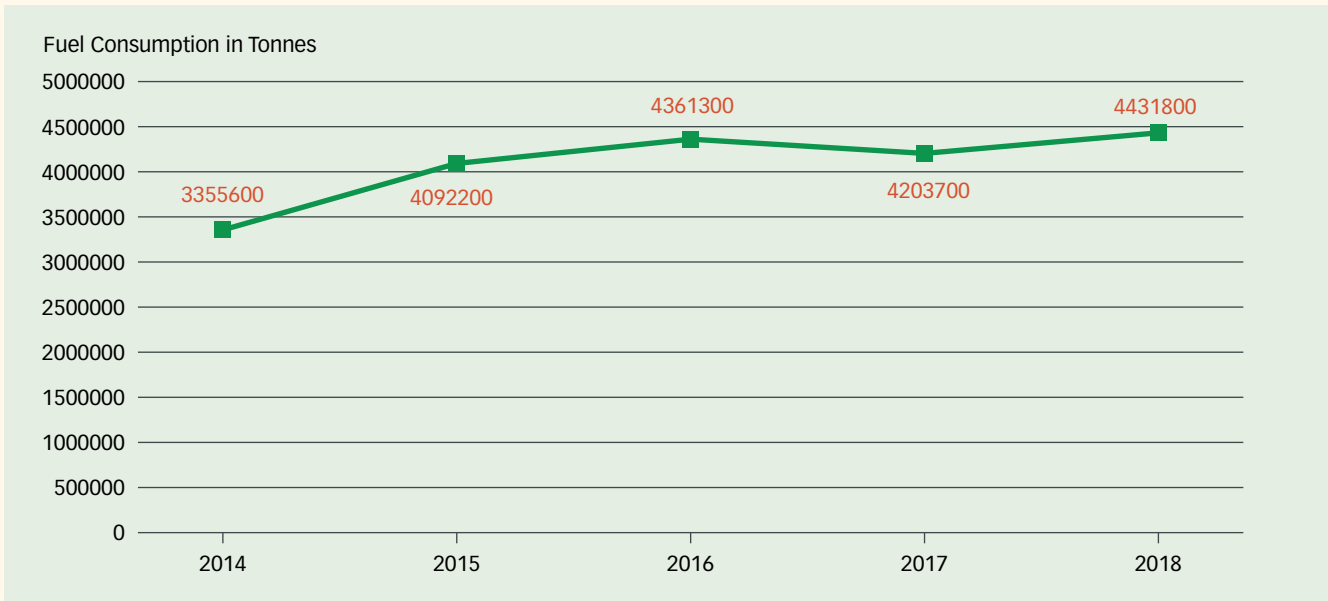
²⁷ <http://www.kmi.co.ke/kmi-briefs/vehicle-ages/https://t2m.org/exploring-public-road-passenger-transport-in-kenya/>

FIGURE 18: Petroleum Fuel consumption in Transport by category in Kenya, 2018



Source: KNBS, Economic Survey, 2019

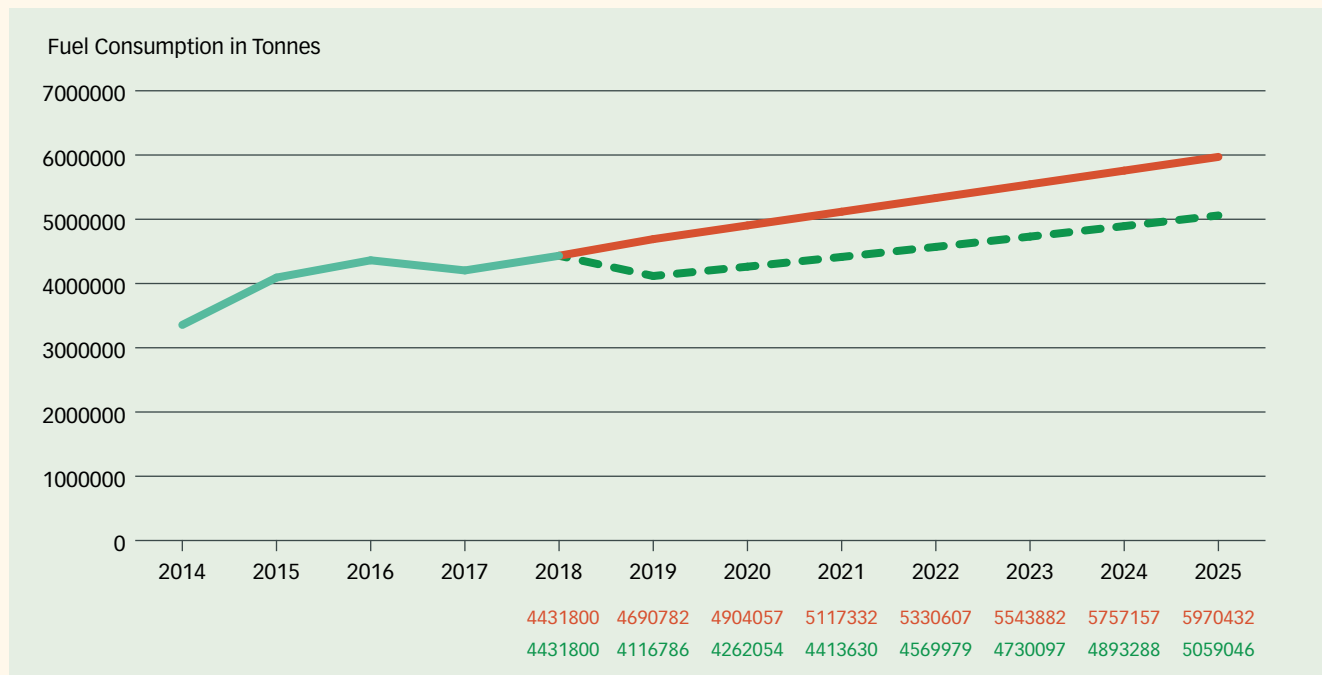
FIGURE 19: Trends in Petroleum Fuel Consumption in Transport,



Source: KNBS, Economic Survey, 2019

- There is a challenge in regulating the transport sector, contributing to disorder on the roads and energy inefficiencies.
- The Kenya Ports Authority has adopted a Green Port Development (GPP) Initiative, aimed at enhancing environmental conservation. This will involve a future requirement for ships calling at the Port of Mombasa to switch off their diesel engines and use electric power instead while docked.
- The importance of railway transport is increasing with a target of increasing the railway capacity to handle 50 per cent of freight cargo (25 million tonnes) from the Mombasa Port.
- There are plans to upgrade the Commuter Core System (existing commuter rail line) and to construct a railway line from JKIA to the Syokimau Railway Station.

FIGURE 20: Projection for Fuel consumption over the years 2018-2025



Source: KNBS, Economic Survey Report 2019

INSTITUTIONAL FRAMEWORK

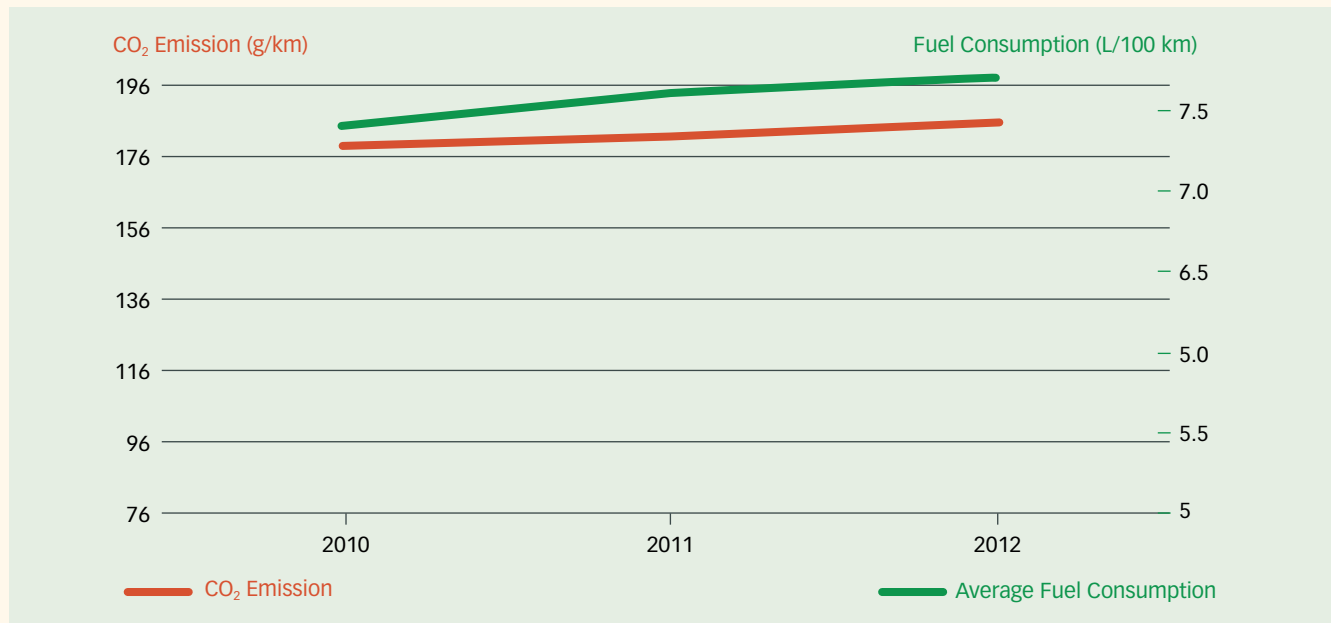
- The overall responsibility for transport administration lies with the Ministry of Transport, Infrastructure, and Housing and Urban Development. The Ministry develops standards and regulations with other stakeholders and enforces them to ensure safe, secure and efficient transport and infrastructure systems.
- The National Transport and Safety Authority (NTSA) harmonizes the operations of the key road transport departments and helps in effectively administering the road transport sub-sector while holding jurisdiction over many issues that may be related to efficiency improvement.
- The other related agencies are KURA (Kenya Urban Roads Authority), KERRA (Kenya Rural Road Authority) and KENHA (Kenya National Highway Authority), which are responsible for the management, development, rehabilitation and maintenance of roads under their jurisdiction.
- The Energy and Petroleum Regulatory Authority (EPRA) is responsible for regulating fuel prices and carrying out monthly reviews of fuel prices. It also has the responsibility of regulating the fuel efficiency of vehicles.
- The Nairobi Metropolitan Area Transport Authority (NAMATA) was formed under the provisions of

the State Corporations Act. Its main mandate is to address transport challenges in Nairobi.

- Chapter Fourteen of the Integrated National Transport Policy, 2009 proposes the use of lead-free and low-sulphur fuels. It stipulates the blending of efficient and less polluting fuels. It also provides strategies for dealing with public service vehicles concerning proper maintenance, and air and noise pollution.

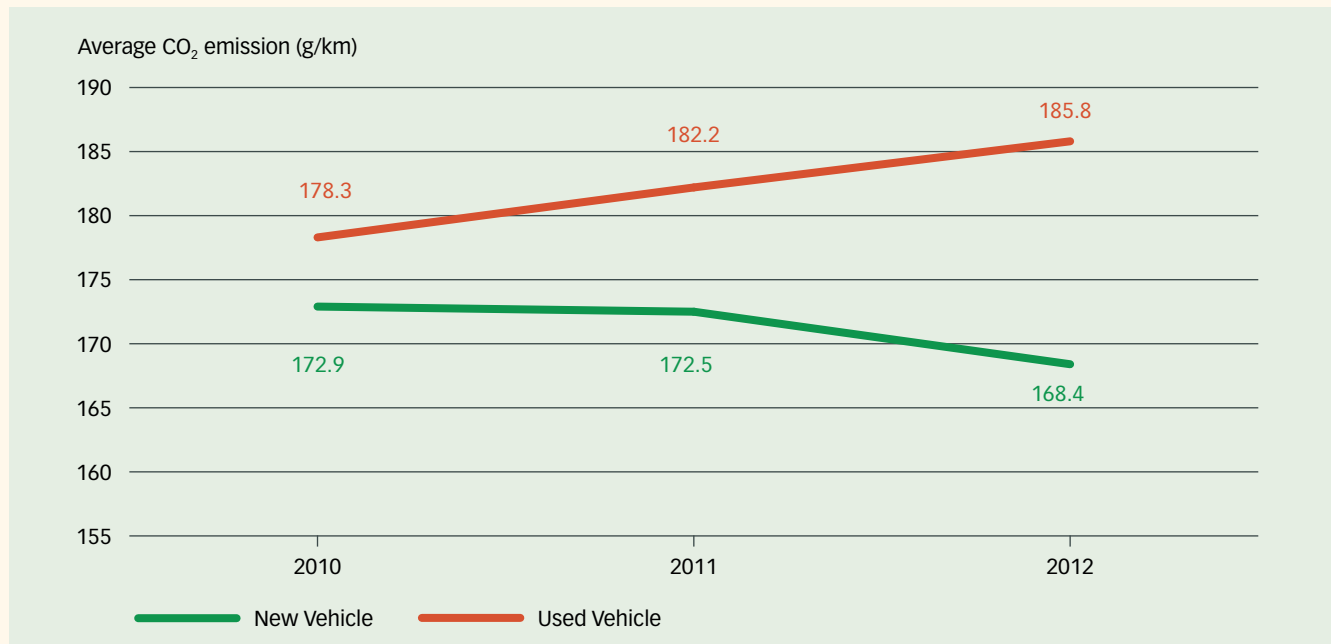
KEY POLICIES AND INITIATIVES

- The country has developed a Code of practice for inspection of road vehicles (KS 1515; 2000). This Code stipulates that vehicles should not emit visibly coloured smoke, the concentration of carbon monoxide (CO) should not exceed 0.5 per cent by volume and hydrocarbons should not exceed 0.12 per cent by volume.
- In 2003, the Ministry of Transport issued Legal Notice No. 161 on Integrated National Transport Policy, which aimed at streamlining public service vehicle operations such as internal control, efficiency, and affordable and safe transport service.
- In February 2017, an Executive Order was issued to create the Nairobi Metropolitan Area Transport Authority (NAMATA) under the enabling provisions of the State Corporations Act.

FIGURE 21: Trends in Fuel Consumption and CO₂ Emissions over the period 2010–12


Source: UNES 2014, Report on Global fuel Economy Initiative Study in Kenya (GFEI)

- More synergy and coordination are required between the various agencies involved in transport sector administration to implement the proposed actions in this strategy. The successful implementation of a road transport energy efficiency programme will involve coordination between different Departments within the Ministry of Transport, Infrastructure, Housing and Urban Development (MTIHU), and between MTIHU and MoE.
- NTSA conducts annual inspection on heavy commercial and public vehicles. However, the inspection does not include efficiency tests.
- There are plans to introduce Bus Rapid Transit (BRT) in Nairobi.
- The Non-motorized Transport (NMT) Policy, 2015 of Nairobi County strives to include NMT within an Integrated Transport System. The policy sets out objectives and strategies to realize an improved NMT environment in Nairobi.
- Kenya is developing inclusive vehicle emission regulations that seek to reduce the vehicle emissions in the country. The regulations are expected to help improve air quality in Kenya by allowing the government to outsource vehicle emission tests to the private sector.
- The Traffic Act requires all motor vehicles above four years old to be subject to annual road worthiness tests, including tests on vehicle emissions.
- The Environmental Management and Co-ordination Act, 1999 (EMCA, 1999) requires the standards and enforcement review committee, in consultation with relevant lead agencies, to recommend guidelines to minimize emissions of greenhouse gases and identify suitable technologies to minimize air pollution.
- There are currently only 17 public vehicle inspection centres, which are insufficient to inspect all vehicles on the road.
- There is a regional push towards harmonization of vehicle emission standards within the East African Community.
- The role of the county governments in the county transport administration covers local roads, street lighting, traffic control and parking, as well as public road transport.
- Kenya Standard KS1515:2000 prescribes the age and performance requirements on cars that may be imported into Kenya. A proposal has been made to restrict the importation of vehicles that are older than three years. The current regulations allow the importation of cars that are up to eight years old.
- The KEBS, on the basis of stakeholder consultations, has developed standards for e-mobility. KS


FIGURE 22: Trends in CO₂ Emissions in the period 2010-12


Source: UNES 2014, Report on Global Fuel Economy Initiative Study in Kenya (GFEI)

ISO 8714:2002 on energy consumption and range of electric vehicles, KS ISO 23274-12:2013 for hybrid-electric road vehicles exhaust emissions and fuel consumption measurements.

- In the National Budget of 2019/2020, the excise duty of electric vehicles carrying more than 10 persons was lowered from 20 per cent to 10 per cent. Investors have also been allowed to import electric golf vehicles and sightseeing buses with a motor capacity of 72V/6.2 kW that are designed to carry more than ten persons, as well as other vehicles of any capacity propelled by an electric motor.

EXISTING SUPPORT AND CAPACITY CONSIDERATIONS

- Fuel Consumption is proportional to CO₂ emissions (Figure 21).
- The Global Fuel Economy Initiative is currently supporting Kenya to develop vehicle policies and strategies to encourage the importation of more fuel-efficient vehicles. This will include fiscal guidelines such as CO₂-based taxation, consumer awareness schemes like mandatory vehicle labelling, and new vehicle purchase schemes. New vehicles are more energy-efficient and produce lower emissions (Figure 22).
- The NAMA Facility aims to support Kenya's first Mass Rapid Transit System (MRT) as a Nationally Appropriate Mitigation Action (NAMA). The NAMA is designed to provide modal alternatives. It will build a new Bus Rapid Transit (BRT) system and aims to shift significant shares of passenger transport to the BRT system.
- The limitations and impacts of these and other existing regulations are undermined by issues in enforcement and implementation.
- The World Bank estimated that in 2014, traffic jams in Nairobi cost KES50 million a day. Nairobi had a Commuter Pain Index of 88 per cent.²⁸ In comparison, Buenos Aires, Argentina had a score of 42 per cent.
- The Nairobi Integrated Urban Development Master Plan (NIUPLAN) focuses exclusively on building road and public transportation infrastructure.
- Several gaps exist in Kenya, including:
 - no programme aiming at reducing transport energy demands,
 - no programme encouraging people to use more energy-efficient modes of transport,

²⁸ IBM, 2011. Data taken from IBM Commuter Pain Index. IBM Global Commuter Pain Survey: traffic congestion down, pain way up; 2011. <http://www-03.ibm.com/press/us/en/pressrelease/35359.wss>.

- no national reporting system to track and report key transport efficiency metrics,
 - no sub-sectoral EE goal for transport,
 - limited research and data on the gap between current vehicle emission standards and gasoline/on-road diesel quality,
 - no clear initiative to improve the diesel emission standards in Kenya to Euro 4 from the current Euro 2equivalent.
- Increasing motor vehicles on the road contribute to about 90 per cent of urban air pollution (UNEP, 2011).
 - Under the ‘business as usual’ scenario, the number of vehicle trips was projected to increase by 120 per cent between 213 and 2030 in the Nairobi Metropolitan Area, with the average speed of trips decreasing from 41.2km/hr to 23.1km/hr as congestion worsens(JICA, 2013).²⁹
 - There are important health implications of roadway emissions, especially for people with prolonged exposure, such as individuals living near roadways and/or for population subgroups that are particularly sensitive to health impacts, such as children and the elderly.³⁰ Of great concern are the large concentrations of pedestrians who walk along busy Nairobi roads.

4.2.4.2. Objectives and Targets

TABLE 13: Agreed Targets in the Transport Sector

Objectives	Indicators	Status (2019)	Target by 2025
Improve fuel economy performance and reduce CO ₂ emissions in Kenya	<ul style="list-style-type: none"> • Average fuel consumption (light duty vehicles) per 100 km travelled • Average CO₂ emission per km travelled 	Average fuel economy = 7.5 L/100km ^a Average CO ₂ emission = 181.9 g/km ^b	6.5 L/100km 160 g/km
Increase the adoption of E-Mobility	<ul style="list-style-type: none"> • Share of electric/hybrid vehicles in total vehicles imported into Kenya 	0%	5% of imported electric cars annually
Enhance public modes of transport	<ul style="list-style-type: none"> • No of passengers using commuter trains in Nairobi City 	116,000	150,000
Improve urban vehicular management	<ul style="list-style-type: none"> • Enhanced Speed of Vehicles in urban areas through reduced traffic jams and increased parking capacity 	41 km/hour (Nairobi)	50 km/hour (Nairobi)

^a University of Nairobi Enterprises and Services Ltd (UNES), 2014. *Report on Global Fuel Economy Initiative Study in Kenya, Final Narrative Report*, July 2014.

^b *ibid.*

²⁹ Japanese International Cooperation Agency (JICA), 2013. *The Study on a Master Plan for Urban Transport in the Nairobi Metropolitan Area in the Republic of Kenya.*

³⁰ Pope CA, III, Dockery DW, 2006. Health effects of fine particulate air pollution: Lines that connect. *The Journal of Air and Waste Management Association.* 2006; 56:709–742.

4.2.4.3. Actions

TABLE 14: Actions in the Transport Sector

Objective	Actions
Improve fuel economy performance of vehicles in Kenya	<ul style="list-style-type: none"> • Initiate Fuel Economy Standards and Labelling for vehicles <p><i>Description:</i></p> <ul style="list-style-type: none"> • Develop and adopt fuel economy standards and labelling for vehicles. The labels will include average fuel consumption per mile and CO₂ emissions. <p><i>Key implementation partners:</i> Ministry of Transport/ NTSA/Ministry of Energy/Treasury/KRA/county governments/Kenya Bureau of Standards/EPRA/KURA/KENHA NEMA NAMATA, and others.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> • Vehicle efficiency standards and labelling for all vehicles imported and sold in Kenya, • Policy restricting the age of second-hand vehicles imported into Kenya to a maximum of five years, • Collecting annual license fees based on the results of annual inspections on fuel economy and CO₂ emissions, • Implementation of vehicle inspection for emissions.
Increase adoption of E-Mobility	<ul style="list-style-type: none"> • Increase adoption and uptake of E- Mobility <p><i>Description:</i> Regulatory actions and financial mechanism to increase the ownership of electric vehicles in Kenya</p> <p><i>Key implementation partners:</i> NTSA, Treasury, MoE / MoT / Treasury / county governments / EPRA / private sector investors.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> • Incentives through lower import duty for electric cars, bicycles and tuk-tuks and lower vehicle road taxes, • Revised Building Code incorporating charging stations in public buildings and new estates, • Awareness-raising on EE in vehicles and e-mobility.
Improve urban vehicular management	<ul style="list-style-type: none"> • Reduce fuel consumption through better vehicle movement management <p><i>Description:</i></p> <ul style="list-style-type: none"> • Implement actions to reduce overall fuel consumption of motor vehicles, • in the main cities in Kenya, • Develop and implement traffic management plans with ITS. <p><i>Key implementation partners:</i> NTSA, Treasury, MoE/MoT/Treasury / county governments/EPRA, NEMA</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> • Replace the current time-based traffic light system with intelligent traffic lights that adjust release intervals to reduce traffic jams, • Development of parking strategy, adopting one-way street systems, intersection and roundabout improvement, and development/enhancement of traffic control centres, • Introduce new number plates that will have built-in microchips and install smart cameras at intersections to monitor the most clogged roads, • Use of IT-based, smart transportation management to reduce reliance on police officers for traffic control and improve urban road transport.

Objective	Actions
<p>Enhance public modes of transport</p>	<ul style="list-style-type: none"> • Enhance new modes of public transport <p><i>Description:</i> Adopt safe and energy-efficient urban transport to reduce emissions.</p> <p><i>Key implementation partners:</i> NTSA, Treasury, MoE/MoT/Treasury/county governments/EPRA/ Ministry of Transport (State Departments of Transport / Housing and Urban Development private sector investors</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> · A modal shift to public transport and non-motorized modes, · Complementary walking and cycling infrastructure developed with support from county governments, · Increased investments in rapid transit and non-motorized travel systems.

4.2.5. POWER UTILITIES

4.2.5.1. Status

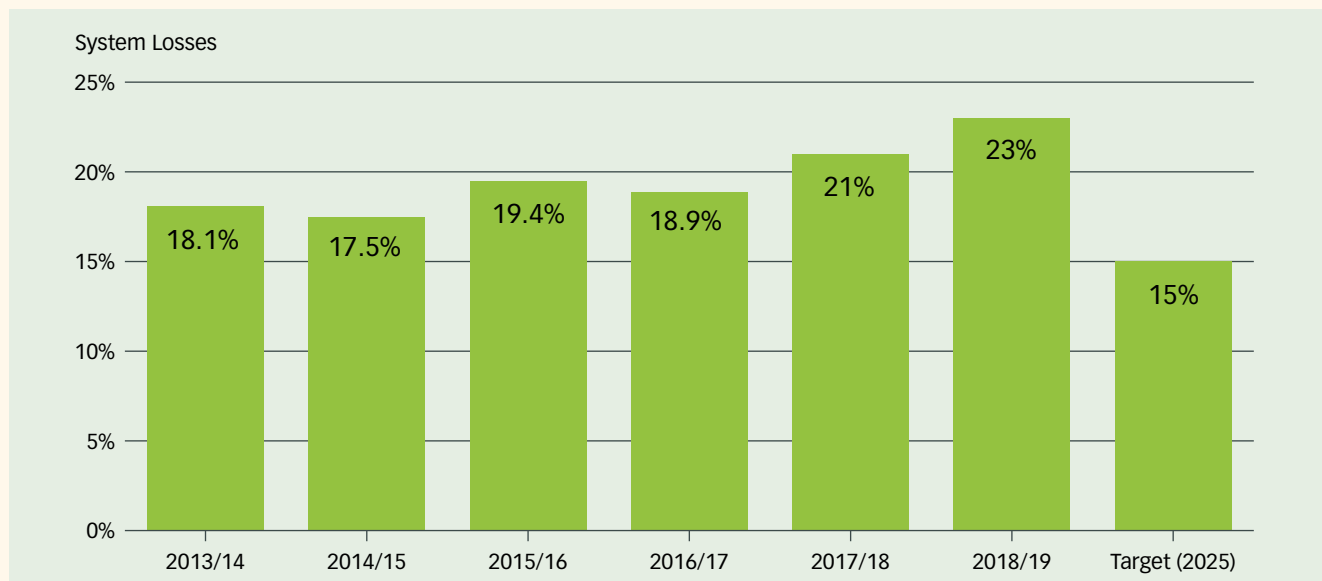
OVERALL TRENDS

- Kenya has 2,712 MW³¹ of installed on-grid capacity across 42 plants, plus an additional 11.5 MW in 19 off-grid stations in remote parts of the country.
- In 2018, 99.1 per cent of all electricity supplied was produced locally, out of which 86 per cent, was renewable.
- The government in 2018 launched the Kenya National Electrification Strategy that seeks to achieve universal access to electricity by the year 2022 through on- and off-grid solutions at an estimated initial investment of USD 2.75 billion.
- In June 2015, KPLC had over 3.6 million customers, rising to over 7 million by June 2019.
- Kenya has 7,174 km of primary transmission lines of 132 kV and above.
- KETRACO is building 5,900 km of new transmission lines, as well as three transmission lines for regional interconnection with Ethiopia, Uganda, and Tanzania.
- KETRACO is also planning a further 4,200 km of transmission lines to expand and strengthen the grid. A total of 8,478 km is planned for the period to 2035, at an approximate cost of USD 5.9 billion.
- The status of the distribution network is as follows:
 - Length of MV Lines: 75,541.45km.
 - Primary and secondary substations: 280 and 69,611 respectively.
 - Length of low voltage network: 153,399.38 km.
 - Length of transmission network: 4,957.31 km of 220 kV & 132 kV, 1100.73 km of 66 kV.
- The MoE, which has the mandate to develop and implement policies that create an enabling environment for efficient operation and growth of Kenya's energy sector, coordinate the development of Indicative Energy Plans and set strategic directions to facilitate the growth of the sector while providing a long-term vision for all sector players.
- EPRA, whose functions include tariff setting and oversight, and monitoring and enforcing sector regulations.
- The Kenya Electricity Generating Company (KenGen), which is the main player in electricity generation, with a current installed capacity of 1,796 MW that supplies 75 per cent of total electricity generation.
- Independent Power Producers (IPPs) and private investors. They generate electricity from thermal, geothermal, hydro, biogas and cogeneration (about 25 per cent of the country's installed capacity).
- Kenya Power and Lighting Company (KPLC), buys electricity from all power generators on the basis of negotiated Power Purchase Agreements for onward transmission. It is responsible for running and maintaining most of the existing transmission and distribution systems in Kenya.
- Nuclear Power and Energy Agency (NuPEA) – carry out research, development and dissemination activities in the energy and nuclear power sector.
- Kenya Electricity Transmission Company (KETRACO). KETRACO was incorporated in December 2008 as a State Corporation with the mandate to plan, design, construct, own, operate and maintain new high voltage (132kV and above) electricity transmission infrastructure that will form the backbone of the national transmission grid and new regional interconnections.
- The Rural Electrification and Renewable Energy Corporation (REREC). The REREC is mandated with spearheading Kenya's green energy drive

INSTITUTIONAL FRAMEWORK

- Reforms in the energy sector have seen a complete reorganization of functions previously concentrated in the Ministry of Energy and Kenya Power and Lighting Company. The sector administration and management have been unbundled into generation, transmission, distribution, oversight and policy functions.
- Key entities are as follows:

³¹ KNBS, 2019. Economic Survey 2019.

FIGURE 23: System Losses Trend


(excluding Geothermal), in addition to implementing rural electrification projects.

- The Geothermal Development Company (GDC). The GDC is a fully government-owned company and a Special Purpose Vehicle (SPV) to accelerate the development of geothermal resources in Kenya. It develops steam fields and sells geothermal steam for electricity generation to KenGen and to private investors.

- The Kenya SE4ALL Investment Prospectus recognizes the need to include investment in energy efficiency in the national electrification strategy. Priority areas include transmission and distribution loss reduction and distributed generation close to load centres.
- The Kenya National Electrification Strategy (KNES) targets universal access to electricity by 2022, to facilitate achieving the Big Four Agenda.

KEY POLICIES AND INITIATIVES

- The Least-Cost Power Development Plan (LCPDP) aims to guide the power sector’s development. The current LCPDP does not focus on energy efficiency in the sector. It mentions the ongoing reforms in the sector and the review of energy sector policy and the current Energy Act 2019, which have since been approved and gazetted.
- The Energy Act 2019 states that the Government shall establish stronger institutional arrangements to promote energy efficiency and conservation, improve energy security and mitigate the impacts of climate change. It also specifies policy support for the creation of public-private partnerships in the development, operation and maintenance of energy infrastructure and delivery systems, and the intention for the Government to set up a Consolidated Energy Fund to provide funding of energy efficiency and conservation programmes, among other priorities.

EXISTING SUPPORT AND CAPACITY CONSIDERATIONS

- The utility sector especially KPLC has been involved in energy efficiency activities in Kenya with Demand Side Management activities.
- Existing support to the sector is very much on the supply side. Development partners support the sector through interventions to drive new generation capacity and increase off-grid connections.
- KETRACO has also been instrumental in developing new high voltage electricity transmission infrastructure that will form the backbone of the National Transmission Grid, in line with Kenya Vision 2030. This shall help in reducing the technical losses.
- Kenya Power is investing in system management tools and bulk digital metering solutions that allow data collection to effectively profile consumers’ consumption, evaluate network impact, and control energy usage, with support for Advanced Metering Infrastructure from development partners.

4.2.5.2. Objectives and Targets

TABLE 15: Objectives and Targets for the power utilities sector

Objectives	Indicators	Status (2019)	Target by 2025
Create and implement models for utility-financed energy efficiency implementation, through methods that create payment streams from energy savings	Energy efficiency project investments by Kenyan power utilities	Investment – 0	Investment – KES 5 Billion
Improve the efficiency of the energy supply system and delivery infrastructure	Technical and Commercial losses	23%	15%
Grid stability, including, ancillary services, adoption of modern energy storage for system stabilization, and distributed generation	Study on ancillary service requirements, energy storage requirement and energy generation distribution	0	1 report
	Modern Energy Storage*	0	1 MWh

* A study will be done alongside the grid stability and evaluation of the Ancillary services requirements as soon as this strategy is launched.

4.2.5.3. Actions

TABLE 16: Actions for the power utilities sector

Objective	Actions
Create and implement models for utility-financed energy efficiency implementation	<ul style="list-style-type: none"> • Adopt a Utility-run ESCO model and develop a super ESCO for project development and financing, notably for public facilities <p><i>Description:</i> Development of a Super ESCO for project development and financing, notably targeting energy efficiency improvement in public facilities in the first instance. Kenya Power will increase its capacity in developing and coordinating EE financing models, including on-bill finance and performance contracting, with implementation by subcontracted private ESCOs, product suppliers and aggregation intermediaries.</p> <p><i>Key implementation partners:</i> Kenya Power, product suppliers, local financiers and investors, development partners, insurance companies, industries & other large commercial building owners.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> • Concept paper for the expansion of Kenya Power's business activities to support the implementation of EE programmes and provide services to customers to identify, design, implement and verify energy efficiency projects. • Documentation of agreed finance models to support identified projects. • A pipeline of projects that would comply with requirements for financing via the Super ESCO mechanism.

Objective	Actions
Improve the efficiency of the energy supply system delivery infrastructure and reduce commercial losses.	<ul style="list-style-type: none"> • System Loss Reduction Programme <p><i>Description:</i> Undertake a series of concerted efforts to reduce energy losses in the transmission and distribution infrastructure</p> <p><i>Key implementation partners:</i> KenGen, Kenya Power, REREC, EPRA KETRACO, IPPS. (The framework and responsibilities will be assigned as the programme gets underway)</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> · A study on the most cost-effective investments in supply infrastructure for reducing system losses, including upgrades to transmission and distribution infrastructure for efficient and quality power, and potential for cost-effective investments in modern energy monitoring, smart metering, and enhancements to existing meter calibration. · A study on power factor correction, · Reduced transmission and distribution losses, · Improved power factor, · Enhanced transformer and feeder metering, · System mapping of high-risk areas where power theft is prevalent, · Consumer awareness, · Revised Transformer Standards.
Improve Grid stability: Including, ancillary services, Adoption of modern energy storage for system stabilization, and distributed generation	<ul style="list-style-type: none"> • Improved Power System stability <p>Carry out a study on ancillary services requirements, energy storage requirement and energy generation distribution.</p> <p>Implement modern energy storage technologies, ancillary service technologies and distributed generation measures to improve system stability.</p> <p><i>Implementation Partners:</i> KenGen, IPPS.</p> <p><i>Outputs</i></p> <ul style="list-style-type: none"> · Installed energy storage capacity, · Uptake of energy storage technologies.

5. Recommended Cross-cutting Actions

Some of the targets set in this strategy require cross-cutting actions that cover two or more sectors and can reinforce the recommended efforts for specific sectors. These cross-cutting initiatives will contribute to the overall success of energy efficiency in different sectors, and therefore are not coupled with a specific target. They will have an impact on the achievement of economy-wide energy efficiency objectives in Kenya.

TABLE 17: Cross-cutting Objectives and Actions

Objective	Actions
Strengthen institutions responsible for EE in Kenya	<ul style="list-style-type: none"> • Enhance the Centre for Energy Efficiency and Conservation (CEEC) <p><i>Description:</i> Enhancing the CEEC will accelerate the implementation of the strategy and demonstrate the importance of energy efficiency to the Kenyan Government’s development agenda. The CEEC will work closely with the Ministry of Energy and EPRA, which are legally responsible for energy efficiency in Kenya.</p> <p><i>Key implementation partners:</i> Ministry of Energy, EPRA, Kenya Association of Manufacturers, county governments (Council of Governors), KNBS, industry associations, EPRA, Development Partners.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> • Review of the existing MoU between the Ministry of Energy and the KAM, including a revised and expanded scope of partnership highlighting key activities, budgets, and resourcing plans, • Increased budgetary allocation from the Ministry of Energy, • A data repository for all energy efficiency data to support monitoring and communication and awareness programmes, devolved by sector and by county in collaboration with the EPRA, • Enhanced coordination of EE activities, including strengthened operational and communications linkages between the national government and Counties through an EE coordination group, • Development plan for county energy efficiency centres that can implement local capacity-building activities, • An annual programme on EE in partnership with EPRA, • A collaborative plan between ERPA and CEEC on EE research and development, EE data analysis and dissemination, the identification of new applicable technologies, the promotion of EE leadership, and engagement with international leaders in energy efficiency, • A coordination plan on EE with academia, research institutes, industry and government agencies, • Strengthen Demonstration Centres and Energy Centres, targeting 47 centres from the existing 16 centres, • Promotion of international engagement on EE programmes, • Annual Reports on the implementation of Energy Efficiency activities in Kenya.

Objective	Actions
Enhance EE Professional Competence	<p>Capacity-building and certifications for energy efficiency professionals</p> <p><i>Description:</i> Enhancing capacity-building for professionals in the energy sector.</p> <p><i>Key implementation partners:</i> Ministry of Energy, EPRA, Association of Energy Professionals KNBS, industry associations, Institutions of Higher learning, Development Partners.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> · Increased professional development programmes, · Growth of professionals’ certification by 30 per cent annually, · Number of certified professionals to support the function (CEM, CMVP, CWEP, CEA, CSDP and REP), · Enhanced licensing of professionals.
Mainstream EE in the Kenyan education system	<p>Mainstream Energy Efficiency in Education</p> <p><i>Description:</i> Establish a long-term mechanism for higher public awareness of the importance of EE by integrating EE curricula into the education system at all levels.</p> <p><i>Key implementation partners:</i> The Ministry of Education, Kenya Institute of Curriculum Development (KICD), National Industrial Training Authority (NITA), TVET Authority, Curriculum Development, Assessment and Certification Council (CDACC), EPRA, MoE, Professional Associations, Training Institutes/CEEC.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> · Updates to primary and secondary school curricula to include EE best practices, · Introduction of local certification of EE practitioners and provision of training course addressing local requirements, in conjunction with the CEEC and professional associations, · Localized professional training for energy efficiency.
Increase financing opportunities for EE	<p>Resource Mobilization for Energy Efficiency Programme</p> <p><i>Description:</i> Improve access to finance for EE projects and actions by offering incentives. Collaborate with development partners to increase energy efficiency finance at competitive rates to approved projects. The Energy Act (2019) proposes the establishment of an Energy Fund.</p> <p><i>Key implementation partners:</i> Ministry responsible for Energy, Finance, Industry, local banks, development financiers/partners, KAM, private sector.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> · Lobby for increased treasury budget allocation for EE, · Activities to mobilize funding from the private sector and development partners, · Introduction of insurance coverage for EE Projects, · Establish an investment advisory board to oversee the fund establishment, agreed participation of funders and fund size, eligibility criteria and prudential mechanisms, · Establish parameters for eligible EE projects and the funding priorities in supporting NEECS initiatives, including the proposed Super ESCO initiative – early priorities include government buildings, compliant audited industrial sites, county Government programmes and transport efficiency projects, · An Investment Prospectus on EE.

5. Recommended Cross-cutting Actions

Objective	Actions
Institutionalize Energy Efficiency in National and county governments	<p>Increase understanding and adoption of EE actions in the public sector</p> <p><i>Description:</i> Boost EE activities in all ministries through inter-ministerial engagements, county governments, and climate change units in all ministries.</p> <p><i>Key implementation partners:</i> Ministries responsible for Energy, Finance, Public Service, Industry, Health, Transport, ICT/Communication Public Procurement Regulatory Authority (PPRA), KAM, private sector.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> · Integrate Energy Planning in Counties as per Energy Act 2019 and strengthen public participation in EE actions, · Increase coordination between various government agencies on EE programmes, · Establish an EE working group consisting of public and private sector players, · Inclusion of EE parameters in the work content and performance assessment of public officials, · Public Procurement Oversight Authority and the proposed CEEE will integrate EE requirements into public procurement to support EE financing for government buildings and county EE programmes, · Revise the Procurement Guidelines and shift to green procurement for both national and county governments, · Include EE in the LCDP, · Develop a communication strategy for EE in Kenya, · Increase data sharing and reporting on EE among concerned agencies.
Enhance gender mainstreaming in EE activities	<p>Identify and incorporate gender considerations in Energy Efficiency activities</p> <p><i>Description:</i> Use participatory approaches to ensure gender equity improvement, perceptions and opportunities in contributing to and benefiting from energy-efficient initiatives.</p> <p><i>Key implementation partners:</i> The ministries and government authorities responsible for energy, gender, public service and social services</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> · Increased adoption of efficient energy appliances like improved cookstoves and ovens among households, · Facilitation of adoption of energy-efficient technologies by women through capacity-building and awareness-raising, · Increase gender equity considerations in EE institutional frameworks, networking and knowledge sharing, capacity-building, and clean energy interventions, · Increased budget allocation for adequate human and financial resources for improving gender equity and empowerment in EE actions.

Objective	Actions
Scale-up cooperation and linkages between MoE and academia/ industry organizations on EE	<p>Scale-up cooperation and linkages with academia/industry on EE activities</p> <p><i>Description:</i> Organize colloquiums with academia/industry organizations on energy efficiency and renewable energy research and development (R&D), as well as a limited number of education or outreach activities related to energy efficiency and renewable energy. Develop Communities of Practice (CoP) in the sectors to facilitate sharing of knowledge experiences and setting and maintain professional standard and ethics.</p> <p><i>Key implementation partners:</i> The MoE and government authorities responsible for energy, higher learning institutions, AEPEA.</p> <p><i>Outputs:</i></p> <ul style="list-style-type: none"> · Conferences or seminars for presentation of research findings and review of performance of the programme, · Increased funding for research and development projects on energy efficiency, · Increased academia and industry cooperation on EE, · Self-reliant and informed society and energy sector partners on EE, · Customized short courses on energy efficiency in higher learning institutions.
Enhance Market Transformation of Efficient cooling Appliances	<p>Develop a National Cooling Action Plan</p> <p><i>Description:</i> Develop a National Cooling Action Plan (NCAP) which will be a comprehensive guide to the provision of access to sustainable cooling for all Kenyans.</p> <p><i>Key implementation partners:</i> Ministry responsible for Energy, Health, Industry, Environment, development partners, private sector.</p> <p><i>Outputs:</i> A National Action Cooling Plan for Kenya with the objective of:</p> <ul style="list-style-type: none"> · increasing the performance and efficiency of energy-consuming cooling appliances, · transiting the cooling sector to refrigerants with low environmental impact, · increasing access to energy-efficient cooling solutions with low environmental impact, · increasing access to agricultural cold chains.

5. Recommended Cross-cutting Actions

5.1. Strategy Implementation Risk

5.1.1. RISK AND MITIGATION FOR ENERGY EFFICIENCY

The strategy identifies key risks that may hinder the achievement of its objectives. These are highlighted in the table below.

TABLE 18: Risk Matrix for the NEECS

	Identified Risks	Risk Rating	Impacts	Impact Rating	Mitigation	Responsibility
1.	Inadequate financing	High	No budget set aside for investing in energy-efficient projects.	High	Inclusion of budget for implementation of energy-efficient projects in the investment plan.	Treasury/ Ministry of Energy
2.	Operation Risk – Human Resource	Low	Lack of adequate capacity at CEEC.	Low	Recruit and retain highly skilled staff at the CEEC.	Ministry of Energy/ CEEC
3.	Stakeholder co-operation Risk	Medium	Low stakeholder understanding and involvement in strategy execution.	Medium	Regular communication briefs from the key drivers of the strategies in addition to regular stakeholders' engagement.	MoE, EPRA, CEEC
4.	Inadequate professional competency	High	Poor implementation performance measures and programmes in the sector.	High	<ul style="list-style-type: none"> Strengthening of professional institutions, Continuous professionals' development, certification and licensing, Enhanced industry and academia linkages and collaboration, Self-regulation mechanisms through communities of practice. 	MoE, EPRA, AEPEA, institutions of higher learning
5.	Inadequate research, development and innovation	Medium	Slow growth of the manufacturing industry and solutions not suited to local problems.	Medium	<ul style="list-style-type: none"> Enhance data collection analysis and feedback systems through research, Promote homegrown solutions or partnerships for knowledge and technology transfer. 	MoE, KAM, AEPEA, institutions of higher learning
6.	Political Risk	Medium	Delay in implementation of this strategy.	Medium	Embed the new EE strategy in national agenda papers.	MoE/EPRA
7.	Project Implementation Risk	High	Low implementation of identified EE actions in this strategy.	High	Initiate Round Table Discussions with development partners.	MoE/KAM/ KEPSA



6. Communication for Energy Efficiency Programme

Low awareness and knowledge among key stakeholders regarding energy efficiency and conservation has been identified as one of the key challenges affecting the uptake of energy efficiency and conservation interventions. Creating an informed and supportive public that understands the rationale for energy efficiency and conservation greatly improves the chances of achieving the objectives of this strategy. There is a need for a change in consumer behaviour and energy consumption practices for these objectives to be realized.

Promoting changes in behaviour may take time. Consumer energy consumption behaviour is determined by many factors such as the cost of energy, culture, personal values, social norms, regulations and appliance design. In some instances, consumers cannot make informed decisions if they are not aware of the available energy efficiency and conservation solutions and options. Actions to increase public awareness, induce behaviour change and provide education constitute an important element of initiatives to support energy efficiency and conservation. Energy behaviour change can be targeted at individuals, communities and organizations.

Effort is also needed to establish the business case for energy efficiency for all decision-makers and to show how energy efficiency can benefit customers, utilities and the country in general by reducing energy costs for consumers, enhancing the financial health of utilities and contributing to the reduction of carbon emissions. The communication strategy requires resources for its implementation; therefore, there is a need to lobby key stakeholders to provide funds to promote energy efficiency and conservation programmes. Lastly, stakeholders in energy efficiency and conservation need to understand energy efficiency policies such as building codes, appliance standards and tax incentives.

The strategy requires consensus, support and behaviour change. This can only be achieved through a communication campaign that consults a range of stakeholders about their concern and perceptions and proactive-

ly addresses these concerns with targeted messaging. The communication plan will help to explain the need for and benefits of energy efficiency and conservation initiatives. Failure to consult stakeholders and gain their support has stalled and sometimes reversed much-needed government initiatives and reforms.

The key stakeholders of energy efficiency and conservation solutions include policy- and decision-makers, companies trading in energy products, citizens, Civil Society Organizations, research institutions and academic institutions. Others include private actors in the industrial and mining, commercial, tourism, public buildings, transport and education sectors, whose energy consumption habits affects the aggregate national energy efficiency outlook.


Communication is an investment. It should be planned and implemented by experienced professionals before and during the implementation of this strategy. The national and county governments need to set aside funds to support this critical component of the strategy. By assessing risks and public sentiment early, informing the public in accessible ways and explaining the mitigation measures to protect poor and vulnerable households, public understanding and goodwill can be built. The communication campaign must be flexible to accommodate shifting political, social and cultural aspects of the strategy.

Key outputs are

- i. Develop a communication strategy for Energy Efficiency and Conservation aimed at:
 - a) establishing and educating stakeholders on the business case for energy efficiency at the state, utility and other appropriate levels, addressing relevant customer, utility, and societal perspectives,
 - b) communicating the role of energy efficiency and conservation in lowering customer energy bills, and system costs and risks over time by promoting behaviour change in households,

6. Communication for Energy Efficiency Programme

- c) communicating the role of building codes, appliance standards and other incentives,
 - d) media communication strategy targeting social media, radio, television, newspaper advertisements, leaflets, billboards, direct mail, and electronic newsletters,
 - e) reaching all stakeholders in the energy efficiency and conservation sector.
- ii. Build capacity of key stakeholders. These include policy-makers in national and county government, academics (universities, technical and vocational training institutions and research organizations), journalists, companies trading in energy products, Non-governmental Organizations, citizens, Civil Society Organizations, industry and trade associations and private sector actors to increase energy efficiency and conservation awareness.
- iii. Carry out a nationwide baseline study on the level of adoption of EE technologies and the impacts of EE on the various sectors. Cost-benefit could be prioritized in the impact analysis, as it will give consumers a clear picture of what adopting EE technologies will mean in financial terms.
- iv. Hold Energy Efficiency and Conservation trade fairs and road shows to promote energy efficiency and conservation.
- v. Promote education and awareness of energy efficiency and conservation measures in schools and institutions of higher learning. These may include textbooks for schools, annual pupil competitions and other initiatives.
- vi. Establish a knowledge management framework for energy efficiency and conservation. This may include:
- a) establishing an energy efficiency and conservation resource centre,
 - b) developing a dedicated website,
 - c) enhancing data collection, collation, processing, and administration of statistical data in energy efficiency and conservation,
 - d) establishing an effective monitoring and reporting framework,
 - e) database development, and
 - f) developing educational materials targeting specific stakeholders.



7. Resource Mobilization for Energy Efficiency Programme

The successful implementation of the energy efficiency and conservation strategy requires substantial financial resources. Therefore, the key stakeholders are required to mobilize adequate resources to finance their relevant programmes/projects. The strategy will be financed through the national government, county governments, other devolved funds, development partners, public-private partnerships and non-governmental partners, among others.

The key stakeholders in resource mobilization include the ministries responsible for Finance, Energy, Transport, Agriculture, Environment and Forestry, and county governments, the Kenya Association of Manufacturers, development partners/financiers, industry, Non-governmental organizations, community social organizations and the private sector.

7.1. National Government Resources

The relevant national government ministries and energy entities such as EPRA, KPLC, KETRACO, REREC, KenGen, GDC and NuPEA will utilize their budgets to implement energy efficiency and conservation as per their mandate. The sources of funds include the exchequer and internally generated funds.

The Energy Act 2019 provides for establishment of consolidated energy fund; part of the funds will be utilized for the implementation of the strategy.

7.2. County Energy Resources

The county governments also have a role to play in energy development as per the fourth schedule of the Constitution and Energy Act 2019. Funds can come from local revenues (taxes and charges for services rendered) as well as through accessing an equitable share of revenue raised by the national government.

In addition, the Energy Act 2019 states the “county government may establish a fund for the purpose of promotion of efficient use of energy and its conservation within the county”.

7.3. Other Devolved funds

There are other devolved funds that the national and county governments can tap to fund energy efficiency and conservation programmes/projects. They include:

- a) National Constituency Development Fund: The Fund is drawn from the national government’s share of revenue in accordance with the Division of Revenue Act enacted pursuant to Article 218 of the Constitution. The eligible projects under the NG-CDF Act are only those entailing works or services falling under the functions of the national government, as provided for in the constitution. Energy is among those functions.
- b) Equalization fund: Article 204 of the Constitution of Kenya 2010 provides for the establishment of an Equalization Fund into which 0.5 per cent of all the revenue collected by the national government each year, calculated on the basis of the most recent audited accounts of revenue received, shall go to provide basic services, including water, roads, health facilities and electricity to marginalized areas.

7.4. Development Partners

The national and county governments should identify and propose energy efficiency and conservation projects and initiatives to development partners for consideration. The energy sector has benefited greatly from this partnership and it is expected that the support will continue during implementation of this strategy. Some of the development partners in the sector include World Bank Group, AFD, AfDB, JICA, EU, DFID, EIB, GIZ, and USAID among others.

7.5. Non-governmental Actors

There are several non-governmental actors involved in the provision of energy services. Their role is crucial as they supplement government efforts in the provision of energy services. There are those involved in undertaking national programmes, while others operate at a regional or county level. The government will continue providing a conducive environment and necessary support for such actors to continue delivering on their mandate.

7.6. Public Private Partnerships (PPPs)

The Government of Kenya has made infrastructure development through PPPs a priority as a mechanism to achieve Vision 2030. The Ministry of Energy, county governments and energy service providers can tap into the PPPs when deemed necessary. The national or county government can provide a concession to private investors to carry out an activity on its behalf: for example, waste management through waste-to-energy technology and commercial biogas for electricity generation. The PPP parties will financially benefit from the PPP through revenue-sharing agreements.

7.7. Private Sector Resources

The national and county governments will develop policy interventions and incentives to attract private actors to invest in energy efficiency and conservation projects/programmes. These incentives may include tax incentives, letters of support to reduce the cost of credit, creating a revolving fund to support investors, and other initiatives. The interventions are aimed at:

- a) supporting capacity-building and institutional collaboration, creating awareness and enforcing regulations,
- b) reducing the high upfront costs that make energy efficiency and conservation projects unaffordable or difficult to finance due to short repayment conditions,
- c) supporting preparatory activities (pre-feasibility, feasibility studies and energy audits) when transaction costs are proportionally high compared to the size of the investment, and

- d) reducing operating costs when revenue streams are insufficient for capital repayment.

Key outputs are:

- i. Develop a resource mobilization strategy to enhance the energy efficiency and conservation budget.
- ii. Develop an investment prospectus on energy efficiency.
- iii. Lobby for an increased budgetary allocation from the National Treasury.
- iv. Collaborate with county governments to promote energy efficiency and conservation.
- v. Lobby for more funds from the proposed Consolidated Energy Fund as stipulated in the Energy Act 2019.
- vi. Promote private sector participation in energy efficiency and conservation:
 - a) De-risk private sector investments through tax incentives and issuance of letters of credit to investors.
 - b) Facilitate access to credit to promote investment and financial incentives, e.g. results-based financing.
 - c) Develop investment or business cases for energy efficiency and conservation.
- vii. Promote Public Private Partnerships (PPPs) in energy efficiency and conservation.
- viii. Establish a resource mobilization coordination framework responsible for mapping finance and resource flows into the sector from the national government, county governments, development partners, the private sector, financial institutions and NGOs.

8. Monitoring and Evaluation

The strategy includes a five-year Monitoring and Evaluation Framework to track implementation. The Ministry of Energy is responsible for monitoring progress against the NEECS objectives. This will be done in close consultation with the enhanced CEEC acting as the data repository for each sector and with oversight of progress against each of the programmes. This role will be played in conjunction with county governments, with indicators reported by counties, and resources allocat-

ed to county-level data collection. Key responsibilities lie with the line government ministries, public agencies, private sector, financial institutions and development partners among others

It is proposed that a mid-term review of progress be conducted by June 2023, with a final report recommending changes to the strategy parameters completed in December 2025.

TABLE 19: M&E Framework



SECTOR: HOUSEHOLD

Key Objective	Performance Indicator	Output	Targets (2025)	Time-lines (Years)	Responsibilities	Budget KES '000 (USD '000) ^a
Improve the energy efficiency of household electrical appliances	Types of appliances covered by MEPS	MEPS for electrical cooking appliances	4 New appliances	5	Kenya Bureau of Standards (KEBS), Energy & Petroleum Regulatory Authority (EPRA), Ministry of Energy (MOE)	20,000 (187.8)
Improve the energy efficiency of household thermal energy	Development of MEPS for LPG cookers and fuel	MEPS and a Testing Lab for fuels and thermal cooking appliances	1 Standards and Labelling Framework for improved household biomass cookstoves	5	KEBS, Kenya Industrial Research Development Institute (KIRDI)	250,000 (2,347)

^a 1 USD = 106.5 KES (June 2020).



SECTOR: BUILDINGS

Key Objective	Performance Indicator	Output	Targets (2025)	Time-lines (Years)	Responsibilities	Budget KES '000 (USD '000) ^a
Develop Minimum Energy Performance Standards for Buildings	1 Minimum Energy Performance developed and gazetted	MEPS in place	1	5	County Governments (CG), MOE, EPRA, Kenya Green Building Society (KGBS), Ministry of Transport, Infrastructure, Housing and Urban Development (MTIHUD), KEBS	10,000 (93.9)
	Baseline Energy Use Index for Buildings in Kenya	Index in Place	1	3	CG, MOE, EPRA, KGBS, KEBS, MTIHUD	5,000 (46.9)
Enhance the energy performance of new buildings in Kenya	Share of newly built floor area compliant with energy efficiency requirements in the total building stock	More new energy-efficient buildings	10%	5	CoG, MOE, EPRA, KGBS, MTIHUD, Centre for Energy Efficiency and Conservation (CEEC), Kenya Association of Manufacturers (KAM)	20,000 (187.8)
	Adopt ASHRAE buildings energy conservation standards or equivalent for public and commercial buildings	Kenya standards in place	2	5	KEBS, CG, MOE, EPRA, KGBS, MTIHUD, CEEC	20,000 (187.8)
Improve the energy efficiency of lighting in existing public buildings	Lighting load in public buildings	Retrofitted buildings	50%	5	Kenya Power & Lighting Company (KPLC), CG, MOE, EPRA, MTIHUD, CEEC, Energy Service Companies (ESCOs)	5,000,000 (47,000)
Promotion of new green public buildings	Awareness Creation on design and construction of energy-efficient/ green public buildings	New Green Public Buildings	20	5	CG, MOE, EPRA, KGBS, CEEC, MTIH-UDPW	100,000 (939)
	Ensure 25% of buildings under affordable housing are green buildings	Green buildings	25%	3	CG, MOE, EPRA, KGBS, MTIHUD	100,000 (939)

^a 1 USD = 106.5 KES (June 2020).



SECTOR: INDUSTRY AND AGRICULTURE

Key Objective	Performance Indicator	Output	Targets (2025)	Time-lines (Years)	Responsibilities	Budget KES '000 (USD '000) ^a
Increase the adoption of energy efficiency programmes	Number of audited facilities	Energy Audits conducted, Implementation Plans	4,000	5	MOE, CG, EPRA, KAM, AEPEA, Kenya National Farmers' Federation (KENAFF), financing institutions, DSM-KPLC.	4,000,000 (37,559)
	Number of certified energy efficiency professionals	Trained Energy Professionals	120	5	MoE, KAM (CEEC), National Industrial Training Authority (NITA), EPRA, Rural Electrification and Renewable Energy Corporation (REREC), Association of Energy Professionals Eastern Africa (AEPEA)	25,000 (235)
Enhance the implementation of recommended EE measures	Estimated industrial energy savings	Reduced energy consumption	885,000 MWh/100MW demand/250m litres heavy fuel oil/9m litres industrial fuel oil	5	EPRA, KAM, MOE, Financial Institutions, ESCOs	45,000,000 (422,535)
	No. of ESCOs created and undertaking EE projects	No. of ESCOs operating in Kenya	5	5	EPRA, KAM MOE	1,000,000 (9,390)
Support EPRA for enforcement and compliance activities	Compliance Inspections	Compliance Reports	2,500	5	EPRA, CEEC, MOE	50,000 (469)
Improve EE in the agricultural value chain in off-grid areas	Number of renewable energy-based solar pumping water systems, cold chains, grain millers	Demonstration projects on Productive Use of Energy activities in agriculture value chains	5	5	Ministry of Agriculture, county governments, REREC, EPRA, farmers organizations, off-grid appliances suppliers, mini-grid developers	150,000 (1,408)

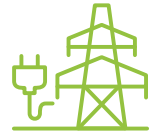
^a 1 USD = 106.5 KES (June 2020).



SECTOR: TRANSPORT

Key Objective	Performance Indicator	Output	Targets (2025)	Time-lines (Years)	Responsibilities	Budget KES '000 (USD '000) ^a
Improve fuel economy performance and reduce CO ₂ emissions in Kenya	Average fuel consumption (light duty vehicles) per 100 km travelled	Reduced Fuel consumption per 100 km travelled	6.5L/100km	5	MTIHUD, National Transport and Safety Authority (NTSA), MoE, Treasury, Kenya Revenue Authority (KRA) CG, KEBS /EPRA, Kenya Urban Roads Authority (KURA), Kenya National Highways Authority (KeNHA) National Environment Management Authority (NEMA), Nairobi Metropolitan Area Transport Authority (NaMATA), Nairobi Metropolitan Services (NMS)	500,000 (4,695)
	Average CO ₂ emissions per km travelled	Reduced CO ₂ emissions per km travelled	160g/km	5		
Increase the adoption of E-Mobility	Share of electric/hybrid vehicles in total vehicles imported into Kenya	Increased number of electric vehicles Charging stations Regulations	5% of imported cars annually	5	NTSA, Treasury, MoE, MTIHUD, Treasury, CG, EPRA, KPLC, KenGen, private sector investors	1,000,000 (9,390)
Improve urban vehicular management	Enhanced average speed of vehicles in urban areas through reduced traffic jams and increased parking capacity	Improved parking systems Intelligent Traffic lights	Average speed of 50 km/hour (Nairobi)	5	NTSA, Treasury, MoE, MTIHUD, Treasury, CG, EPRA, NEMA.	2,000,000 (18,880)
Enhance public modes of transport	No of passengers using commuter trains in Nairobi City	Increased number of passengers using commuter trains	150,000 passengers per day	5	NTSA, Treasury, MoE / MoT/Treasury/county governments /EPRA/ Ministry of Transport (State Departments of Transport/Housing and Urban Development private sector investors.	10,000,000 (93,897)

^a 1 USD = 106.5 KES (June 2020).



SECTOR: POWER UTILITIES

Key Objective	Performance Indicator	Output	Targets (2025)	Time-lines (Years)	Responsibilities	Budget KES '000 (USD '000) ^a
Create and implement models for utility-financed energy efficiency implementation, through methods that create payment streams from energy savings	Energy efficiency project investments by Kenyan power utilities	Super ESCO and active ESCOs	Investment of KES 5 billion	5	MoE, KPLC, REREC, EPRA, KenGen, IPPs, KeTraCo	21,150,000 (198,592)
Improve the efficiency of the energy supply system and delivery infrastructure	Technical and commercial losses	Reduced system losses	15%	5	MoE, KPLC, REREC, EPRA, KenGen, IPPs, KeTraCo	500,000 (4,695)
Grid stability: including ancillary services, adoption of modern energy storage for system stabilization and distributed generation	Study on ancillary service requirements, energy storage requirements and energy generation distribution	Grid stability study report	1	1	MoE, KPLC, REREC, EPRA, KenGen, IPPs, KeTraCo	50,000 (469)
	Modern energy storage system		1 MW	5	MoE, KPLC, REREC, EPRA, KenGen, IPPs, KeTraCo	200,000 (1,878)

^a 1 USD = 106.5 KES (June 2020).

8. Monitoring and Evaluation

SECTOR: CROSS-CUTTING

Key Objective	Performance Indicator	Output	Targets (2025)	Time-lines (Years)	Responsibilities	Budget KES '000 (USD '000) ^a
Strengthen institutions responsible for EE in Kenya	No. of Staff in EPRA, CEEC	Increased number of employees	20	5	EPRA, CEEC, KAM, MOE	1,000,000 (9,390)
Enhance EE Professional Competence	No. of certified professionals	Increased number of practicing certified professionals	200	5	MoE, EPRA, AEPEA, KNBS, industry associations, institutions of higher learning, development partners.	40,000 (376)
Mainstream EE in the Kenyan education system	Revised curricula	Energy efficiency curricula	1	5	Ministry of Education, Kenya Institute of Curriculum Development (KICD), National Industrial Training Authority (NITA), TVET Authority, Curriculum Development, Assessment and Certification Council (CDACC), EPRA, MoE, professional associations, training institutes/ CEEC	20,000 (188)
Increase financing opportunities for EE	Number of partners financing EE activities in the country	EE financing packages	5	5	Ministries responsible for energy, finance, industry; local banks; development financiers/partners; KAM; private sector	50,000 (469)
Institutionalize EE in national and county governments	Number of public EE projects	EE procurement guidelines	1	3	Ministries responsible for energy, finance, public service, industry, health, transport, ICT/ communications; Public Procurement Regulatory Authority (PPRA); KAM, private sector	100,000 (939)
Enhance the mainstreaming of gender equity in EE activities	Increased budget for EE gender mainstreaming	Gender policy on EE implemented	1	3	Ministries and government authorities responsible for energy, gender, public service, social services	20,000 (188)

Key Objective	Performance Indicator	Output	Targets (2025)	Time-lines (Years)	Responsibilities	Budget KES '000 (USD '000) ^a
Scale-up cooperation and linkages between MoE and academia/ industry organizations on EE	EE Network of academia and industry	EE symposiums	5	5	The MoE and government authorities responsible for energy, higher learning institutions AEPEA.	300,000 (2,817)
Enhance market transformation of efficient cooling appliances	Increased uptake of energy-efficient cooling appliances	National Cooling Action Plan	1	2	Ministries responsible for energy, health, industry, environment; development partners; private sector	20,000 (188)

^a 1 USD = 106.5 KES (June 2020).

9. Annexes

9.1. Annex 1 – Summary of Recommended Actions

Objectives	Indicators	Status (2019)	Target by 2025
ECONOMY-WIDE			
Ensure energy efficiency contributes to the achievement of NDC	Annual greenhouse gas emissions due to energy supply and consumption	6.9 MtCO ₂ e (2015 baseline)	7.6 MtCO ₂ e
Ensure energy efficiency contributes to the achievement of SDG7 and the objectives of Sustainable Energy for All	Annual rate of improvement in energy intensity	0.2% per annum	3% per annum
HOUSEHOLDS			
Improve the energy efficiency of household electrical appliances	Electricity consumption of household appliances	961 GWh (6 kinds of appliances) ^a Projected target ^b	3% annual increase in efficiency to the base case level in 2020. See Figure 8, 9 and 10 for the trends in Business as Usual and Policy Intervention Scenarios.
	Number of appliances covered by MEPS	6 MEPS, covering motors, air conditioners, fridges, CFLs, magnetic ballasts, and fluorescent lamps	10 MEPS – Additional MEPS for LEDs, computers, TVs, and cookstoves
Improve the energy efficiency of household thermal energy	<ol style="list-style-type: none"> MEPS for cookers Standards for cookers and fuels Testing lab for cookers and fuels Communication and awareness strategy Reviewed CAP Bio energy strategy formulated 	70% of households using biomass fuel	50% of households utilizing clean energy
BUILDINGS			
Improve the energy performance of new buildings in Kenya	Share of newly built floor area compliant with energy efficiency requirements in the total building stock	0	10%
	Adopt American Society of Heating, Refrigerating and Air-Conditioning Engineers buildings energy conservation standards or equivalent for public and commercial buildings	0	2
Improve the energy efficiency of lighting in existing public buildings	Lighting load in public buildings	0	50%

Objectives	Indicators	Status (2019)	Target by 2025
Promote new green public buildings	Design and construction of energy-efficient/green public buildings	0	20
	Ensure 25% of buildings under affordable housing are green buildings	0%	25%
Develop Minimum Energy Performance Standards for Buildings	1 Minimum Energy Performance standard developed and gazetted	0	1
	Establish Baseline Energy Use Index for Buildings in Kenya	0	1
INDUSTRY AND AGRICULTURE			
Increase the reach of successful industrial energy efficiency programmes	Number of audited facilities	1,800	4,000
Improve the acceptance of energy audits and implementation of energy audit recommendations	Number of certified energy efficiency professionals	70 licensed EE professionals	120 licensed EE professionals
Enhance the implementation of recommended EE measures	Estimated industrial energy savings	Current estimated annual savings level from programmes: 177,000 MWh/20MW demand/51 million litres of heavy fuel oil/1.8 million litres of industrial fuel oil ^d	885,000 MWh/100MW demand/250 million litres heavy fuel oil/9.0 million litres industrial fuel oil ^c
	Number of ESCOs created and undertaking EE projects	0	5
Improve EE in the agricultural value chain in off-grid areas	Demonstration projects for EE in Productive Use of Energy activities in agricultural value chain in off-grid areas. Target projects include pumping water systems, cold chains, grain milling	0	5
TRANSPORT			
Improve fuel economy performance and reduce CO ₂ emissions in Kenya	Average fuel consumption (light duty vehicles) per 100 km travelled	Average fuel economy = 7.5 L/100km ^e	6.5 L/100km
	Average CO ₂ emission per km travelled	Average CO ₂ emission = 181.9 g/km ^f	160 g/km
Increase the adoption of E-Mobility	Share of electric/hybrid vehicles in total vehicle imported into Kenya	0%	5% of imported electric cars annually
Enhance public modes of transport	Number of passengers using commuter trains in Nairobi City	116,000	150,000

9. Annexes

Objectives	Indicators	Status (2019)	Target by 2025
Improve urban vehicular management	Enhanced speed of vehicles in urban areas through reduced traffic jams and increased parking capacity	41 km/hour(Nairobi)	50 km/hour (Nairobi)
POWER UTILITIES			
Create and implement models for utility-financed energy efficiency implementation, through methods that create payment streams from energy savings	Energy efficiency project investments by Kenyan power utilities	Investment – 0	Investment – KES 5 billion
Improve the efficiency of the energy supply system and delivery infrastructure	Technical and commercial losses	23%	15%
Grid stability: including ancillary services, adoption of modern energy storage for system stabilization and distributed generation	Study on ancillary service requirements, energy storage requirement and energy generation distribution	0	1 report
	Modern Energy Storage	0	1 MWh

^a This Figure is based on the data from UNDP (2014), Consultancy Services for Detailed Study on Impacts of Energy Performance Standards and Labels Implementation in Kenya, for 6 analysed appliances.

^b This is not actual data, it is the results of modelling.

^c Targets derived by assuming a 333 per cent increase in number of audited sites, and an increase in implementation rate from approx. 45 per cent in the study to an assumed 75 per cent by 2025.

^d These Figures derived as estimates based on Rencon (2019), Study to Assess and Ascertain the Impact of Energy Audits on Implementation of Energy Efficiency Measures, Savings Achieved and Barriers to Implementation for selected Firms in Kenya, Draft Final Report, May 2019. Savings for 51 firms were extrapolated 30-fold to represent the 1,500 audits already conducted, and then discounted by a factor of 50 per cent, to account for the fact that many sites not included in the study are likely smaller and/or less likely to implement ECMs than those included in the study.

^e University of Nairobi Enterprises and Services Ltd (UNES), Report on Global Fuel Economy Initiative Study in Kenya, Final Narrative Report, July 2014

^f ibid.

CROSS-CUTTING ACTIONS

Objectives	Indicators	Target by 2025
Strengthen institutions responsible for EE in Kenya	Number of Staff in EPRA, CEEC	20
Enhance EE Professional Competence	Number of certified professionals	200
Mainstream EE in the Kenyan education system	Revised curricula	1
Increase financing opportunities for EE	Number of partners financing EE activities in the country	5
Institutionalize EE in national and county governments	Number of public EE projects	1
Enhance the mainstreaming of gender equity in EE activities	Increased budget for EE gender mainstreaming	1
Scale-up cooperation and linkages between MoE and academia/industry organizations on EE	EE Network of academia and industry	5
Enhance market transformation of efficient cooling appliances	Increased uptake of energy-efficient cooling appliances	1

9.2. Annex 2 – Stakeholder Consultations

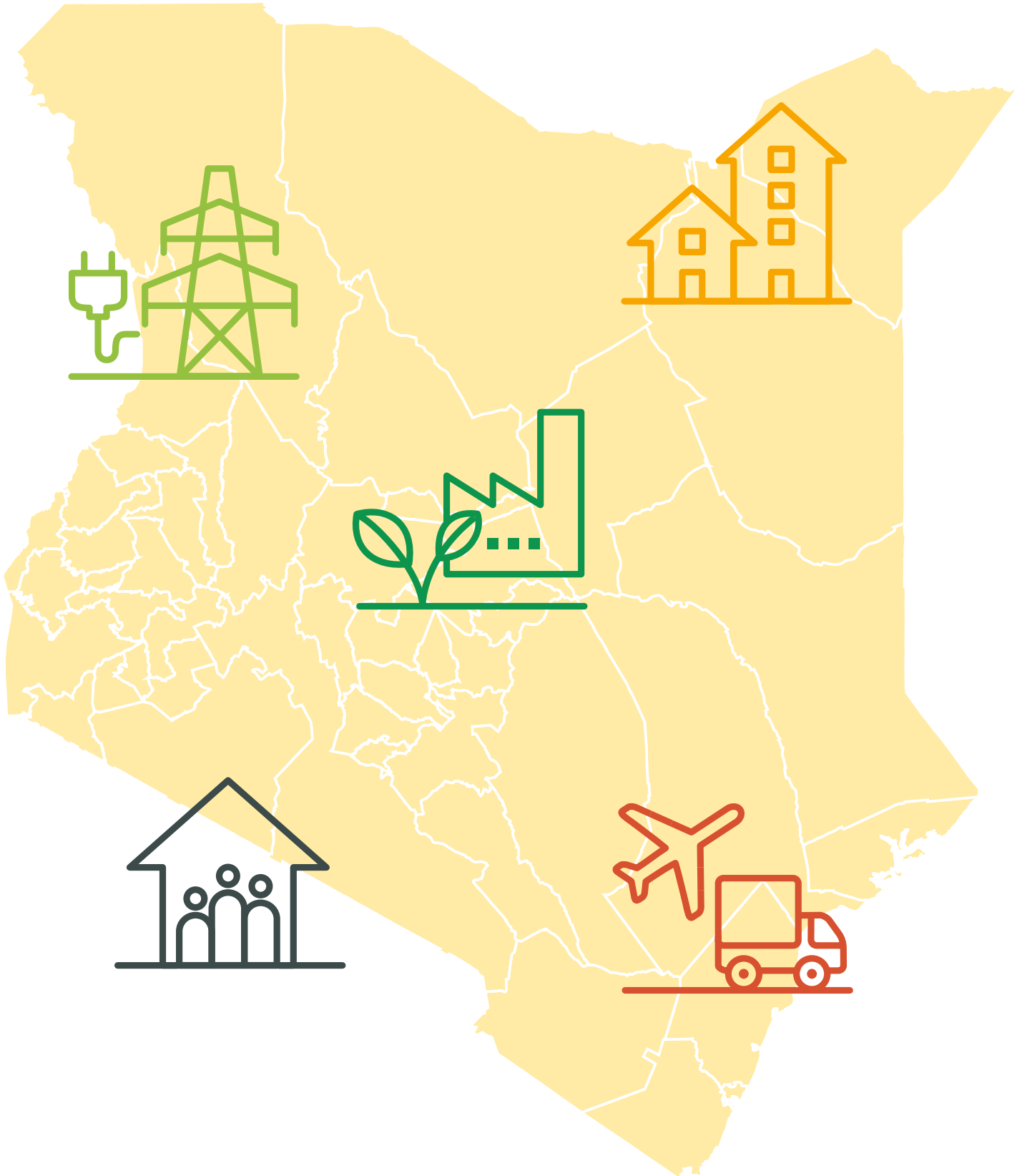
The following stakeholder consultations meetings were conducted during the formulation of this strategy.

	Event	Dates	Town
1.	Stakeholders Workshop	28th May 2019	Nairobi
2.	Stakeholders Workshop	30th May 2019	Mombasa
3.	Stakeholders Workshop	4th June 2019	Kisumu
4.	Stakeholders Workshop	7th June 2019	Embu
5.	Stakeholders Workshop	11th June 2019	Nakuru
6.	TC Meeting	26th-28th Nov 2019	Naivasha
7.	Experts Meeting	30th-31st Jan 2020,	Naivasha
8.	TC Meeting	19th-21st February 2020	Naivasha
9.	Public Review	March 2020	Countrywide
10.	Online Discussion– TC	June 2020	Nairobi

10. References

- Clean Cooking Alliance, 2019. Kenya. Retrieved from Clean Cooking Alliance: <https://www.cleancookingalliance.org/country-profiles/focus-countries/4-kenya.html>
- E3, 2012. Gas Appliance Energy Efficiency Labeling. Commonwealth of Australia.
- GTZ, 2007. Eastern Africa Resource Base: GTZ Online Regional Energy Resource Base: Regional and Country Specific Energy Resource Database. II – Energy Resource.
- Baum C. and Wekesa D.W., 2019. Basics in Solar Photovoltaics, DBTA, ISBN: 978-9966-1972-0-7.
- IBM, 2011. IBM Commuter Pain Survey: Traffic congestion down, pain way up. Retrieved from IBM Commuter Pain Index: <http://www-03.ibm.com/press/us/en/pressrelease/35359.wss>
- IEA, 2014a. World Energy Outlook. France: International Energy Agency.
- IEA, 2014b. Energy efficiency: a key tool for boosting economic and social development [WWW Document]. International Energy Agency. URL <https://www.iea.org/newsroom/news/2014/sepember/energy-efficiency-a-key-tool-forboosting-economic-and-social-development.html> (accessed 11.12.18).
- IEAE, 2017. International Atomic Energy Agency. Vienna: IAEA.
- Japanese International Cooperation Agency (JICA) (2013). The Study on a Master Plan for Urban Transport in the Nairobi Metropolitan Area in the Republic of Kenya. Nairobi: JICA.
- Kenya National Bureau of Statistics, 2019. Economic Survey 2019. Nairobi: Kenya National Bureau of Statistics.
- KNBS, 2019. Kenya Population and Housing Census. Kenya National Bureau Statistics.
- KPLC, 2018. Annual Reports and Audited Financial Statements of The Year Ended 30th June 2018. Nairobi: Kenya Power and Lighting Company.
- Mangi PM, 2019. Geothermal Exploration in Kenya- Status Report and Updates, 2019.
- Ministry of Energy, 2019. Kenya Household Cooking Study. Nairobi: Ministry of Energy.
- Ministry of Energy, 2004. Sessional Paper No. 4 on Energy. Nairobi: Ministry of Energy.
- Moraa, G., 2019. Exploring Public Road Passenger Transport in Kenya. Retrieved from <https://t2m.org/exploring-public-road-passenger-transport-in-kenya/>
- National Construction Authority of Kenya, 2017. National Building Regulations. January 2017. Nairobi: NCA.
- Paolo, B., 2017. Proceedings of the 9th international conference on Energy Efficiency in Domestic Appliances and Lighting Appliances and Lighting (EEDAL '17). EU, Joint Research Centre.
- Pope, C. and Dockery, D. W., 2006. Health Effects of Fine Particulate Air Pollution. The Journal of Air and Waste Management Association 56, 709-742.
- Rencon Associates Ltd., 2018. A Study On Solar Photovoltaic Industry In Kenya. Nairobi: ERC.
- Republic of Kenya and CCAK., 2019. Kenya Household Cooking Sector Study: Assessment of the Supply and Demand of Cooking Solution at The Household Level. Republic of Kenya.
- Ritcher, A., 2017. Think Geoenergy. October 13, 2017. Retrieved from Geothermal energy becoming predominant source of electricity in Kenya: <https://www.thinkgeoenergy.com/geothermal-energy-becoming-predominant-source-of-electricity-in-kenya>
- SEI, 2018. Overcoming barriers to sustainable charcoal in Kenya. Stockholm: Stockholm Environment Institute.
- StARCK+ (n.d.). Kenya National Determined Contribution: Sector Analysis. Retrieved from UKAID StARCK+: <http://www.starckplus.com/index.php/starck-components/technical-assistance/ndc>
- UNDP, (n.d.). Nationally Appropriate Mitigation Action on Access to Clean Energy in Rural Kenya Through Innovative Market Based Solutions. New York: UNDP.

32. UNDP, 2014. Consultancy Services for Detailed Study on Impact of Energy Performance Standards and Labels implementation in Kenya. United Nations Development Programme.
33. UNFCCC, 2016. Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015. Paris: United Nations.
34. United Nations Economic Commission for Europe (UNECE) and Food and Agriculture Organization of the United Nations (FAO), Organisation for Economic Co-operation and Development.
35. Organisation for Economic Co-operation and Development (OECD), The World Bank, Statistical Office of the European Communities (Eurostat) (2007).
36. The Wye Group Handbook Rural Households' Livelihood and Well-Being Statistics on Rural Development and Agriculture Household Income. New York and Geneva: UNITED NATIONS.
37. University of Nairobi Enterprise and Services Ltd (UNES), 2014. Report on Global Fuel Economy Initiative Study in Kenya (GFEI). Nairobi: Energy Regulatory Commission.
38. VASHMEDIA, 2019. VASHMEDIA. Retrieved from Kenyan ERC Changes Its name: <https://www.vashmedia.co.ke/kenyas-erc-changes-its-name>. April 25, 2019.
39. WANLEYS Consultancy Services, 2013. ANALYSIS OF DEMAND AND SUPPLY OF WOOD PRODUCTS IN KENYA. Nairobi: Ministry of Environment, Water and Natural Resources.
40. Wilkinson, R. and Kituyi, E., 2006. Retrieved from Final Evaluation of the UNDP-GEF Project (Removal of Barriers to Energy Efficiency and Conservation in Small and Medium Enterprises in Kenya (KEN/98/G31, KEN/98/031), "GEF-KAM Industrial Energy Efficiency Project").
41. <https://eartheval.org/sites/ceval/files/evaluations/125%20Removal%20of%20Barriers%20to%20Energy%20Efficiency%20and%20Conservation%20in%20Small%20and%20Medium%20Enterprises%20in%20Kenya.pdf>



Contact Information

Ministry of Energy, Nyayo House
Kenyatta Avenue
P. O Box 30582-00100
Nairobi, Kenya
Tel +254 (0) 203310112
Fax +254 (0) 2228314

Email: info@energy.go.ke

Website: energy.go.ke