REPUBLIC OF KENYA

TANA RIVER COUNTY ENERGY PLAN (CEP)

2024 - 2034

County Mission

To have a community that is capable of determining her own destiny.

County Vision

To provide visionary political leadership that will facilitate the desired social, political and economic positive change and development.

FOREWORD

The Constitution of Kenya, 2010 (The Constitution) established 47 counties and instituted a framework that, for the first time in the history of the country, devolves some energy planning and administrative functions to the County Governments. These energy functions are envisioned in Section 5 of the Energy Act, 2019 (the Act). The Act provides for the development of county energy plans in line with the Integrated National Energy Planning (INEP) Framework. INEP as an energy sector inter-governmental document, which is a summary of all the 47 Counties' energy needs. It outlines guidelines on the short, medium and long-term energy requirements based on evolving economic, socio-political and technical circumstances. The objective of this County Energy Plan (CEP) is to ensure a coherent and coordinated approach to meeting the County's energy needs. It also targets energy investments, particularly in areas that have been historically neglected. Tana River County is, therefore, proud to launch this CEP for the period 2024- 2034. It will be subjected to review after every three years. This Plan is the outcome of many months of consultations with relevant stakeholders representing the County Government, the National Government, development partners, state agencies, and non-governmental actors. As a critical component of the Sustainable Energy Access and Climate Action Plan (SEACAP), this Plan provides a roadmap for energy development in the County.

Tana River County is committed to playing its role as delegated in the Constitution, the Act, and the Draft Energy Regulations of 2022. The County, through the Accelerating Clean Cooking Action (ACCA) in Kenya Project, has been able to finalise this milestone on energy planning. We are also committed to strengthening linkages between energy and climate action at the local level. The completion and inauguration of this Plan is part of that commitment. From the baseline survey carried out in preparation for this Plan, Tana River County is firmly on course to achieving universal access to electricity by 2030 This can be credited to the ambitious public sector grid extension efforts made in the last 10 years through national programmes such as the Last Mile Connectivity Project (LMCP) and innovative private sector initiatives to promote the use of solar Photo Voltaic (solar PV) based stand-alone solutions. However, five out of every eight homes still use traditional forms of cooking energy including firewood and charcoal.

The limited access to modern cooking solutions is especially acute in rural areas. We have set ambitious targets to increase access to clean cooking solutions to 40% by 2028, and to achieve universal access by 2030. This will be achieved through a combination of technologies, including liquefied petroleum gas (LPG), bioethanol, biomass briquettes, and electricity, including solar. On the energy efficiency front, we have committed to retrofitting all streetlights with LED bulbs by the year 2027, among other plans. Despite relatively high electricity access rates, consumption at the household level remains very low. This deprives consumers of potential benefits of using electricity as a tool for economic empowerment

One of our focus areas in enhancing productive use of energy as a County is through the establishment of the County Aggregated Industrial Park (CAIP) in Chifiri, which will open up economic development and growth opportunities in many ways. The ACCA Project also supported the County with 2000 improved cookstoves to be distributed to households. This initiative will significantly improve local livelihoods as well as help the County move a step closer to the increasing access to clean cooking solutions by 2028.

To implement this Plan, a County Energy Planning Committee (CEPC), of which I will be the Patron, will be established according to the INEP framework. This Committee will establish a secretariat responsible for the management of specific tasks, as outlined in this Plan. The CEPC will periodically review this plan and update it accordingly. We invite other partners from the private sector, the National Government, and non-governmental organisations to walk with us on this journey.

HE Major (Rtd) Dr. Dhadho Gaddae Godhana
Governor, Tana River County

PREFACE

This County Energy Plan (CEP) has been prepared in fulfilment of the requirements of the Energy Act, 2019 and the Constitution of Kenya, 2010 (the Constitution). Following the promulgation of the Constitution, some energy planning functions previously led by the National Government were devolved to the newly created counties. Among those functions include, energy planning; energy regulation and licensing; promotion of renewable energy; last mile connectivity to rural and underserved areas through rural electrification programmes; energy efficiency and conservation; and capacity building and training. The rationale for the devolution of energy functions is the realisation that different counties are endowed differently with energy resources and are at different stages of development. To ensure that local county-specific circumstances are factored into the planning process, county level planning is imperative.

Tana River County is thus pleased to have attained this critical milestone of developing a comprehensive CEP that both addresses the needs of the County. In accordance with the INEP approach, the Plan will run for 10 years and be reviewed after every three years. The Department of Water, Energy, Mining, Wildlife and Natural Resources has played the lead role in this process. Developing this Plan involved extensive consultations with various stakeholders and background research facilitated by Practical Action with support from UNDP in context of the Accelerating Clean Cooking Action (ACCA) in Kenya Project. To ensure that the outcome was aligned with the realities and priorities on the ground, primary data collection was carried out in all the 11 sub-counties covering households, enterprises, and social institutions including educational and health establishments. Key Informant Interviews (KIIs) with sectoral stakeholders and technical experts, and workshops with County technical staff from the nexus directorates formed part of this extensive process. The review and planning process was done through a gender-lens and considered the current and impending impacts of climate change. We are, therefore, confident that the contents of this Plan represent the aspirations of the residents of Tana River County and those of the County Government.

This Plan has been launched at an opportune time when the County is reviewing its County Integrated Development Plan (CIDP) 2023-2027. Given the cross-cutting nature of energy, we hope to engender the programmes and activities outlined in this Plan in the CIDP. The proposals of this Plan are multi-layered. There are policy and institutional recommendations that will be accomplished through institutional review and legislation, while others are administrative. All this will be implemented by the Secretariat entrusted with oversight from the County Energy Planning Committee (CEPC) with guidance from the office of the Governor. The County Government will allocate part of the funding towards the implementation of this Plan and mobilise the rest from development partners. Once again, we call upon our partners to join us in rolling out the Tana River CEP.

Hon. Hadija Harufa Algi
County Executive Committee Member, Water, Energy, Mining, Wildlife and Natural Resources

ACKNOWLEDGEMENT

This County Energy Plan (CEP) for the County Government of Tana River is the result of a collaborative effort between the County Government's Department of Water, Energy, Mining, Wildlife and Natural Resources and Practical Action (PA). It was developed under the Accelerated Clean Cooking Action (ACCA) Project with funding from UNDP and generous contribution from the Government of Japan, through the Japan International Cooperation Agency (JICA). The Plan provides detailed solutions addressing the priority energy development needs of the citizens of Tana River County. The process of its development was not only inclusive but also participatory.

We extend our gratitude to all stakeholders who contributed to its development including community members who willfully shared information through surveys and needs assessments. We acknowledge the support of the Ministry of Energy and Petroleum (MoEP). We thank experts from the MoEP's Renewable Energy Directorate namely, Dan Marangu, from the Director Renewable Energy and Eng. David Mutisya, for their support and guidance. At the same time, we are grateful to Wycliffe Amakobe and Prudence Lihabi who served as National Mentoring Experts.

This work would not have been complete without the invaluable contribution of technical experts from the nexus departments in the County Government namely Kenya Power and Lighting Company (KPLC), Rural Electrification and Renewable Energy Corporation (REREC), the National Council for Persons with Disabilities (NCPWD), Anglican Development Services (ADS), Nature Kenya, Davis and Shirtliff, Hola. Others were various civil society organisations and private stakeholders who participated as part of the County Energy Planning Technical Committee.

We highly appreciate the drafting team led by James Gatimu and supported by Elly Odhiambo, who worked tirelessly on this initiative. The Sustainable Energy Technical Assistance (SETA) Project team were a supportive partner, led by JP Laude and Jechoniah Kitala. They provided crucial technical support, with additional expertise from Etienne Jacquemet in least cost electrification planning and Doreen Irungu in clean cooking modelling. County coordination and primary data collection was spearheaded by the Tana River County team, led by Eng. Felix Mumba (Director Water and Energy), supported by Laura Makali (County Energy Officer), under the overall leadership of Ms. Hadija Harufa Algi (County Executive Member, Water, Energy, Mining, Wildlife and Natural Resources).

Finally, we acknowledge the PA team led by George Theuri (Team Lead), Evans Omondi, and Mercy Kospir (Intern), for their project management, technical inputs and support. Tim Mwangi (PA's - Head of Programmes) and Yvonne Nyokabi (UNDP's Project Manager - Climate Promise) who provided overall leadership during the entire process to develop this Plan.

EXECUTIVE SUMMARY

Energy access is a critical prime mover of socio-economic development. It serves as a cornerstone for entrenching progress across various sectors essential for human well-being. At the household level, energy access directly influences the quality of life, enabling essential activities such as cooking, heating, and lighting. In health care, energy plays a pivotal role in enhancing healthcare services by powering medical equipment, refrigeration for vaccines and medicines, and providing electricity for lighting health facilities. In education, energy facilitates learning through the provision of lighting for study purposes, powering electronic devices, and supporting integration of Information and Communication Technology (ICT) into learning activities. Additionally, energy is indispensable for agricultural activities, including irrigation, processing, and storage, thereby contributing to food security and livelihoods enhancement. For water access and sanitation systems, energy is needed for pumping, purification, and reticulation, ensuring access to clean and safe water for communities. In essence, energy access provides the foundation for socio-economic development, driving progress and prosperity across all facets of human existence.

The Energy Act, 2019 (Section 5, 5th schedule), the Integrated National Energy Plans (INEP) framework & the draft INEP regulations of 2023 provide for integrated energy planning where County Governments are required to prepare County Energy Plans (CEPs). These will be forwarded to the Cabinet Secretary for Energy and consolidated into one National Integrated Energy Plan, which will guide implementation of energy projects and programmes in Kenya. The CEPs will guide implementation of energy projects for 10 years and will be reviewed on a rolling basis after every three years.

This CEP for Tana River County has been developed in order to comply with the above requirements, while also providing a road map for mainstreaming energy access issues into the County's development agenda. Its contents have been informed by detailed baseline data analyses and extensive stakeholders' consultations. Though the Plan is supposed to cover a period of 10 years, it was agreed, through the deliberations of the County Energy Technical Committee, to tie, to the extent possible, energy access projects to the life of 3rd Tana River County Integrated Plan (Tana River CIDP3). As such, most projects have been scheduled to run from 2024 to 2028. They are a few, however, and namely the Least Cost Electrification Planning and the Biogas Project for Households, which are envisioned to continue until 2030. In line with INEP Regulations, this plan will due for review in 2028.

The document is structured into eight primary chapters, each addressing specific aspects of the County's energy landscape and development objectives.

Chapter 1 is on introduction. It captures the process of developing this document, explores the modalities of integrating the CEP and CIDP3, provides a high-level overview of the County's development and demographic indicators and the energy access profile, and finally examines national and county level policies and regulations relevant to energy planning.

Chapter 2 takes stock of the County's energy resources. Specifically, the Chapter delves into wood fuel; agricultural residues; livestock population; the feasibility of biogas generation from livestock waste; and hydro, solar and wind resources.

Chapter 3 is on energy access. It has two sub-topics namely; electricity access and access to clean cooking services. Under electricity access component, focus is on households, education institutions, health facilities, agri-based facilities, irrigation, water access and the mining sector. The Plan documents the status of electricity access and proceeds to propose interventions to achieve it. With respect to access to clean cooking services, the focus is on households, education institutions, health facilities, Micro-Medium and Small Enterprises (MSMEs), prisons and National Youth Service (NYS) institutions.

Chapter 4 focuses on energy efficiency and conservation, outlining measures aimed at promoting efficiency across households, buildings, industries, and transportation.

Chapter 5 delves into bioenergy resources, highlighting various aspects such as the potential for biogas generated from livestock waste for households use, the potential for biogas generated from human waste for institutional and large hotel applications, bioethanol fuel, and the potential for converting the castor oil plant, which does very well in the Tana Delta region, into energy.

Chapter 6 documents projects and programmes which need to be implemented so as to achieve energy access objectives detailed under chapters 3, 4 and 5. To facilitate clarity and accountability, the projects are categorised according to the implementing agency responsible for their execution.

Chapter 7 presents the implementation, coordination, monitoring and evaluation framework. This section delineates the mechanisms and structures required to execute, coordinate, and assess the progress of the Plan. It outlines roles, responsibilities, and monitoring protocols to ensure effective implementation and the attainment of set targets.

Finally, chapter 8 is on conclusions and recommendations. A salient recommendation is on the necessity to bolster the manpower capacity within the Energy Department for successful implementation of the CEP and the realisation of its objectives. There is also need to prepare a policy framework upon which the implementation of this Plan will be anchored. It is envisioned that the CEP will inform all future Annual Development Plans (ADPs- 24-25, 25-26, 27-28) and will ultimately propel energy access matters into the heart of the County's development agenda.

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LIST OF ACRONYMS, ABBREVIATIONS & SYMBOLS

AC	Alternating Current
ACCA	Accelerated Clean Cooking Action
ADS	Anglican Development Services
CAIP	County Aggregation and Industrial Park
CAPEX	Capital Exependiture
CCA	Clean Cooking Alliance
CCAK	Clean Cooking Association of Kenya
CEP	County Energy Plan
CEPC	County Energy Planning Committee
CETC	County Energy Technical Committee
CFLs	Compact Fluorescent Lamps
CGTR	County Government of Tana River
CIDP	County Integrated Development Plan
DC	Direct Current
ECDE	Early Childhood Development and Education
EE&C	Energy Efficiency and Conservation
EPRA	Energy and Petroleum Regulatory Authority
FAO	Food and Agricultural Organization
GCP	Gross County Product
GDC	Geothermal Development Company
GDP	Gross Domestic Product
GHG	Green House Gases
GHI	Global Horizontal Irradiation
GIS	Geographic Information System
GSA	Global Solar Atlas
GWA	Global Wind Atlas
HAP	Household air pollution
HH	Household
HMFL	High Mast Flood Light
ICS	Improved Cookstove
ICT	Information Communication Technology
INEP	Integrated National Energy Plan
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
ITCZ	Inter Tropical Conventional Zone
JKP	Jumuiya ya Kaunti za Pwani
KCAP	Kenya Country Action Plan
KCJ	Kenya Ceramic Jiko
KDHS	Kenya Demographic Health Survey
KES	Kenya Shillings

KETRACO	Kenya Electricity Transmission Company
KFS	Kenya Forest Service
kg	Kilogram
KIIs	Key Informant Interviews
km	kilometer
KNBS	Kenya National Bureau of Statistics
KNECCS	Kenya National Efficiency and Conservation Strategy
KNES	Kenya National Electrification Strategy
KOSAP	Kenya Off-grid Solar Access Project
KPLC	Kenya Power and Lighting Company
kV	kilovolt
kWh	kilo watt hour
LCEP	Least Cost Electrification Plan
LCOE	Levelized Cost of Electricity
LCPDP	Least Cost Power Development Plan
LED	Light Emitting Diode
LMCP	Last Mile Connectivity Project
LPG	Liquefied Petroleum Gas
M&E	Monitoring and Evaluation
m2	Square meter
MEC	Modern Electric Cooking
MEPS	Minimum Energy Performance Standards
MRF	Materials Recovery Facility
MSME	Micro Small and Medium Enterprises
MVA	megavolt-amperes
NDMA	National DroughtManagement Authority
NMT	Non-Motorized Transport
NTSA	National Transport and Safety Authority
NuPEA	Nuclear Power and Energy Agency
OPEX	Operating Costs
PAYG	pay-as-you-go
PPP	Public Private Partnership
PV	Photovoltaic
PWD	Persons With Disability
REREC	Rural Electrification and Renewable Energy Corporation
SE4All	Sustainable Energy for All
SEACAP	Sustainable Energy Access and Climate Action Plan
SEP	Slum Electrification Project
SETA	Sustainable Energy Technical Assistance
SHS	Solar Home System
SIVAP	Small-Scale Irrigation and Value Addition Project
SWH	Solar Water Heating
Tawasco	Tana River Water and Sewerage Company
TRICCA	Tana River County Community Association
UNDP	United Nations Development Programme
USD	United States Dollar
VTC	Vocation and Technical College
W	Watt
WHO	World Health Organization

DEFINITION OF TECHNICAL TERMS

Improved cookstove (ICS) - There lacks a clear cut, universally accepted definition of an improved cookstove. However, notwithstanding the relativity around the definition, ICS designs are aimed at achieving either or a combination of fuel efficiency, reduced emissions and enhanced safety in usage relative to traditional stoves.

Traditional stoves - the two main traditional stoves alluded to in this document include the three stone open fire and the metallic charcoal stove.

e-Cooking - abbreviates cooking with electricity. The main stoves which cook with electricity include the ordinary electric hotplates, electric pressure cooker (EPC) and the electric induction cookers.

Bellerive Institutional Stove – a popular stove in institutions. It is made of a cylindrical metallic frame which has a stainless-steel inner surface. The fire chamber is made of bricks. The stove has a chimney.

Grid extension – entails extending the grid network to areas without grid coverage.

Grid densification - is achieved by installing additional transformers on existing medium-voltage to connect housing clusters within 600 meters of existing distribution transformers.

Grid intensification - is achieved by extending short (up to 2 km) medium voltage lines and additional transformers to connect more consumers.

Mini-grids consist of electricity generators and energy storage systems connected to a distribution network. They provide electricity to a localized group of customers who are not served by the interconnected national power grid.

1

INTRODUCTION

Tana River

Source: Shutterstock

Chapter 1.0

INTRODUCTION

1.1 Background

The Constitution of Kenya, 2010 established 47 counties and instituted a framework that, for the first time in the history of the country, devolves some energy planning and administrative functions to counties. This is expected to lead to a more equitable sharing of resources, heightened participation in energy planning at the county level, and targeted investments, particularly in areas that have been historically neglected. These diverse functions devolved to the County Governments are enumerated in Chapter 11 and the 4th Schedule of the Constitution. The Energy Act, 2019 builds on the provisions of the Constitution and provides details of this new structure under sections 5, 193, 194, 196, 199, 222, and the 5th Schedule. Section 5, sub-section 3 states that "each County Government shall develop and submit a country energy plan (CEP) to the Cabinet Secretary in respect of its energy requirements."

The objective of the CEP is to develop a socially inclusive energy supply infrastructure which gives all the residents sustainable access to energy for their needs. This planning will also help to identify environmentally sound and climate-friendly technologies and resource options for providing energy access, and associated investment opportunities.

1.2 Process of developing County Energy Planning (CEP)

Inception workshop

This process begun with an inception workshop held in Hola Town between 4th and 5th October 2023. The event was attended by Practical Action and the County Government representatives. It was explained that Practical Action, with support from United Nations Development Program (UNDP), was implementing a project christened Accelerating Clean Cooking Action in Kenya. Through it, Practical Action would support the County Government of Tana River to develop its CEP in line with Section 5 of the Constitution and the 5th Schedule of Energy Act,2019, which obligates County Governments to develop CEPs. Upon completion, the CEPs are to be forwarded to the national government for consolidation into one Integrated National Energy Plan (INEP) which will guide implementation of energy projects and programmes in Kenya.

Key Informant Interviews

In the week of 30th October to 3rd November 2023, key informant interviews were held with key stakeholders. The departments interviewed include Agriculture (crops, livestock & fisheries), Water Access, Health, Trade, Education, Early Childhood Development and Education (ECDE) institutions and primary, secondary and tertiary institutes), Environment & Climate Change, Gender and Physical Planning; and the Kenya Off-Grid Solar Access Project (KOSAP). The interviews provided rich insights which provided an overview of the County's energy access landscape. Through in-depth discussions and expert opinions, a multifaceted understanding of prevailing energy challenges, opportunities, and priorities emerged.

The Energy Directorate was tasked with the formation of the County Energy Technical Committee (CETC). According to the INEP framework, the CETC will bring together representatives of key County partners to provide technical-level strategic leadership and direction and contribute to the development and implementation of policy decisions, strategic directions and key interventions that will lead to realisation and attainment of CEP objectives. The departments seconded to the CETC are listed in Annex 1.

Literature review

A judicious and harmonious review of all existing and relevant National and County Governments' plans; strategy documents, laws and policies; and project reports, was undertaken. Specifically, the following documents were reviewed: the County Integrated Development Plan (CIDP) for 2023- 2027; Annual Development Plan (ADP) for 2024-2025; county energy laws and policies; Kenya Population and Housing Census, 2019; Kenya Demographic and Health Survey, 2022; Energy Act, 2019 and subsidiary legislations; the National Energy Policy of 2018; the INEP framework; Kenya National Efficiency and Conservation Strategy; Kenya National Electrification Strategy; Kenya Bio-energy Strategy; project reports; and published academic works. The exercise enabled a deep understanding of the legal and policy frameworks which underpin energy planning in general and their

implications on County energy planning. Further, through literature review, it was possible to obtain insights about demographics, energy access levels, proposed plans and allocated budgets. All this information was crucial in building a solid contextual foundation on the existing County energy access situation.

Baseline surveys

To better understand the energy access landscape, two baseline surveys were undertaken. One targeted households and the other businesses. They were critical in providing insights on energy access situations including the main sources of energy, consumption levels, energy budgets among others. Specifically, the household survey delved into crucial aspects such as the primary sources of energy used for cooking, lighting, and heating, as well as the levels of energy consumption and associated budgetary considerations. Additionally, it sought to uncover inherent factors influencing energy choices and preferences among households, including socio-economic status, geographical location, and cultural norms. On the other hand, the businesses survey provided valuable insights into electricity and cooking energy requirements, which were instrumental in informing relevant solutions.

Cooperation with nexus sectors

A concerted effort was undertaken to comprehensively understand the energy requirements of the nexus sectors, recognising their pivotal role in the energy planning process. Identified as key stakeholders in energy consumption and service provision, these sectors are crucial in ensuring that energy access needs are accurately profiled and effectively integrated into the CEP. To achieve this, five nexus sectors were identified: agriculture, health, education, water access, and trade. Tailored data collection templates were crafted and disseminated to gather insights into the unique energy demands of each sector. Through diligent data collection, baseline information was obtained and subsequently subjected to rigorous analysis to derive critical insights. This collaborative endeavour ensures that the CEP transcends conventional boundaries, embodying inclusivity and a comprehensive understanding of energy access needs across various sectors. By adopting this broad-spectrum approach, the CEP emerges as a dynamic and responsive document, poised to address the multifaceted energy challenges facing the County and paves way for application of energy solutions that respond to the diverse needs.

Community Engagement Forums

The activity was geared towards fulfilling the Constitutional requirement of ensuring public participation at planning and implementation stages. To this end, Tana River community engagement forums were held between 7th and 8th February 2024, marking a significant initiative in fostering dialogue and collaboration across the County's diverse sub-counties. Simultaneously conducted in the five sub-counties, namely Tana River, Tana Delta, Tana North, Bangale, and Galledy-ertu, these forums provided platforms for interrogating the needs and expectations of local communities through the lens of energy access and its role in driving socio-economic development.

The feedback from sessions was varied but it revolved around energy poverty in: households, agricultural sector (especially the role of energy in enhancing the shelf life of perishable agricultural produce, as well adding its market value), water pumping, an example was the realization that small holder farmers along River Tana spend a fortune on fuels to run water pumps, For health, education and water access the for equipping boreholes and water pans with pumping infrastructure became evident. This feedback was instrumental in shaping the different interventions proposed in this document.

Solutions Validation Workshop

Through the activities discussed above a number of energy access issues were prioritised. Prioritisation was based on identified energy access needs across the different nexus sectors as well as prescriptions of the INEP framework. Based on this consideration, the following priorities were adopted: clean cooking, electricity access, agriculture (crops, livestock and fisheries), water access, education, health, trade and energy efficiency and conservation.

In response to identified energy access needs, gaps, and barriers within the County, a series of appropriate solutions were developed and organised into programmatic, policy, and regulatory interventions around the priorities listed above. These solutions were crafted to address the diverse challenges and opportunities inherent in the County's energy landscape. Subsequently, during the week of 4th March 2024, a meeting with the CETC was convened in Hola. This gathering served as a platform to deliberate upon and validate the proposed solutions, fostering collaborative dialogue and gathering input from key stakeholders.

1.3 Integration of CEP into CIDP

The development of the CEP involved a detailed and critical review of all the CIDPs already developed by the County Government of Tana River (CGTR) as its development blueprints. A lot of information was gathered, particularly from the CIDP 3 (2023-2027), which explicitly outlines five key development goals for the energy sector in the County. These goals as contained in the CIDP 3 include:

Goal 1: Promote access to modern energy services: The goal aims to improve the use of renewable energy technologies, increase electrification rates, improve security, reduce cost of power, and improve livelihoods at community level.

Goal 2: Promote access to clean cooking solutions and technologies which aims to reduce indoor pollution, promote sustainable use of natural resources and increase adoption of alternative clean cooking solutions.

Goal 3: Promote energy efficiency and conservation measures in buildings and industries which aims at reducing electricity bills, business growth and increased awareness on energy efficiency measures.

Goal 4: Capacity building on productive use of energy which aims to reduce energy poverty levels and promote green jobs.

Goal 5: Development of policy, legal and institutional energy frameworks which aims at increasing development and investment of renewable energy sources, to provide efficient and effective support services and policies.

This CEP gives a detailed account of the county's energy situation in line with the five energy goals outlined above and proposes strategic solutions which will be implemented to bridge energy gaps. It is a very useful reference and guide not only for the CGTR but also for all stakeholders. The proposed projects in the CEP will be aligned to the CIDP 3 and included in future annual County development work plans. This will require resource allocation for their implementation. It enables the CGTR to seek for partnerships with development partners and the private sector to realise the County's energy development objectives.

1.4 County overview & Energy profile

1.4.1 Location and size

Tana River County is one of 47 Counties in Kenya. The County takes its name from River Tana which is the longest river in Kenya. It is part of the former Coast Province, with an area of 35,367 sq. Kms. and a population of 315,943, according to the 2019 Kenya Population and Housing Census. The county borders Kitui County to the West, Garissa County to the North East, and Isiolo County to the North, Lamu County to the South East and Kilifi County and Indian Ocean to the South. It straddles between latitudes 000'53" and 200'41" South and longitudes 380 30' and 40015' East. It has 76 Km coastline.

Tana River County has five Sub Counties namely, Tana North, Bangale, Galledyertu, Tana River and Tana Delta. It has 15 wards, 55 locations and sub-locations. Galole, Bura and Garsen all have 15 county electoral wards.

Tana River County has a hot and dry climate within ecological zones ranging from III (in the very high grounds) to VII (in the plains or lowlands). Average annual temperatures are about 30°C with the highest being 41°C around January-March and the lowest being 20.6°C around June-July. Rainfall is low, bimodal, erratic and conventional in nature. The total annual rainfall ranges between 280 mm and 900 mm with long rains occurring in April and May, short rains in October and November with November being the wettest month. The Inter Tropical Convergence Zone (ITCZ), which influences wind and non-seasonal air patterns for the River Tana, determines the amount of rainfall along the river line. The dry climate in the hinterland can only support nomadic pastoralism.

The major physical feature in Tana River County is an undulating plain that is interrupted in a few places by low hills at Bilbil around Madogo and Bura divisions. The land in Tana River generally slopes south eastwards with an altitude that ranges between 20m to 200m above sea level at the top of the Bilbil Hills. The River Tana traverses the County from Tharaka County in the North to the Indian Ocean in the South passing through Tana Delta and covering a stretch of approximately 500 km. It is the County's most striking feature.

Besides the River Tana, there are several seasonal rivers popularly known as lagas, which flow in a west-easterly direction from Kitui and Makueni Counties draining into River Tana and eventually into the Indian Ocean. The river beds support livestock as well as wildlife during the dry season since they have high ability to retain water. River beds are most appropriate sites for shallow wells, sub-surface and earth dams.

1.4.2 Demographic features

According to the Kenya National Bureau of Statistics (KNBS) Census, 2019, Report Volume I, the total population is 315,943 people, comprising 158,550 men and 157,391 women with two being intersex. The County has an inter census population growth rate of 2.83% slightly lower than the national average of 2.9%. There are 68,242 households with an average size of 4.6 people. The population density is the second lowest in the country, at eight people per sq. Km. Hola and Garsen are the major urban centres. Other upcoming centres include Madogo and Minjila.

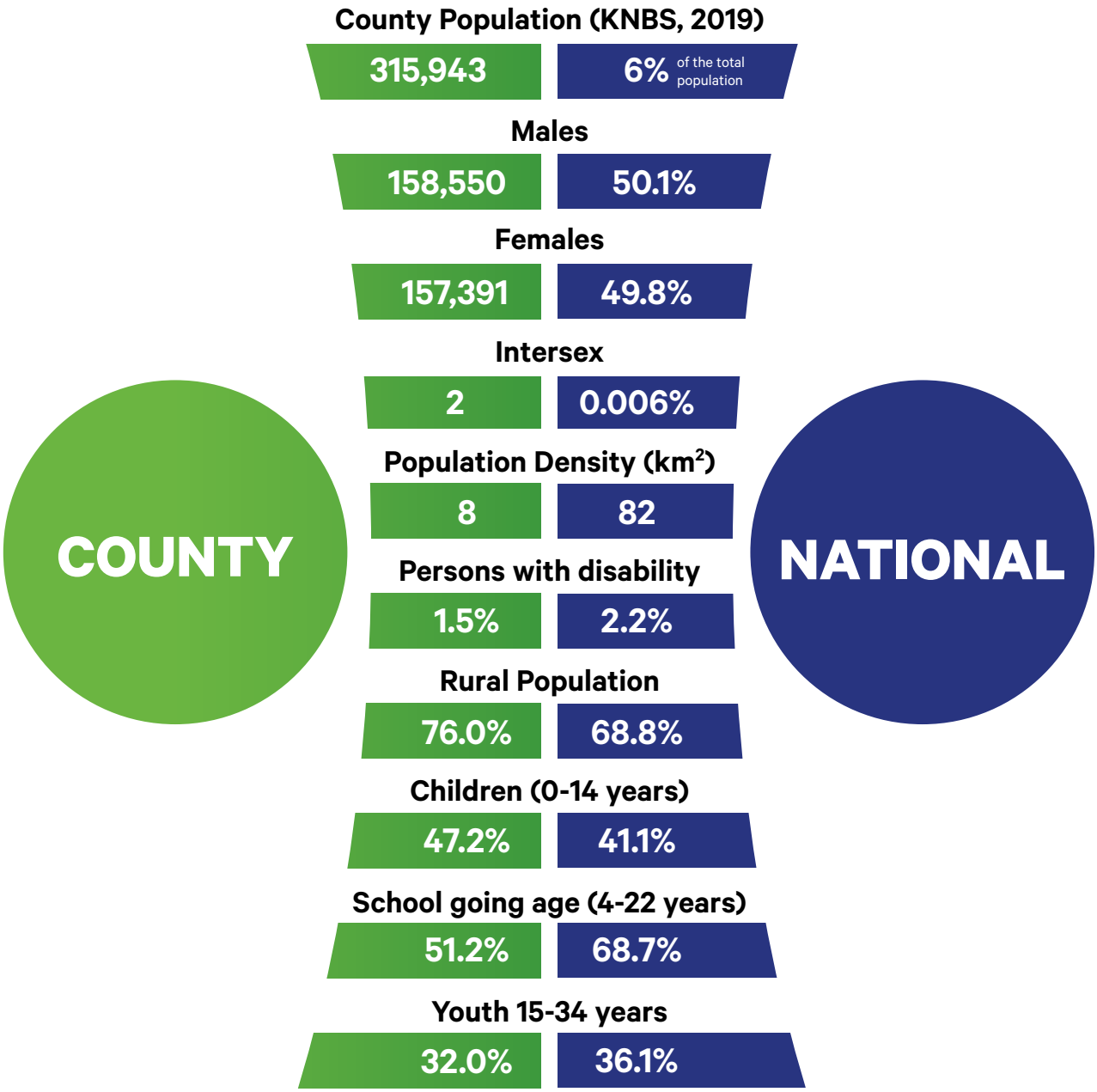
Of the population 4,040 (1.5%) are Persons With Disability. The youth constitute 32.0% of the population of whom 51.0% are female. About 76.0% of the population live in rural areas of whom 49.8% are female. The elderly population (65 years and above) make up 3.1% of the total population of whom 51.9% are female. The population in school going age group (4-22 years) is 51.2 % according to the 2019 Census.

Table 1: Demographic indicators in Tana-river County

Demographic indicators in Tana River County		
	County	National
Estimated County Population (KNBS, 2019) Males Females Intersex	315,943 158,550 157,391 2	0.6% of the total population 50.1% 49.8% 0.006%
Estimated Population Density (km2)	8	82
Persons with disability	1.5%	2.2%
Population living in rural areas (%)	76.0%	68.8%
Children (0-14 years) (%)	47.2%	41.1%
School going age (4-22 years) (%)	51.2%	68.7%
Youth 15-34 years (%)	32.0%	36.1%

(Source: KNBS 2019)

Demographic indicators in Tana River County



1.4.3 County socio-economic profile

Tana River County is one of the counties in Jumuiya ya Kaunti za Pwani (JKP) (Kiswahili for Community of Coast Counties) economic bloc. Agriculture and livestock are the main sources of livelihood. They contribute about 82% of household incomes and more than 80% of employment. Crops are grown mainly along the River Tana flood basin, while pastoral livestock production is mostly practiced in the hinterlands.

Tana River County's Gross County Product (GCP) accounted for 0.4% of total Gross Domestic Product (GDP) as at 2017 as indicated in Table 2 below. The GCP increased from Ksh. 21,419 million in 2013 to Ksh. 33,498 million in 2017 representing an annual average growth rate of 11.3%. The agriculture sector contributed 54.7% of GCP while services and industries' share constituted 38.0% and 7.0%, respectively. The services sector includes such activities as wholesale and retail trade. Industries and manufacturing include production of consumer goods such as plastics, furniture, textiles, and food processing.

Over the period 2015/2016, the overall poverty rate in the County was 62.0% against a national poverty rate of 36.1%. In addition, 55.9% of the population were living in food poverty and 61.0% were living in multidimensional poverty. This means being deprived in several dimensions including, health care; nutrition and adequate food; drinking water; sanitation and hygiene; education; knowledge of health and nutrition; housing and standard of living; and access to information. According to the KDHS, 2014, 28.1% of the children were stunted as compared to the average national level at 26.0%.

Table 2: Development indicators in Tana-river County

Parameter	County	National
Labor force (15-64 years) (%)	49.0%	55.0%
Elderly population (over 65-year-old)	3.1%	3.9%
Poverty (%)	62.1%	36.1%
Food Poverty (2015/2016) (%)	55.9%	31.9%
Multidimensional Poverty (2015/2016) (%)	61.0%	56.1%
Stunted children (KDHS 2014)	28.1%	26%
Gross County Product (Ksh. Million)	33,498	0.4% Share to total GDP (2017)
Average growth of Nominal GCP/GDP (2013-2017) (%)	11.3%	15.3%

(Source: KNBS 2019)

Sustainable food production through modern irrigation methods

Solar powered water pump in Tana River County

1.4.4 Energy profile

Based on a Geographic Information System (GIS) analysis done while developing the LCEP, which has been discussed in details under Chapter 3, as of 2023, approximately 40% of households in the County had gained access to electricity, representing around 22,000 domestic clients out of an estimated total of 55,000 households. This data indicates a significant gap in electrification, with a substantial portion of the population still lacking access to this essential utility.

Based on a household survey conducted in 2023, on cooking energy, firewood and charcoal are the predominant fuels utilised by the residents. They are primarily used by 81.7% and 17.3% of households respectively. Firewood is mainly burnt on the traditional three-stone open fire by 94% of households while charcoal is mainly burnt on the inefficient metallic charcoal stoves by 54% of households. These traditional cooking methods are associated with inefficiencies and environmental concerns, contributing to deforestation, air pollution, and adverse health effects.

1.5 Policy & regulatory framework

1.5.1 National level policies and regulations

The enabling environment for County energy planning is anchored in the Constitution of Kenya, 2010. The 4th Schedule distributes roles between the National and County Governments. Part 1 of the 4th Schedule provides that the national government shall be responsible for formulation of the energy policy, including electricity and gas reticulation and energy regulation; while in Part 2 provides that the County Governments shall be responsible for county planning and development, including electricity and gas reticulation and energy regulation. It is clearly observed that energy is a concurrent function of both the National and County Governments. Furthermore, sustainable development is one of the national values and principles of governance that all state organs, state officers, public officers and all persons are required to observe as stipulated under Article 10 (2)(d). It is thus imperative that county energy planning ensures environmental sustainability and is integrated and mainstreamed into all development action planning. In addition, Article 60 (c) of the Constitution calls for sustainable and productive management of land resources (including energy).

Constitution of Kenya, 2010

The Constitution has enhanced protection and enforcement of fundamental rights amongst other gains. It provides for a two-tier structure of government, National and the County Governments. It distributes the functions and powers between the two levels as detailed in Chapter 11 and the 4th Schedule.

Part 1 of the 4th Schedule provides that the National Government shall be responsible for:

a) Protection of the environment and natural resources with a view to establishing a durable and sustainable system of development, including water protection, securing sufficient residual water, hydraulic engineering and the safety of dams;

b) Energy policy, including electricity and gas reticulation and energy regulation

c) public investment.

In relation to the energy sector, Part 2 of the 4th Schedule provides that the County Government shall be responsible for planning and development, including electricity and gas reticulation and energy regulation.

The Energy Act, 2019

The Energy Act, 2019 is the revised edition of the Energy Act, 2006. The revision was necessitated by the need to align the Energy Act, 2006 to the 2010 Constitution which ushered in devolution. The Energy Act, 2019, consolidates the laws relating to energy and aligns the legal and regulatory framework of the energy sector with the Constitution. It does this by setting out with clarity the specific roles of the National and County Governments in relation to energy.

Public Private Partnerships Act, 2013

Under the Public Private Partnerships Act, 2013, a contracting authority that intends to finance, operate, equip or maintain an infrastructure facility or provide a service may enter into a project agreement with any qualified private party for the financing, construction, operation, equipping or maintenance of the infrastructure or development facility or provision of the service of the Government in accordance with the provisions of this Act.

A contracting authority shall, prior to entering into public-private partnership arrangements, pursuant to Section 19, undertake a sector diagnostic study and assessment covering the following:

a) Technical issues

b) Legal, regulatory and technical frameworks

c) Institutional and capacity status

d) Commercial, financial and economic issues

e) Such other issues as the Cabinet Secretary may stipulate

Part VI under project identification and selection of private party, the Public Private Partnerships (PPP) Act, 2013 is very clear that all procurement must be through a competitive bidding process. In stipulates: "Except as otherwise provided for under this Act, all projects shall be procured through a competitive bidding process". In procuring and awarding a contract to a private party under this Act, counties must be guided by the principles of transparency, free and fair competition and equal opportunity in accordance with the guidelines made under this Act.

The County Governments Act, 2012

The County Governments Act, 2012 states that a County Governments shall plan within a framework that integrates economic, physical, social, environmental and spatial planning and protects and develops natural resources in a manner that aligns National and County Governments' policies. Environment and climate change are a function of the National and County Governments and requires concurrent jurisdiction across both levels.

Energy Regulations

A number of regulations are in place that can enhance adoption of energy access, energy efficiency and rural electrification in Kenya. There are a series of policies and regulations, which include:

Electricity Regulations

a) The Electric Power (Electrical Installation Work) Rules, 2006,

b) The Energy (Complaints and Dispute Resolution) Regulations, 2012

c) The Energy (Electricity Licensing) Regulations, 2012

d) Kenya Green code

Renewable Energy Regulations

a) The Energy (Solar Photovoltaic Systems) Regulations, 2012

b) Designation of Energy Users Gazettement

c) The Energy (Energy Management) Regulations, 2012

d) The Energy (Solar Water Heating) Regulations, 2012

e) Charcoal Rules, 2009.

f) The Biogas Regulations (Draft)

g) Improved Biomass Cook Stove Regulations, 2012(draft)

h) The Energy (Biodiesel Licensing) Regulations, 2009 (Draft);

i) Kenya Mini-grids Regulatory Framework (under development)

j) Feed-In-Tariff (FiT) Policy

Petroleum Regulations

a) The Energy (Gasohol Blending) Regulations, 2010
b) The Petroleum (Amendment- No 2) Rules, 2003 - Ln 197
c) The Petroleum (Amendment) Rules, 2002 - Ln 31
d) The Petroleum (Amendment) Rules, 2000 - Ln 64
e) The Energy (Petroleum Regulation Levy) (Amendment) Regulations, 2008 (August) – Ln 104-111
f) The Energy (Liquefied Petroleum Gas) Regulations, 2009
g) The Energy (Importation of Petroleum Products) (Quota Allocation) Regulations, 2010
h) The Energy (Minimum Operation Stock) Regulations, 2008
i) The Energy (Strategic Stock) Regulations, 2008
j) Liquified Petroleum Gas Policy 2015 (Draft)
k) The Petroleum (Exploration, Development and Production) Act, 2015
l) Model Production Sharing Contract
m) The Petroleum Act No. 2 of 2019
n) The Local Content Bill, 2018

Other Policies, Laws and Regulations Influencing Clean Energy

a) National Climate Change Action Plan
b) The Climate Change Act, 2016

Strategic and Planning Documents

a) Kenya Vision 2030
b) County integrated development plans
c) Kenya Sustainable Energy for All (SE4All)
d) Least Cost Power Development Plan (LCPDP)
e) Rural Electrification Master Plan
f) Kenya Country Action Plan (KCAP), 2013

1.5.2 County level energy policies & legislations

Draft Tana River County Climate Change Policy 2024

The Policy has been formulated and public participation has been done. It is awaiting validation by the County Executive Committee (CEC). After approval, it will be tabled at the County Assembly for review and approval. It highlights efficient transport and clean energy as a potential pathway for facilitating transition to low carbon development. The following are some of the policy objectives with a bearing on energy access.

i) Promote the adoption of fuel-efficient vehicles that produce fewer emissions
ii) Develop infrastructure for motorised and non-motorised transport systems
iii) Promote the adoption of cleaner fuels to reduce Green House Gas (GHG) emissions per kilometre travelled such through use of biofuel for local transport
iv) Support the private transport sector by providing incentives for reducing emissions and adopting environmentally friendly transport services such as electric/ hybrid vehicles for urban use
v) Secure financing for technology innovations for urban planning and the transportation sectors
vi) Reduce driving through cutting both the distances travelled per trip and the number of trips
vii) Develop and promote in-land waterways transportation
viii) Develop a maritime safety system through innovation in ICT-driven monitoring and warning systems to reduce weather-related accidents
ix) Design and implement water transport safety by-laws
x) Increase water transport surveillance to enforce safety measures
xi) Promote the use of fuel-efficient vessels and boats

The draft Tana River County Environment Policy, 2024

The Policy has been validated and has been forwarded to the CEC through the Member responsible for Environment and Climate Change. Under Chapter 5, the Policy, it stipulates: “That a significant proportion of Tana River residents rely on woody biomass for cooking; this has the effect of accelerating deforestation and frustrating the County’s environmental targets considering the role trees play in the environment. Some few segments still rely on kerosene for cooking and lighting, resulting in both environmental pollution and health risks.” The following are some of the policy objectives with a bearing on energy access.

i) Develop and implement the CEP for generation and sustainable utilisation of renewable energy.
ii) Develop and implement CEP.
iii) Promote adaptation of the cleaner production concepts in all energy production and consumption activities.
iv) Promote investments in clean energy.
v) Encourage the establishment of green buildings.
vi) Create public awareness with respect to clean energy and energy efficient technologies.
vii) Facilitate public access to clean and affordable energy sources.
viii) Ensure compliance with air quality standards by all sectors and strengthen monitoring and enforcement capacities.

ix) Develop and implement legal frameworks on air quality in order to protect the right to a clean and a healthy environment.

x) Promote the use of renewable energy domestically and in industries.

xi) Promote efficient non-motorised, non-polluting and efficient infrastructure for mass transport system.

xii) Implement the Tana Greening Programme.

The Tana River County Forest Policy, 2023

The overall goal of this Policy is to "Ensure sustainable development, conservation and management of forest resources as a strategy to improve the County's economy and livelihoods of residents while protecting the rich biodiversity and cultural heritage that contribute to the national and global commitments." Its objectives are as follows.

i) Halt deforestation and reverse forest degradation trends in Tana River County through strict enforcement by the government and community structures.

ii) Increase and maintain tree cover of at least 15% of the total land area of Tana River County.

iii) Provide enabling legal, policy and institutional arrangement for forest sector development.

iv) Enhance community participation in forest conservation and management through capacity building of Community Forest Associations and other community institutions.

v) Enhance innovative resource mobilisation including securing adequate funding for sustainable management of forests through county budget allocations and partnerships.

vi) Support livelihoods of forest dependent communities by promoting nature-based enterprises as incentives for restoration.

vii) Incentivise the establishment of forest plantations, agroforestry and commercial forests.

viii) Promote public, private and community participation and partnerships in forest sector development.

ix) Promote the use of forest conservation and management as a strategy to adapt to and mitigate the impacts of climate change

x) Promote the use of research, knowledge management and capacity building in the development of the forestry sector.

xi) Track policy implementation for adaptive management through a monitoring and evaluation framework

xii) Manage and expand green spaces in urban and peri-urban areas to enhance citizens' wellbeing

Tana River County Forest Conservation and Management Bill, 2024

The Bill has been submitted to the County Assembly for approval. The following are sections relevant to charcoal production;

i) The CEC Member in consultation with the relevant stakeholders shall prescribe regulations for trading in timber, charcoal and other forest products within the County.

ii) To give effect to these provisions, the CEC Member shall by notice in the Gazette, publish rules regulating trade of forest products in the County.

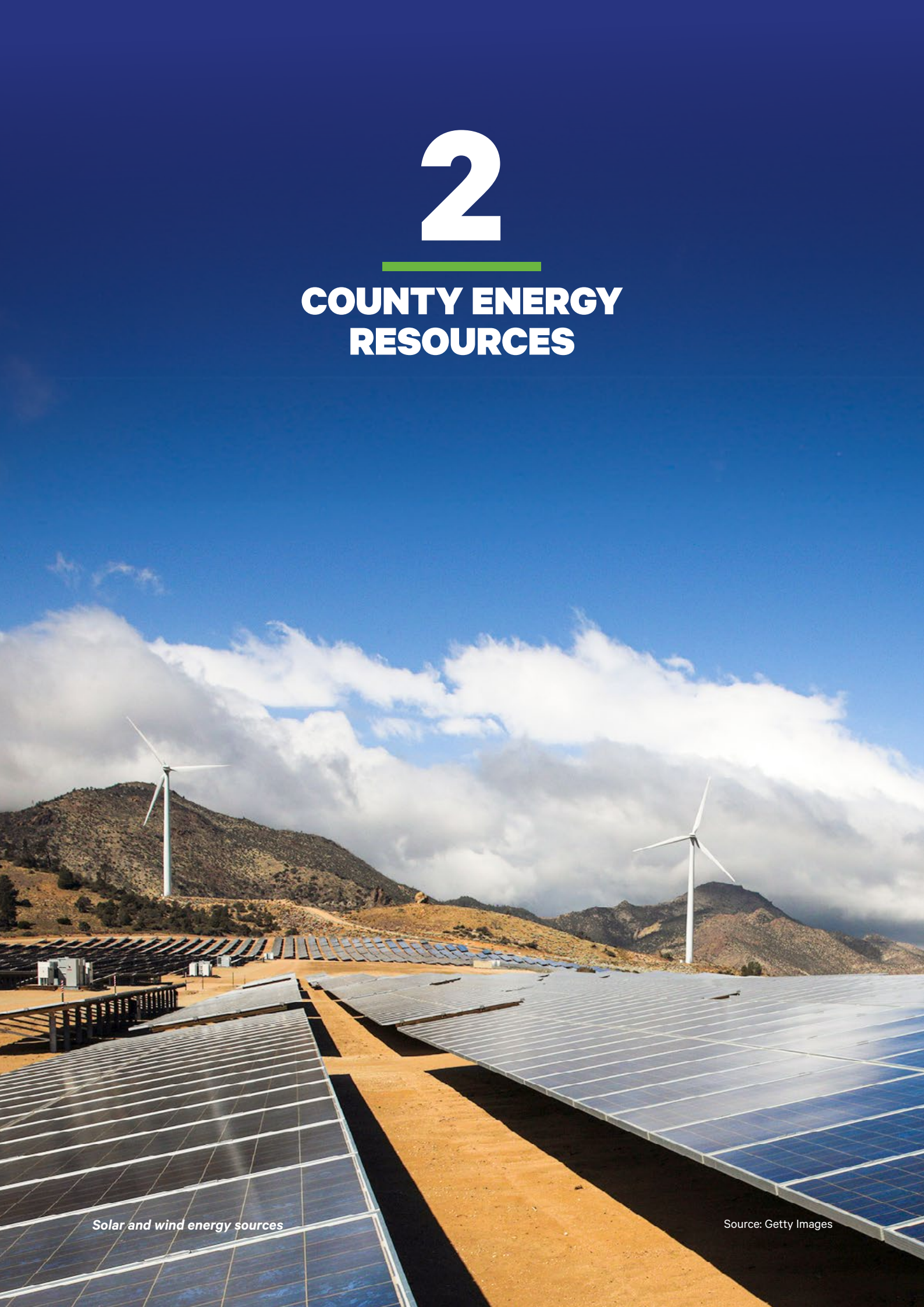
Solid Waste Management Act, 2022

According to this Act, both public and private entities will be equally expected to contribute towards the development of sustainable waste management practices across the country. Different sets of regulations and policies are expected to be enacted under the Act, which will further impact its overall effect and implementation. Organisations should commence proactively reviewing and considering their waste management policies, processes and business practices.

Opportunities may also emerge (i) for investors in waste handling, transportation and recycling, and (ii) for development of various infrastructure for waste management. Particularly, it is useful to note that County Governments may need to consider investments in various infrastructure for purposes of their obligations under the Act. This may be an opportunity for collaboration with the private sector to manage the current infrastructure gap in waste management and ensure appropriate developments are in place for effective performance of their functions. The Public Private Partnerships Act, 2021 may be significant in this regard.

2

COUNTY ENERGY RESOURCES



Solar and wind energy sources

Source: Getty Images

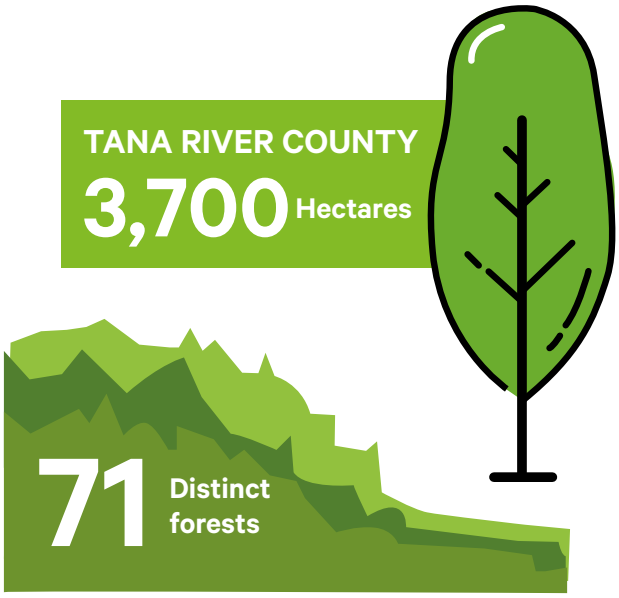
Chapter 2.0

COUNTY ENERGY RESOURCES

2.1 Wood fuel

Forest cover

According to Kenya Forest Service (KFS) tree resource survey of 2021, forest cover is unevenly distributed across Kenya with Central Region, parts of Western and the Coastal regions being the most forested. In Tana River County, there are about 71 distinct forests ranging in size from 1-1,100 hectares and covering around 3,700 hectares. They form part of a mosaic of habitats that include grassland, wooded grassland, bush land and deciduous forests (composed mostly of trees that shed all their leaves each year).



Tana River County boasts a diverse and intricate ecosystem, encompassing a mosaic of habitats ranging from high canopy coastal forests to grasslands and mangrove swamps. Covering an expansive area of 355,688.65 hectares, this ecological tapestry is home to a variety of plant species, each playing a vital role in sustaining the County's biodiversity.

According to the KFS Hola office, the dominant species in high canopy forests include *Chlorophora excelsa, Pennisetum spp., Manilkara zasibarensis, Brachylaena brichantha,* and *Terminalia spp*. Wooded bush areas are primarily dominated by *Hypaene coriacea, Terminalia spinosa, Digitaria milanjiana,* and *Panicum infestum*. Grasslands are characterised by dominant species such as *Echinochloa spp., Sporobolus halepensis, Panicum spp.,* and *Cynodon dactylon*. Mangrove swamp forests typically consist of *Bruguiera spp.* and *Avicennia spp*. In drylands, the dominant species include *Acacia spp., Dobra glabella, Salvadora persica,* and *the invasive Prosopis spp.*

2.2 Agricultural residues

Maize

According to the National Irrigation Board, there are an average of 15,000 acres put under maize cultivation in Bura and Hola irrigation schemes (7500 acres per season, two seasons per year). After harvest, the cobs and stovers normally go to waste.

According to Kirimi et al. (2018), the average maize yield per acre in Kenya is 18, 90 kg bags. This translates to an average yield of 1,710 kg per acre. Therefore, for 15,000 acres under cultivation, the average yield is 25,650 tons. According to the Food and Agriculture Organization of the United Nations (FAO)[1], , the average crop to residue ratio for maize to stovers and cobs is 1.96 and 0.33 respectively. This implies that for every 1 kg of maize harvested, there is usually 1.96 kg of stovers and 0.33 kg of cobs generated. Put differently, for every 1 kg of maize harvested, a total of 2.29 kg of stovers and cobs will be available as residues. In light of this therefore, for the 25,650 tons of maize harvested annually, a total of 58,738.5 tons of residue comprising stovers and cobs is generated.

Rice

According to the National Irrigation Board, an average of 15,600 acres is put under rice cultivation in Bura and Hola irrigation schemes (5200 acres per season, three seasons per year). After harvest, the rice stalks usually go to waste. The rice is thereafter transported to Mwea Irrigation Scheme for de-husking. However, milling companies are slowly setting up rice de-husking facilities at the two irrigation schemes and it is projected that going forward, there will be sufficient de-husking capacity at Bura and Hola schemes.

[1]https://www.fao.org/fileadmin/user_upload/energy/befs/natural_resources/external/Agricultural_Residues__tool_2.0.xlsm

Similarly, according to Kirimi et al. (2018), the average rice yield per acre for scheme farmers in Kenya is 25, 90 kg bags. This translates to an average yield of 2,250 kg of rice per acre. Therefore, for 15,200 acres under cultivation, the average yield is 34,200 tons of rice. According to the FAO, , the average crop to residue ratio for rice to straws and husks is 1.33 and 0.25 respectively. This implies that for every 1 kg of rice harvested, there is usually 1.33 kg of straw and 0.25 kg of husks generated. Put differently, for every 1 kg of rice harvested, a total of 1.58 kg of straw and husks will be generated. In light of this, therefore, for the 34,200 tons of rice harvested annually, a total of 54,036 tons of residue comprising straw and husks are generated.

Subject to further feasibility assessment, the above preliminary data points to substantial amounts of corn and rice residues which can potentially be converted into energy.

2.3 Livestock population & biogas potential

Table 3: Livestock population in the county

County/ Sub County	Farmers	Exotic cattle - Dairy	Exotic cattle - Beef	Indigenous cattle	Sheep	Goats	Camels	Donkeys	Pigs	Indigenous Chicken	Exotic Chicken Layers	Exotic Chicken Broilers	Beehives	Rabbits	Fishponds	Fish Cage
Tana Delta	15,128	456	116	5,662	6,412	8,142	160	1,395	-	5,693	437	297	464	22	91	29
Tana North	9,397	399	50	2,052	5,423	7,017	2,392	2,714	1	1,718	300	130	424	9	51	15
Tana River	10,569	447	117	4,298	4,890	6,386	781	1,220	1	2,776	282	189	178	7	34	4
Total	**35,094**	**1,302**	**283**	**12,012**	**16,725**	**21,545**	**3,333**	**5,329**	**2**	**10,187**	**1,019**	**616**	**1,066**	**38**	**176**	**48**

(Source: KNBS, 2019)

Livestock farming is a crucial aspect of agricultural livelihoods in Tana River County, contributing significantly to the local economy and food security. According to the 2019 Census data, Tana River County exhibits a diverse array of livestock populations, comprising exotic and indigenous species across various sub-counties. The total livestock population stands at 72,391, encompassing cattle, sheep, goats, camels, donkeys, pigs, and poultry.

Tana Delta emerges as a prominent hub for livestock rearing, with sizable populations of exotic cattle, sheep, goats, camels, and poultry. The sub-county boasts a total livestock population of 28,792 and a total of 15,128 farmers, showcasing the richness of its agricultural resources.

Tana North and Tana River sub-counties also exhibit significant livestock populations, with Tana North housing 22,205 livestock reared by 9,397 farmers while Tana River has a total of 21,394 animals and a total of 10,569 farmers. These regions rear a mix of exotic and indigenous livestock species, reflecting the livestock diversity within the County.

While the livestock population data provides valuable insights into the agricultural landscape of Tana River County, it presents limitations in assessing the potential uptake of biogas technology. The absence of information on livestock distribution per household impedes a precise estimation of households with the potential to adopt biogas technology.

Livestock population in a household is a key parameter employed in evaluation of potential to uptake biogas technology. Water access, level of education, income, exposure to information, access to credit, distance to firewood sources and farmland size, are the other factors which are instrumental in determining the likelihood of a household to adopt biogas technology (Shallo, Ayele & Sime 2020).

In this regard, the Directorate of Livestock assisted with providing data on a profile of farmers with potential to take up this technology. Drawing upon their deep understanding of the County's agricultural landscape and extensive interactions with the farming community, the Directorate identified and profiled a total of 370 farmers. This profile encapsulates key information about these farmers, shedding light on their farming practices, livestock ownership, and potential for embracing biogas technology. By targeting these farmers with tailored interventions, through information dissemination, access to finances, training programmes, and incentives, the County can facilitate a significant uptake of biogas technology, leading to environmental sustainability, improved livelihoods, and enhanced resilience in the agricultural sector.

Table 4: List of profiled farmers with potential to take up biogas technology

Sub-county	Ward	Village	Farming method	No. of farmers with potential to uptake biogas	Average total livestock	Average no. of cows	Average no. of goats	Average no. of sheep	Average no. of camels
Tana River	Kinakomba	Gafuru	Pastoralism	60	60	10	30	20	0
		Kipendi	Agro –pastoralism	12	26	5	15	6	0
		Wenje	Agro-pastoralism	8	19	4	10	5	0
		Maroni	Agro-pastoralism	6	15	4	7	4	0
	Mikinduni	Kalkacha	Pastoralism	12	10	5	10	16	0
		Bondeni	Agro- pastoralism						
	Chewani	Wachakone	Agro-pastoralism	10	28	8	12	8	0
		Malindi ya ngwena	Agro-pastoralism	8	23	6	12	5	0
		Matanya	Agro-pastoralism	6	21	7	8	6	0
Tana Delta	Garsen south	Itsoe	Agro-pastoralism	6	24	4	12	8	0
		Danisa	Pastoralism	12	22	5	10	7	0
		Ngao	Agro-pastoralism	7	15	3	8	4	0
		Tarasaa	Agro-pastoralism	10	18	10	5	3	0
		Minjilla	Pastoralism	12	32	12	10	10	0
	Garsen Central	Kipao	Pastoralism	18	38	15	12	11	0
		Dibe	Pastoralism	20	46	18	16	12	0
		Galili	Pastoralism	22	53	21	19	13	0
		Onkode	Pastoralism	17	58	20	21	14	0
	Kipini west	Odole	Pastoralism	12	48	16	19	13	0
		Sancha	Pastoralism	13	45	18	15	12	0
		Mwanja	Pastoralism	18	64	18	26	20	0
		Kikokmo	Pastoralism	16	68	15	30	23	0
		Nduru	Pastoralism	19	54	14	21	19	0
Tana North	Madogo	Madogo	Agro-pastoralism	8	47	20	15	12	0
	Hirimani	Bura	Agro-pastoralism	12	62	8	12	11	0
	Sala	Nanighi	Agro-pastoralism	8	46	5	5	8	0
	Banagale	Bangale	Pastoralism	18	91	20	32	28	8
Total	370	1033	291	392	298	8			

(Source: Department of Livestock)

2.4 Municipal Solid Waste

According to the County Department of Environment, the current state of waste management in the Tana River lacks an organised system for municipal waste collection, aggregation, transportation, and disposal. Consequently, this makes it challenging to accurately quantify the amount of waste generated within the County. This deficiency underscores the pressing need for the implementation of comprehensive waste management strategies, to address the growing concerns surrounding waste accumulation and environmental degradation, in line with the provisions of the County's Solid Waste Management Act, 2022 as well as the National Government's Sustainable Waste Management Act, 2022. Section 14 of the latter Act provides that each County Government shall establish a Materials Recovery Facility (MRF). The MRF shall be used for final sorting, segregation, composting and recycling of waste generated or transported to the county's long-term storage or disposal facility such as a landfill.

2.5 Solar Energy

Tana River County has significant potential for solar energy generation particularly on the north side. (Bangale, Madogo) with an average nine hours of sunshine per day. According to the Global Solar Atlas, the County's long term daily/yearly Global Horizontal Irradiation (GHI) is averagely 1976.5 KWh/m2. The average potential photovoltaic power output is 4.217KWh/KW-peak per day or 1539.3 KWh/KW-peak per year. In other words, a small residential PV system could supply on average more than 1.483MWh per year.

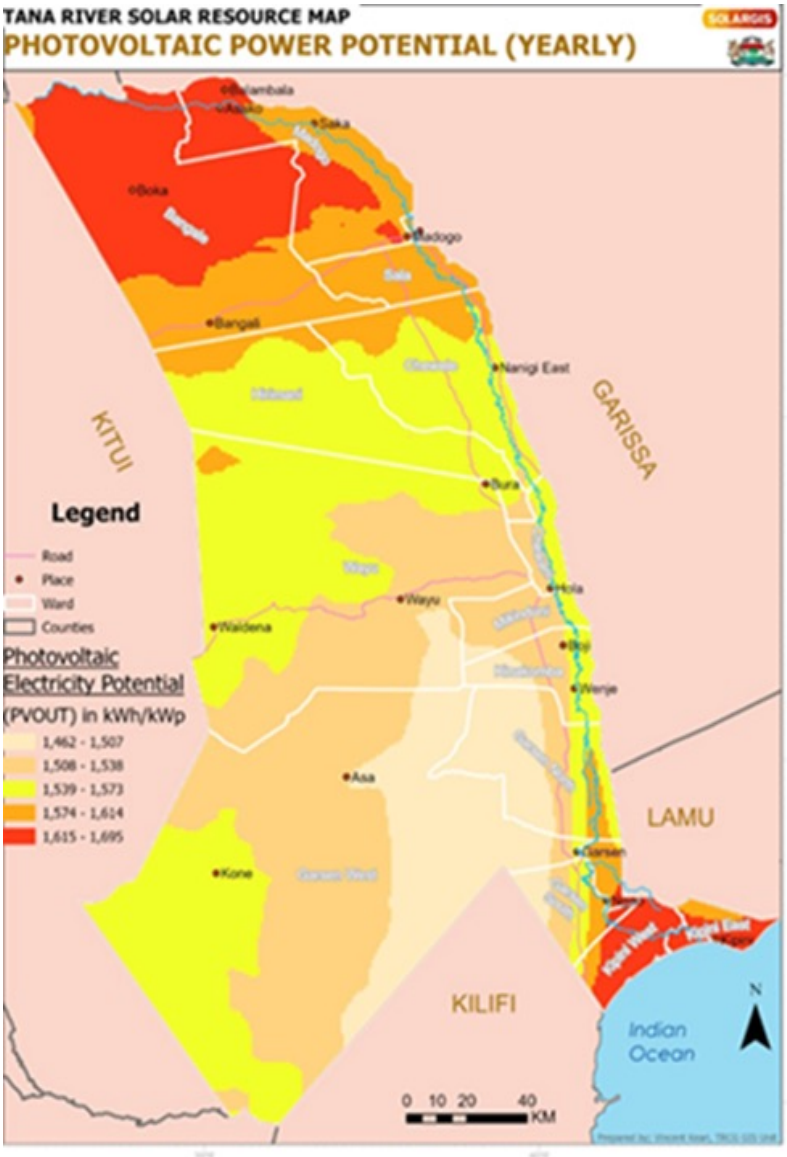


Figure 1: Tana River Solar Resource Map (source: The Global Solar Atlas (GSA)

2.6 Wind energy

The Global Wind Atlas is an open access, web-based application that maps the mean annual wind speed and wind power capacity factor across the world at high-resolution. The capacity factor is defined as the average power generated, divided by the rated peak power - or the amount of energy produced by a wind turbine compared to the energy produced if the machine ran at its rated power over a given period. It is used as a performance parameter for comparing the potential for wind power generation at different sites. Tana River County has on average mean wind speeds of 7.14m/s and mean power density of 314W/m2 at 100m for the windiest areas of the county, which are in Tana North sub county.

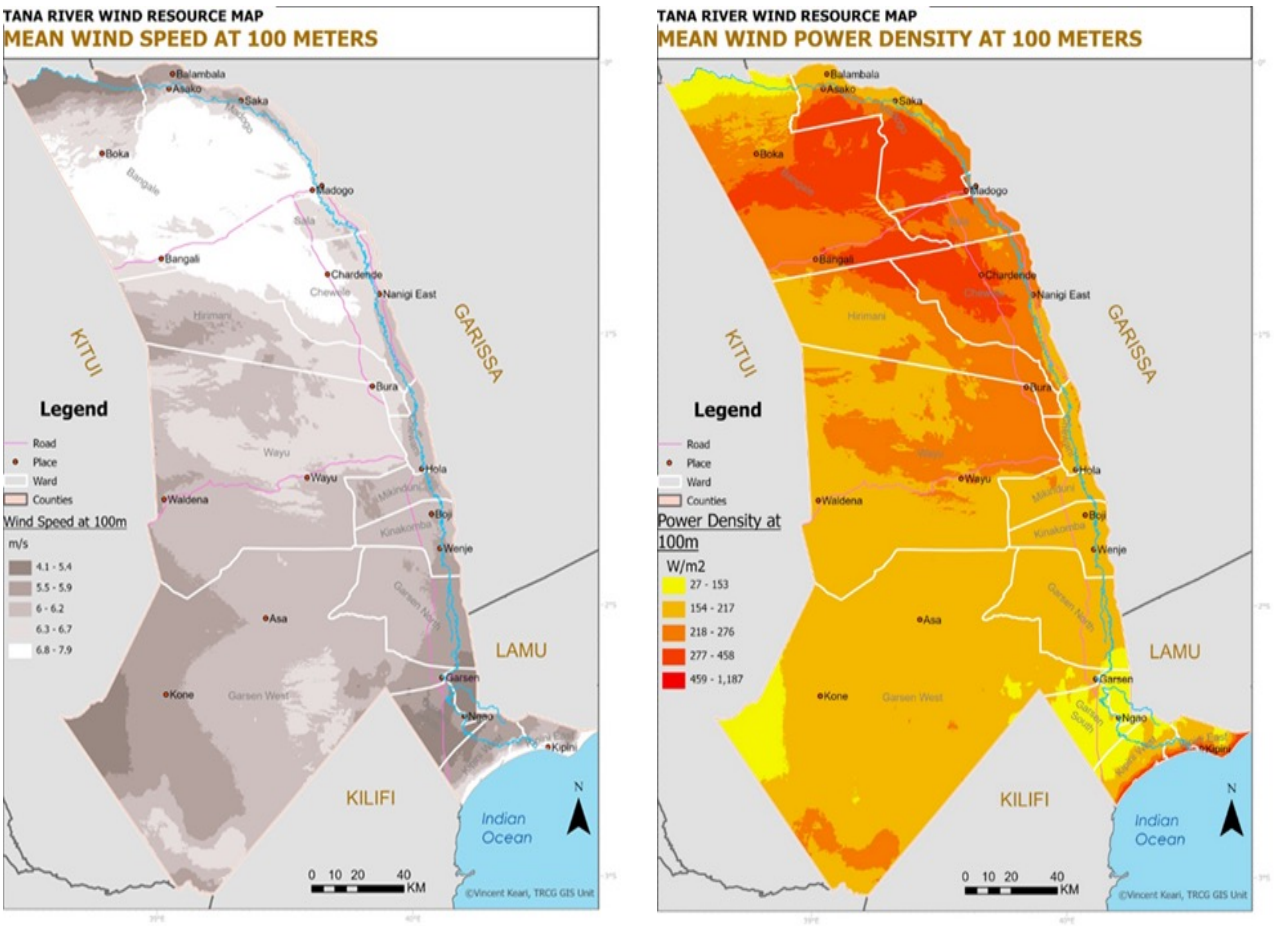


Figure 2: Tana River Wind Resource Map (source: The Global Wind Atlas (GWA)

2.7 Hydro power

As indicated on the map below the hydro power potential for one to three Megawatt flows down River Tana with plenty of catchment areas from the North of county towards it's South. At the Southern most part (Garsen sub county) of the county river Galana also provide a hydro potential for one to three megawatts.

Figure 3: Tana River Hydro Power Distribution 1-3 MW

Figure 4: Tana-River Hydro Power Distribution 0.5-1 MW

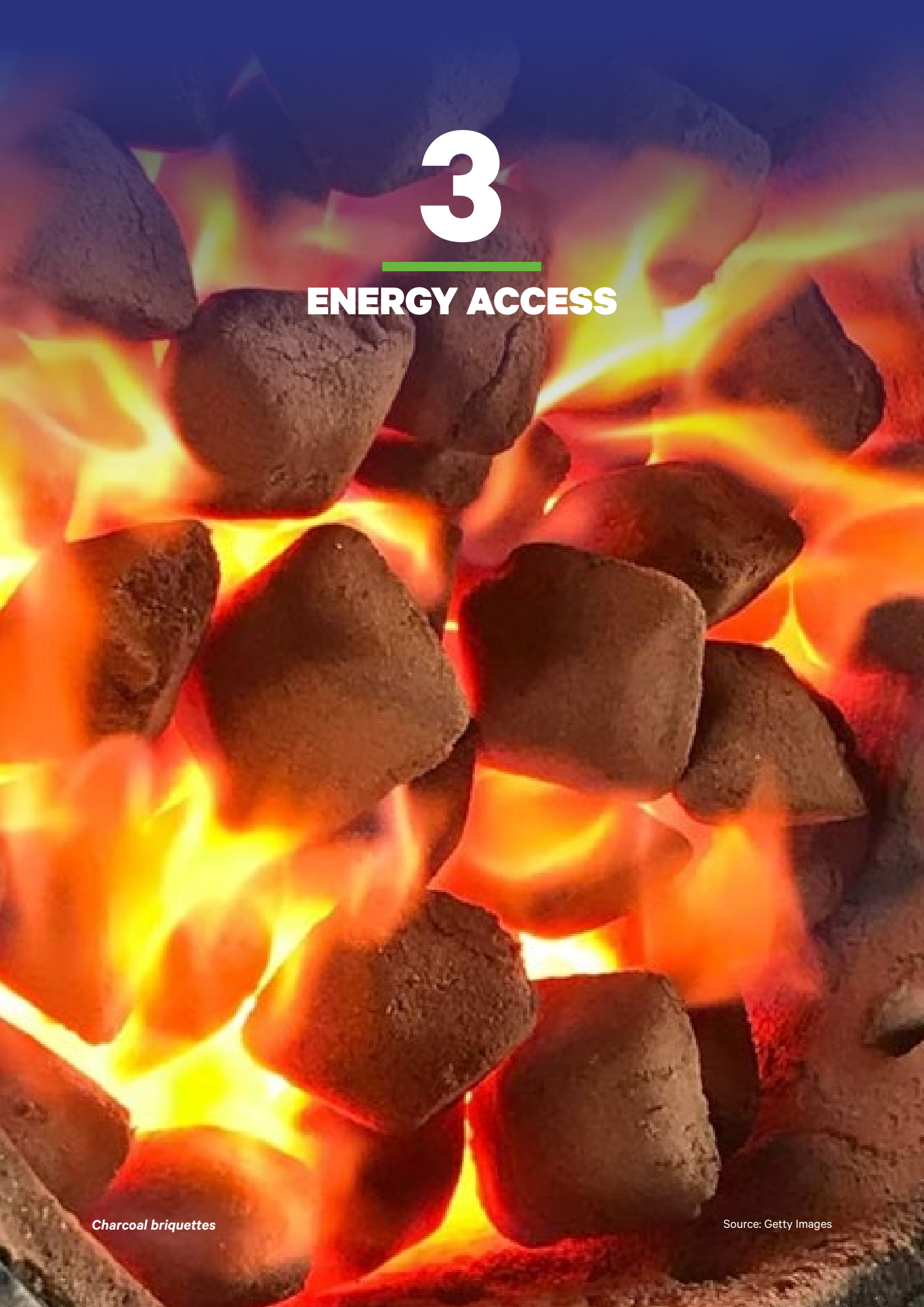
Despite Numerous tributaries for River Tana, 0.5 to one megawatt potential is on the main river with two locations. One in the North East Madogo Sub-County and the other in East of Bura Sub-county both along river Tana. There are no meaningful potential areas for hydro potential below 0.5 megawatt.

Table 5: A summary of County prospective energy resources

Sector	General description	Potential energy capacity	Unit of Measure	Status of Exploitation	Location
Waste					
Cattle manure (for conversion into biogas)	Number of farmers with potential to uptake biogas technology	370 farmers with good potential to uptake	No. of potential 8-12 cubic meter digesters	Nil	All over the county
Corn residues	Stovers and cobs	58,738.5	tons	Nil	Bura and Hola irrigation schemes
Rice husks	Straws and husks	54,036	tons	Nil	Bura and Hola irrigation schemes
Municipal waste	N/a	N/a	N/a	N/a	N/a
Solar	Global Horizontal Irradiation (GHI)	1976.5	KWh/m2	Minimal	Good potential all over the county with highest potential on north side of the county
Wind	Mean power density at 100m above ground level	314	W/m2	Nil	Windiest areas are in Tana North sub county
Hydro power		Several sites	No. of sites	Nil	Sites along river Tana

3

ENERGY ACCESS



Charcoal briquettes

Source: Getty Images

Chapter 3.0

ENERGY ACCESS

3.1 Electricity Access

Energy serves as the prime mover for socio-economic development, powering a wide array of activities and sectors essential for growth, prosperity, and human well-being. Energy drives industrialisation by providing the power necessary for manufacturing, machinery operation, and other production activities. This industrial growth not only creates jobs but also enhances productivity and economic diversification, laying the foundation for sustainable development.

In agriculture, energy plays a pivotal role in boosting productivity and food security. Energy-powered irrigation systems, mechanised farming equipment, and processing facilities improve crop yields and enable efficient farming practices. This, in turn, supports rural livelihoods, strengthens food supply chains, and contributes to economic stability.

At the household level, modern energy services enhance living standards and well-being. Electricity enables lighting, cooking, heating, and access to ICT, improved health, education, and overall quality of life. Furthermore, cleaner cooking solutions reduce indoor air pollution, mitigating associated health risks and enhancing the welfare of families.

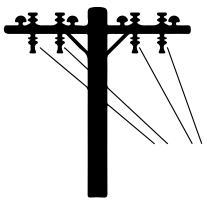
From an economic standpoint, energy availability and affordability are key drivers of growth and competitiveness. Countries with robust energy systems attract investments, stimulate business development, and foster innovation across various sectors. Additionally, transitioning to cleaner and renewable energy sources promotes environmental sustainability, mitigating climate change and minimising pollution. In conclusion, energy's pivotal role in socio-economic development cannot be overstated.

3.1.1 Key stakeholders in electricity access & projects

The Ministry of Energy and Petroleum (MOE&P) holds responsibility for crafting energy policies and overseeing their implementation to foster an environment conducive to the efficient operation and expansion of the energy sector. It establishes the strategic trajectory for sector development and offers a long-term vision guiding all stakeholders within the industry.

The Kenya Power and Lighting Company (KPLC) serves as the system operator and primary off-taker within the power market, procuring bulk power from various generators through negotiated Power Purchase Agreements (PPAs) for distribution. Additionally, KPLC is responsible for owning and managing a portion of the current transmission infrastructure and the majority of the interconnected distribution network. KPLC's customer base in Tana River has grown steadily from 10,329 connections in 2017 to 21,867 connections in 2023.

As per the Energy Act, 2019, the **Rural Electrification and Renewable Energy Corporation (REREC)** has been designated as the principal authority responsible for advancing renewable energy resources, excluding geothermal and large hydropower. This expanded mandate complements its existing role in rural electrification efforts. In the period between 2021 and 2023, REREC implemented a total of 39 projects in Tana River County which entailed construction of 227 km of medium voltage lines and 109 km of low voltage lines and eventual connection of 2,939 customers. In this financial year (2023-2024), 12 projects are at different stages of implementation have also been rolled out in the County.



Between 2021 and 2023, REREC implemented a total of 39 projects in Tana River County

Bura	Galole	Garsen
14	11	14

Table 6: REREC's projects in Tana River County

REREC PROJECTS STATUS IN TANA RIVER COUNTY					
	Constituency	**No. Of Projects**	**MV Length (Km)**	**LV Length (Km)**	**No. Of Connected Customers**
I. PROJECTS IMPLEMENTED BETWEEN FY 2021 TO FY 2023					
1	Bura	14	152.984	52.283	914
2	Galole	11	25.618	23.326	960
3	Garsen	14	48.822	33.859	1065
	Total	**39**	**227.424**	**109.468**	**2939**
II. PROJECTS TO BE IMPLEMENTED FY 2023-2024					
1	Bura	4			
2	Galole	3			
3	Garsen	5			
	Total	**12**	**0**	**0**	**0**

(Source: REREC's Coast Regional Office)

The Kenya Electricity Transmission Company (KETRACO) is tasked with planning, designing, constructing, owning, operating, and maintaining new high-voltage (132kV and above) electricity transmission lines. These lines serve as the core infrastructure of the National Transmission Grid and regional interconnections. This initiative further aims at fostering the development of an open-access system for energy within Kenya.

The Kenya Electricity Generating Company (KenGen) serves as the primary power generation entity in Kenya and is renowned for its extensive expertise in geothermal technology development.

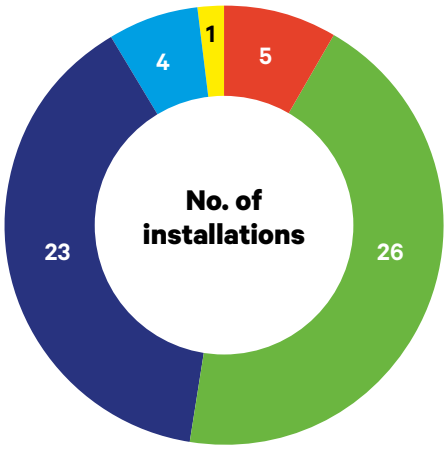
The Energy and Petroleum Regulatory Authority (EPRA) oversees the economic and technical aspects of the energy sector. Its responsibilities encompass licensing power sector facilities and technicians, conducting energy audits, setting tariffs, and providing sector oversight. Additionally, EPRA develops and implements regulations, ensuring compliance and enforcement across the sector.

The KOSAP is a flagship initiative of the Ministry of Energy and Petroleum, funded by the World Bank, with the goal of delivering electricity and clean cooking solutions to 14 remote, sparsely populated, and historically underserved counties across Kenya. Tana River is amongst the 14 beneficiary counties. It is jointly implemented by the Ministry of Energy, Kenya Power and Lighting (KPLC), and REREC. KOSAP will specifically support the following projects in Tana River County.

Table 7: KOSAP's projects in Tana River County

S/N	Component	No. of installations
1	Mini-grids	5
2	Equipping & solarisation of boreholes	26
3	Stand-alone Solar PV systems for dispensaries	23
4	Stand-alone Solar PV systems for schools	4
5	Stand-alone Solar PV systems for administration units	1
6	Solar Home Systems for households; there are 13 companies under the KOSAP, a number of these companies have been engaged to disseminate SHS under a results-based funding framework	

(Source: KOSAP, Tana River County)



The Nuclear Power and Energy Agency (NuPEA) is tasked with advancing the nuclear energy programme in Kenya, promoting the development of nuclear electricity generation, and conducting research, development, and dissemination activities of energy related research findings. Additionally, NuPEA facilitates and coordinates capacity-building initiatives around nuclear energy.

Geothermal Development Company (GDC) operates as a Government Special Purpose Vehicle (SPV) responsible for surface exploration of geothermal fields, conducting exploratory, appraisal, and production drilling, and overseeing proven steam fields. Additionally, GDC engages in steam sales agreements with investors in the power sector.

Independent Power Producers (IPPs) are private investors engaged in electricity generation, either on a large scale or for the development of renewable energy projects under the Feed-in-Tariff Policy.

Mini-grids consist of electricity generators and energy storage systems connected to a distribution network. They provide electricity to a localised groups of customers who are not served by the interconnected national power grid, as authorised by EPRA. The KOSAP) has earmarked five sites for construction of mini-grids in the Tana River County.

Solar home systems companies provide Solar Home Systems (SHS) to households located in remote areas without access to the main electricity grid. They will have a crucial role in achieving universal electrification access. Under the KOSAP, a number of these companies have been engaged to disseminate SHS under a results-based funding framework. These companies include: Barefoot Power, Bboxx Capital, Brenhert Investments, Dlight, Elcom Networks, Equity Bank, Solar Panda, Econome Limited, Krystal Solutions, M-Kopa Solar, Engie Mobisol, Solibrium, Green Innovation Ventures Enterprises Limited, Givewatts East Africa Limited, and Greenlight Planet.

County Government. According to the 4th Schedule of the Constitution, sections 5(b), 8(e), the County Government, through the Department of Transport, Public Works, Infrastructure, and Energy, is tasked with the responsibility of overseeing street lighting.

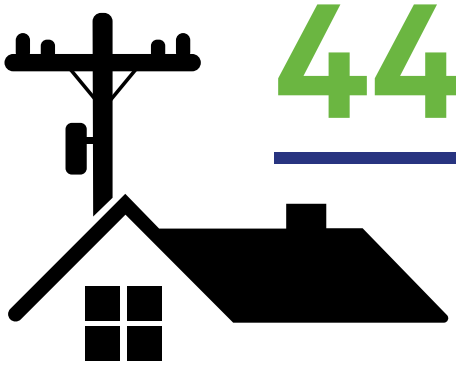
3.1.2 Access situations, interventions and envisioned progression to universal access

3.1.2.1 Households

Electricity access status

Based on the assessment conducted 2023 using GIS approximately 40% of households in the County have been electrified, constituting 22,000 domestic clients out of an estimated total of 55,000 households. This statistic underscores both progress and the existing gap in electricity access within the county. While a significant portion of households have gained access to electricity, a substantial number still remain without this essential service. This data serves as a crucial benchmark for gauging the effectiveness of electrification efforts and highlights the ongoing need for targeted interventions to extend electricity access to underserved areas.

In order to achieve universal electrification by the year 2030, an additional 44,000 households need to be electrified. This ambitious target underscores the importance of accelerating efforts to expand electricity access and ensure that every household in the County has access to this essential service. Meeting this goal will require coordinated action, innovative solutions, and sustained investment in electrification projects and infrastructure. The list of these localities where the additional 44,000 households are located has been provided as a separate annexure to this document.



44,000

Number of additional households that need to be electrified in order to achieve universal electrification by the year 2030

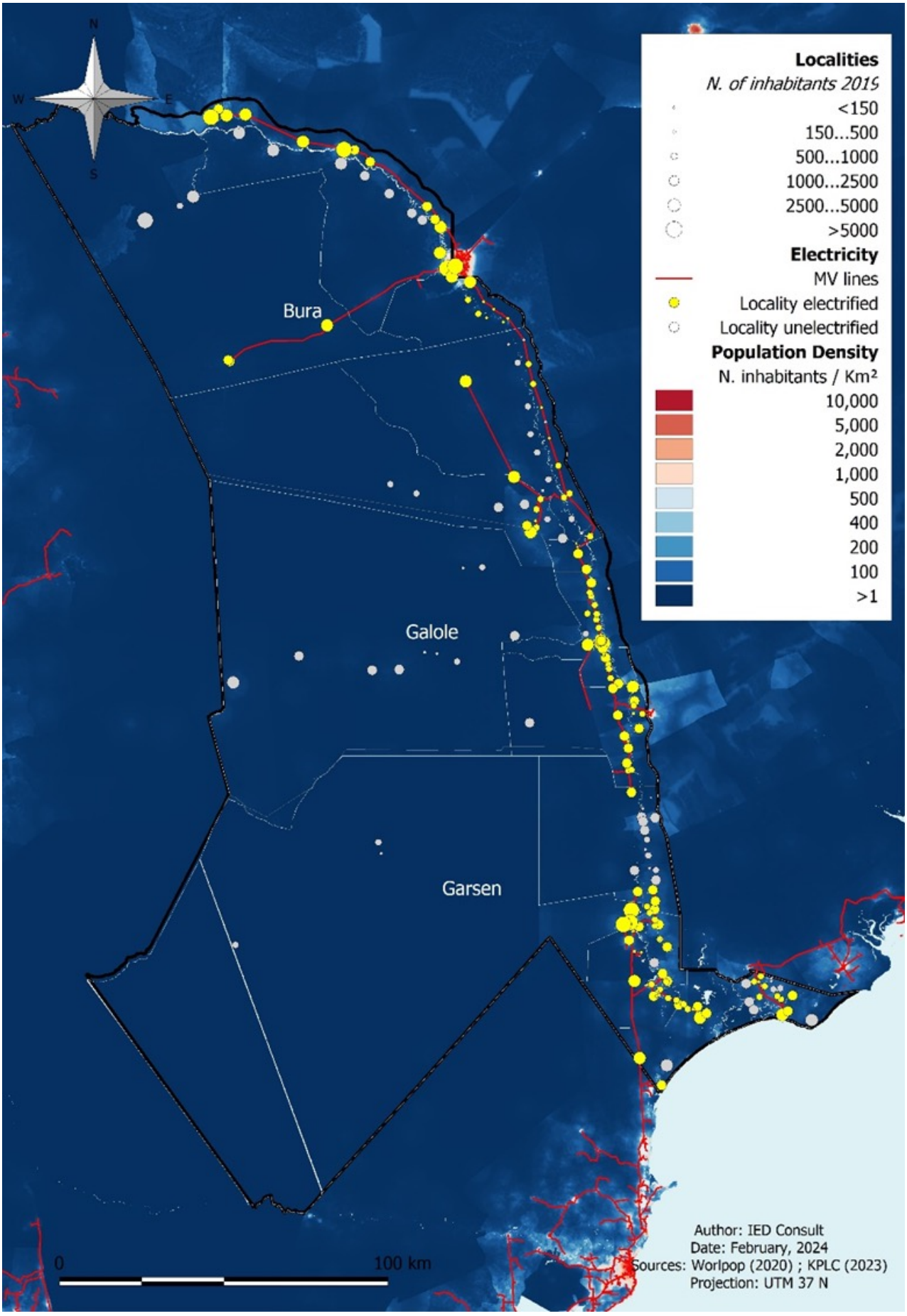


Figure 5: Electrification status of population clusters in the county

All the analysis was conducted using a GIS developed specifically for the Tana River County electrification plan. In order to obtain the greatest accuracy, a set of population clusters were defined using a continuous raster surface representing the population density of the County. Population estimates for both rural and urban clusters were then cross-checked with the population data of 2019 Census. Electrification status of clusters was defined based on the location of step-down transformers through a GIS layer provided by KPLC and then cross-checked with the County representatives. Clusters that are located fully or partially within a 600 metres buffer around transformers (maximum distance at which households are generally located from transformers) were considered 'electrified'. Clusters that didn't overlap with the buffer were considered unelectrified.

Using these population clusters as a starting point, the geospatial electrification tool GEOSIM, was then used to calculate the investments and operating costs related to the development of electrification projects. Different supply options were proposed to reach universal access. These were:

i) **Grid densification** – to connect unelectrified households in already electrified clusters.

ii) **Grid intensification** – to electrify housing clusters within a perimeter between 601 to 1,500 meters from an existing transformer.

iii) **Grid extension** – to extend the interconnected grid to the clusters in unserved areas.

iv) **Mini-grids** (both PV and hybrid) – deployed in small and medium sized clusters located far from the interconnected network.

v) **Solar Home Systems (SHS)** – standalone systems to reach households in very sparse areas (less than 1,000 inhabitants / km²) or in densification / intensification areas when the price of a SHS becomes lower than a grid connection for an equivalent level of consumption. This tends to be the case with lower levels of consumption.

The choice of the best electrification option is made according to the lowest levelised cost of electricity (LCOE). LCOE is the ratio between the lifetime costs divided by the electricity production of a project. For conventional electrification solutions like grid or mini-grid connections, as the size of the localities and the level of consumption increases (from Tier 1+ to Tier 5), the LCOE decreases. The LCOE of SHS does not change insofar as these solutions are individual. The investment for each electrification project, as well as the operating expenditure (OPEX) costs were calculated from the current costs of equipment in Kenya.

Demand Forecast

To look across the spectrum of electricity demand, three scenarios corresponding to different levels of consumption (Tiers) were tested for rural and urban areas in order to quantify the investment required and identified the best electrification option for every community across the geography of Tana River County. The geographically dispersed population is divided into small units of analysis referred to as "population clusters".

As indicated in the table below, levels of consumption ranged from Tier 1+ (a level of service sufficient to power task lighting and phone charging or a radio) to Tier 5 (allowing the use of medium and high-load appliances such as laptop, fridge, rice cooker, washing machine, iron, hair dryer, toaster or microwave, air cooler) as well as small business operation – so called productive use of energy. The tiers of access are based on SE4ALL's multi-tier framework for assessing electricity access.

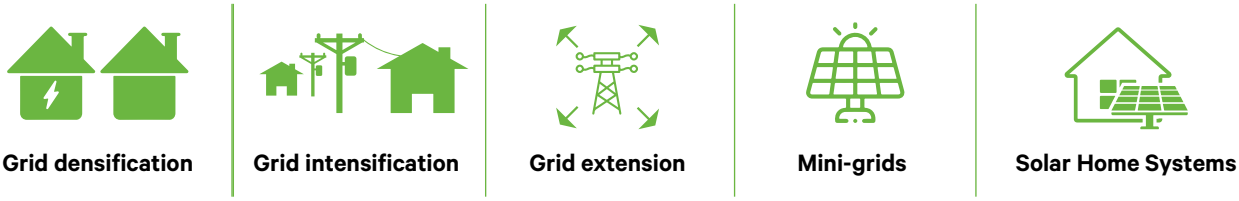


Table 8: Energy consumption scenarios explored for the least-cost electrification planning

Scenario	Urban households	Rural households		
		Tier	Annual Energy (kWh)	Capacity (W)
1	Tier 5	Tier 1+	40	40
2		Tier 3	365	200
3		Tier 5	2,993	2,000

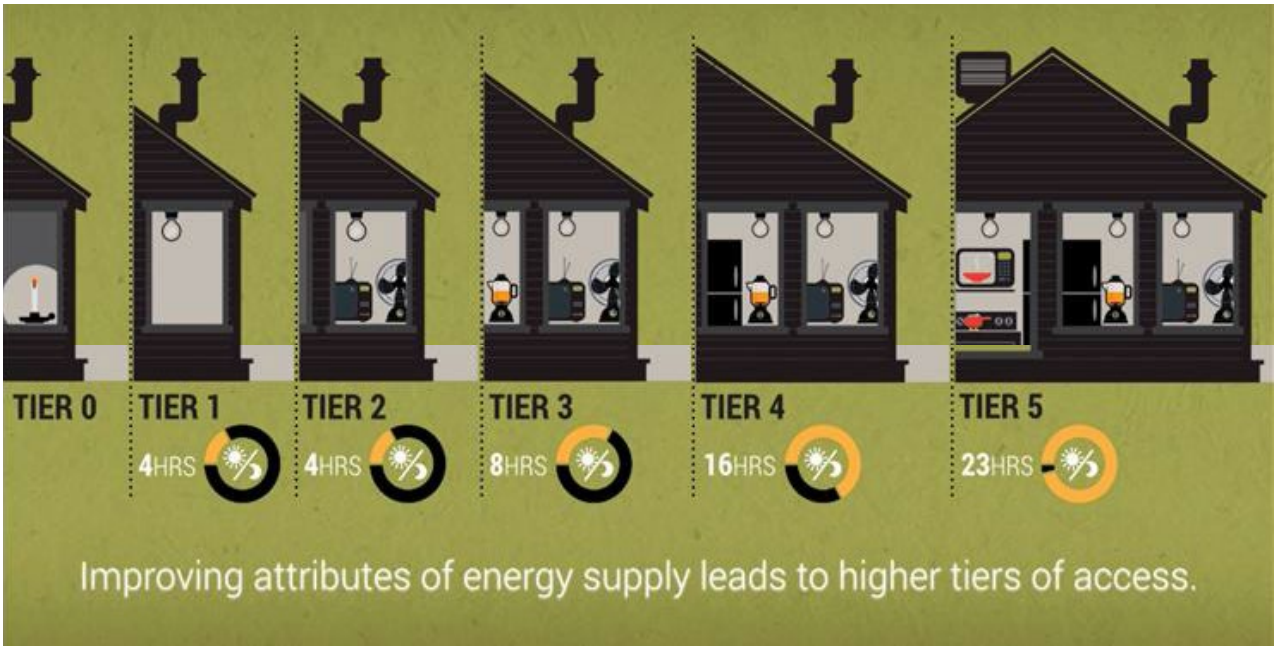


Figure 6: The multi-tier access definition (SE4ALL)

Supply options

To achieve universal electricity access by the year 2030, an additional 44,000 households would need to be electrified. Based on the sensitivity analysis described above, three distinct scenarios emerged from this analysis, each offering a unique approach to expanding electricity access:

Scenario 1: Only urban households located in the densification area would be electrified via the national grid. All the others (90% of the households) would be electrified by SHS. This scenario would cost USD 13.5 million (13.5 United States dollars) to implement.

Scenario 2: Most households would be electrified through the grid; 62% through grid densification and 30% through grid extension. 16 localities have been identified for hybrid mini-grid development. These 16 mini-grids would electrify 8% of households. List of these mini-grid sites is an annexure to this document. USD 67.4 million is needed to implement the scenario.

Scenario 3: Most households (98%) will be electrified through grid connection; 62% through densification and 36% through extension. Seven localities have also been identified for hosting hybrid mini-grids which would electrify 2% of the households. List of these mini-grid sites is annexed. A total of USD 76.8 million would be required.

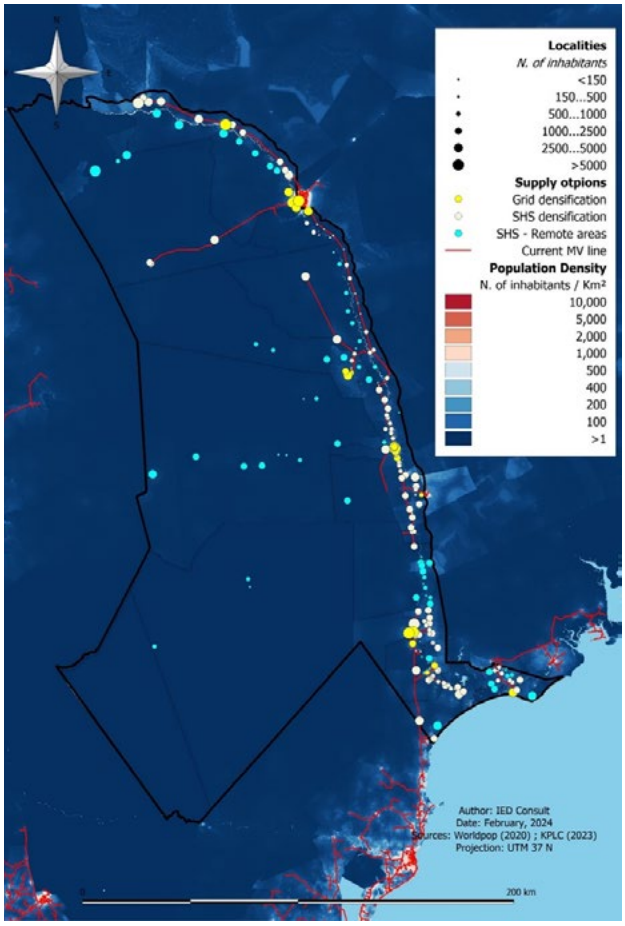


Figure 7: Options for electrifying population clusters under Scenario 1

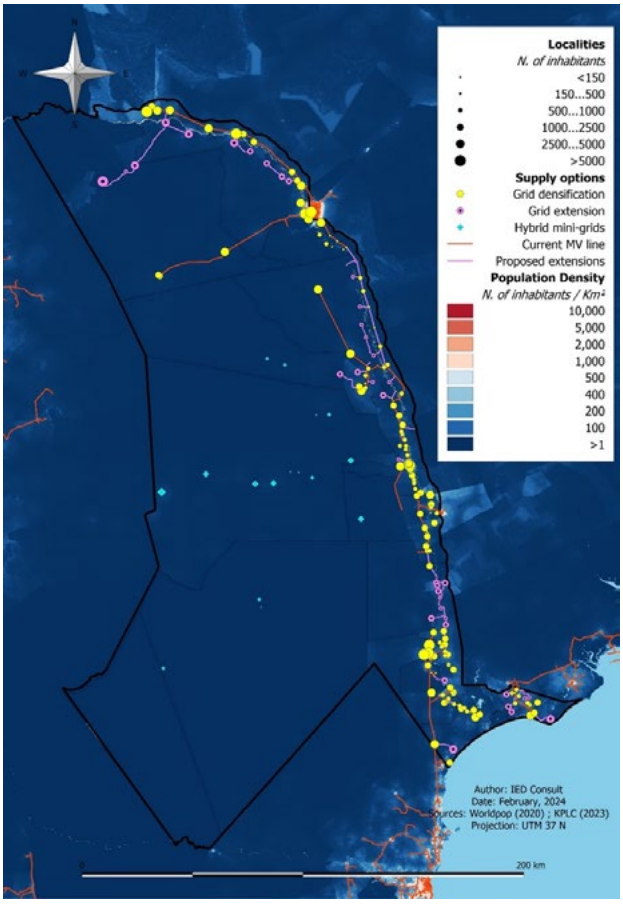


Figure 8: Options for electrifying population clusters under Scenario 2

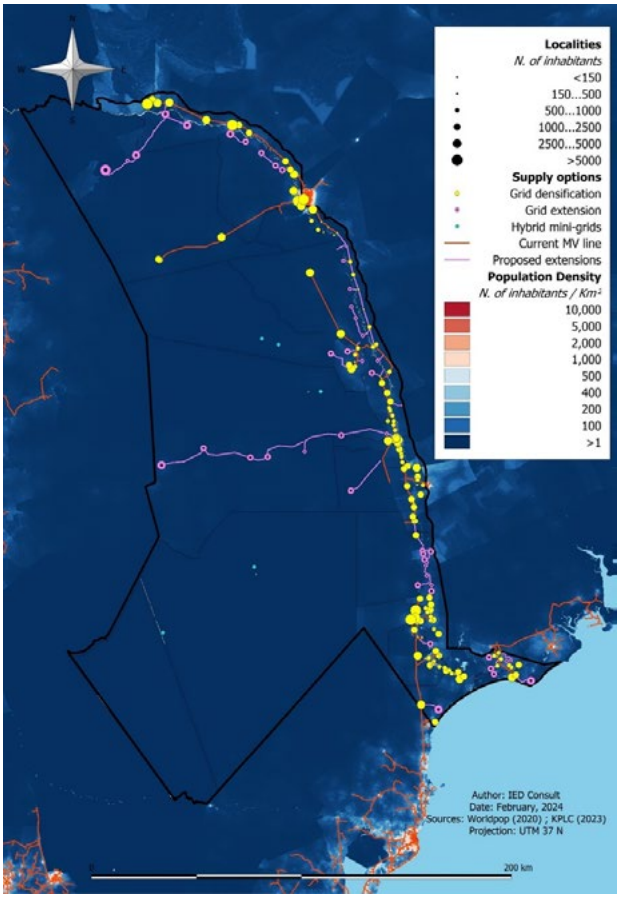


Figure 9: Options for electrifying population clusters under Scenario 3w

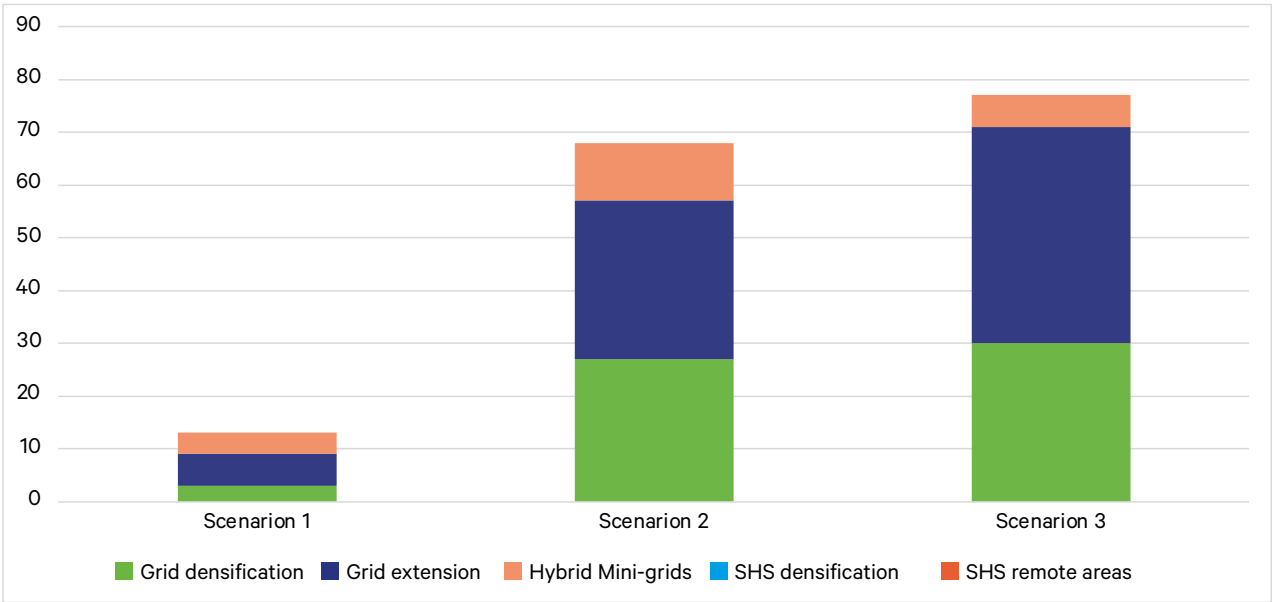


Figure 10: Summary of electrification solutions under the 3 feasible options

Table 9: Levelized cost of electrifying 44,000 HHs by 2030 under three different delivery options

Supply option	Scenario 1 (USD)	Scenario 2 (USD)	Scenario 3 (USD)
Grid densification	3,159,072	26,781,444	30,132,300
SHS densification	5,967,996	-	-
Grid extension	-	29,725,200	40,980,965
Hybrid Mini-grids	-	10,921,000	5,695,967
SHS- Remote areas	4,332,662	-	-
Total	**13,459,730**	**67,427,645**	**76,809 232**

Pathways for universal electricity access

The decision on which scenario to apply in order to achieve universal electricity access by at least the year 2030 ultimately rests with the County Government, in consultation with the national government and relevant agencies responsible for electrification, such as Kenya Power, REREC, and KETRACO. This collaborative approach ensures that electrification efforts are aligned with national priorities and strategies, while also considering the unique circumstances and needs of the County.

However, from an analysis point of view, Scenario 3 would be the most judicious to follow. This is notwithstanding the high level of effort required for carrying out necessary public works and the high connection cost which is out of reach for most households. The grid connection cost, even if subsidised (KES 15,000) is out of reach for many households. Indeed, network extensions in the countryside have already taken place in the past to serve smaller and fewer localities. While Scenario 1 may be cost-effective, it could be deemed overly restrictive in terms of energy access for households and socio-economic services in unserved localities.

In line with the above recommendation therefore, a project is proposed to electrify a total 44,000 households by 2030. This will entail connecting roughly 6,300 households every year from 2024 to 2030, through grid densification and intensification and setting up of seven hybrid mini-grids. The project will be spearheaded by the County Directorate of Energy in close collaboration with the relevant national government agencies (Kenya Power, REREC and KETRACO), development partners such as KOSAP as well as the private sector (private mini-grid developers). For example, as already indicated elsewhere in this document, the KOSAP has already earmarked five sites for construction of mini-grids.

3.1.2.2 Education institutions (EDCDEs, Primary schools, secondary schools & tertiary institutions)

Electricity access status

Early Childhood and Development Education

There are 318 ECDE centres of which 12 are connected to electricity. three are connected to the grid while nine are connected to Solar PV systems. This implies that there are 306 ECDE centres which require connection to electricity. The few ECDEs with connection to electricity are in Tana North Sub-County. ECDEs in other sub-counties are not connected. Details of ECDE centres which require connection and repair of Solar PV systems are available in annex section of this document.

Table 10: Status of electricity access in ECDE centres

Name of sub-county	No of ECDEs	No of ECDEs with connection	No connected to main grid	No connected to Solar PV/generator	No without connection
Tana North	96	12	3	9	84
Tana Delta	124				124
Tana River	98				98
TOTAL	**318**	**12**	**3**	**9**	**306**

(Source: County Department of ECDEs)

Primary schools

There are 183 primary schools in the County. Out of the 183 schools, 138 have access to electricity of which 67 are primarily supplied by grid and 71 by solar PV systems. This implies that 45 primary schools have no connection hence the need for access to electricity. All the 45 schools which have no electricity access are in off-grid areas. 71 schools with solar as primary source of power or backup have faulty systems which require repair and maintenance. The list of primary schools which require connection and repair of Solar PV systems are available in the annex section of this document.

Table 11: Status of electricity access in primary schools

Name of sub county	No. of primary schools	No. of primary schools with connection	No. connected to main grid	No. connected to Solar PV/Generator	No. without connection
Tana Delta	79	47	21	26	32
Tana River	42	37	30	7	6
Tana North	27	24	9	15	3
Gale Dyertu	8	8	1	7	
Bangale	27	22	6	16	4
TOTAL	183	138	67	71	45

(Source: County Directorate of Education - National Government)

Secondary schools

There are 41 secondary schools in the County. 33 schools have access to electricity (22 schools connected to grid electricity, two are connected to generators and nine to solar PV systems). A total of eight schools have no connection to electricity. The nine schools connected to solar have faulty systems which require repair and maintenance. This implies that eight secondary schools in the county need connection to either grid or solar PV electricity. All the secondary schools have no power backup supply. Details of the secondary schools which require connection and repair of Solar PV systems are in the table below.

Table 12: Status of electricity access in secondary schools

Name of sub county	No. of secondary schools	No. of secondary schools with connection	No. connected to main grid	No. connected to Solar PV / generator	No. without connection
Tana Delta	17	11	11		6
Tana River	13	12	10	2	1
Tana North	6	6		6	
Gale Dyertu	1	1	1		
Bangale	4	3		3	1
TOTAL	41	33	22	11	8

(Source: County Directorate of Education - National Government)

Vocational and Technical Colleges (VTCs)

There are 10 VTCs of which 8 are connected to grid electricity, while 2 have no connection. The 2 VTCs without connection are found in the Tana Delta. Of the 8 VTCs with connection, 3 are connected to 3 phase electricity supply while 5 VTCs are connected to single phase. These would require upgrade to 3 phase connection. There is also a need to connect to solar PV electricity supply, the 2 remaining VTCs which are yet to be connected. Details of the VTCs which require connection and upgrade are available in the annex section.

Table 13: Status of electricity access in VTCs

Name of sub county	No of VTCs	No of VTCs with connection	No connected to main grid	No connected to Solar PV/generator	No without connection	No on single phase	No on 3 phase
Tana North	2	2	2			1	1
Tana Delta	6	5	5		1	4	1
Tana River	2	1	1		1		1
TOTAL	10	8	8		2	5	3

(Source: County Department of VTCs)

Overally, 71 primary schools have faulty solar PV systems, 11 secondary schools have faulty solar PV systems, while nine ECDE centres also have faulty solar PV systems

Pathways for universal electricity access

To enhance access to electricity in the educational institutions, it would be ideal to connect educational institutions (ECDEs, primary, secondary and VTCs) in on-grid areas. For those in off-grid areas, there is a need to connect to solar PV systems. All the education facilities should be provided with functional power backup systems. For VTCs with connection to grid electricity, there is a need for upgrading to a three-phase electricity power supply since the centres involve running of heavy machinery and equipment for learning.

Repair and maintenance of the 91 faulty solar PV systems should also be considered. A disaggregated list of these interventions in contained in the annex section. Note that the costs are based on prevailing market prices as well as previous experiences in the County while implementing similar projects. They factor the cost of site assessment and design; installation/ connection and commissioning; and relevant associated works.

Table 14: Solutions Costing – Electrification for Educational Facilities

Cost component (interventions)	Specifications	Unit cost (KES)	Units	Cost (KES)
Connecting ECDEs to grid power	Single phase	300,000	153	45,900,000
Solar PV systems for ECDEs which are off-grid	1kW An average of 7$/W (IRENA 2016 & previous experiences in the county while implementing similar projects) Exchange rate- (130-150 KES/ $)	1,000,000	153	153,000,000
Solar PV systems for primary schools which are off-grid	2-3 kW An average of 7$/W (IRENA 2016 & previous experiences in the county while implementing similar projects) Exchange rate- (130-150 KES/ $)	2,000,000	45	90,000,000
Solar PV systems for secondary schools which are off-grid Installation of Solar PV systems	3-5 kW An average of 7$/W (IRENA 2016 & previous experiences in the county while implementing similar projects) Exchange rate- (130-150 KES/ $)	3,000,000	8	24,000,000
Solar PV systems for VTCs which are off-grid:	>5 kW An average of 7$/W (IRENA 2016 & previous experiences in the county while implementing similar projects) Exchange rate- (130-150 KES/ $)	10,000,000	2	20,000,000
Upgrade KPLC power supply from single phase to three-phase in VTCs	three-phase	500,000	5	2,500,000
Provide power supply backup in primary schools connected to grid electricity:	2-3 kW An average of 7$/W (IRENA 2016 & previous experiences in the county while implementing similar projects) Exchange rate- (130-150 KES/ $)	2,000,000	67	134,000,000
Provide power supply backup in secondary schools connected to grid electricity:	3-5 kW An average of 7$/W (IRENA 2016 & previous experiences in the county while implementing similar projects) Exchange rate- (130-150 KES/ $)	3,000,000	22	66,000,000
Provide power supply backup in VTCs connected to grid electricity:	>5 kW An average of 7$/W (IRENA 2016 & previous experiences in the county while implementing similar projects) Exchange rate- (130-150 KES/ $)	10,000,000	8	80,000,000
Rehabilitation of faulty PV systems in ECDEs.	(30% of the initial cost of a PV system – IRENA 2016)	300,000	9	2,700,000
Rehabilitation of faulty PV systems in primary schools.	(30% of the initial cost of a PV system – IRENA 2016)	600,000	71	42,600,000
Rehabilitation of faulty PV system in secondary schools	(30% of the initial cost of a PV system – IRENA 2016)	900,000	11	9,900,000
Total				**670,600,000**

3.1.2.3 Health facilities (levels 2, 3 & 4)

Electricity access status

There are 53 public health facilities in Tana River County. These include one Level 4+ hospital (Hola Referral Hospital), two Level 4 hospitals (Ngao and Bura), three Level 3 hospitals (Kipini, Garsen and Madogo) and 47 Level 2 hospitals. All the Level 3 and 4 hospitals except Bura are connected to three-phase electricity supply. All Level 4 health facilities have power backup systems, while all Level 3 and 2 facilities have none. Hola Referral and Ngao SC Hospital both use a generator, while Bura SC Hospital uses solar PV. Finally, 37 Level 2 hospitals have no connection to electricity while 10 are connected to electricity. Similarly, none of the 53 hospitals has a water heating system.

Table 15: Status of electricity access in health facilities

Level of health facility	Name of sub county	No. of health facilities	No. of health facilities without power backup	With connection	Without connection	No. without water heating solutions
Level 2	Tana Delta	19	3	3	16	19
	Tana River	15	6	6	9	15
	Tana North	13	1	1	12	13
	TOTAL	**47**	**10**	**10**	**37**	**47**
Level 3	Tana Delta	2	2	2		2
	Tana River					
	Tana North	1	1	1		1
	TOTAL	**3**	**3**	**3**		**3**
Level 4	Tana Delta	1	0	1		1
	Tana River	1	0	1		1
	Tana North	1	0	1		1
	TOTAL	**3**	**0**	**3**		**3**

(source: County Department of Health)

Pathways for universal electricity access: The healthcare infrastructure upgrade plan includes several key initiatives aimed at enhancing energy reliability and efficiency across various health facilities in Tana River County.

Upgrading grid supply: Bura Sub-County Hospital will undergo a significant enhancement by transitioning its power supply from single-phase to three-phase. This upgrade aims to improve the hospital's electrical capacity, ensuring it can better meet the growing energy demands of its operations.

Solar powered water heater

Solar water heating systems: Implementation of solar water heating (SWH) systems will be carried out across all healthcare facilities. This sustainable energy solution will provide reliable hot water supply while reducing reliance on conventional energy sources, contributing to cost savings and environmental conservation efforts.

Power backup systems: Level 3 and 2 health facilities connected to the grid will benefit from installation of power backup systems. These systems will offer additional resilience against power outages, ensuring uninterrupted healthcare services delivery.

Solar PV systems for off-grid dispensaries: To address energy access challenges in remote areas, 37 dispensaries currently off-grid will be connected to solar photovoltaic (PV) systems. This initiative aims to provide these healthcare facilities with a reliable and sustainable source of electricity.

Through these comprehensive measures, the healthcare sector in Tana River County will not only improve its energy infrastructure but also enhance service delivery, ultimately contributing to better healthcare outcomes for the local communities. Lists of these facilities and the applicable interventions are contained in the annex.

Table 16: Solutions costing for electricity access in health facilities

Cost component	Specifications	Unit cost (KES)	Units	Cost (KES)
Upgrading grid supply at Bura SCH		500,000	1	500,000
Installing solar water heating (SWH) systems in level 4 hospitals	7 SWHs, 200 litres systems to cater for maternity, wards, kitchen & laundry, Accessories including: · Elevated tank · Plumbing works · Labor	5,000,000	3	15,000,000
Installing solar water heating (SWH) systems in level 3 and 2 hospitals	3 SWHs, 200 litre systems and accessories + labour	2,500,000	50	125,000,000
Installing solar PV systems for Level 2 health facilities which are off-grid	>5 kW An average of 7$/W (IRENA 2016 & previous experiences in the county while implementing similar projects) Exchange rate- (130-150 KES/ $)	10,000,000	37	370,000,000
Providing power systems back-ups to 3 level 3 health facilities with grid connection	>5 kW An average of 7$/W (IRENA 2016 & previous experiences in the county while implementing similar projects) Exchange rate- (130-150 KES/ $)	6,000,000	3	18,000,000
Providing power systems back-ups to 10 level 2 health facilities with grid connection	3-5 kW An average of 7$/W (IRENA 2016 & previous experiences in the county while implementing similar projects) Exchange rate- (130-150 KES/ $)	4,000,000	10	40,000,000
Total				**568,500,000**

3.1.2.4 Agri-based facilities

Electricity access status

Milk chillers

Table 17: List of milk chillers and status of electricity access

centre Name	Location	Source of power	Power back up	Ownership	Operation status
Garsen Milk Processing plant	Garsen west	Electricity available but not connected	Solar back up	Communal	Operational
Tarasaa Milk collection centre	Kipini West	Electricity available but not connected	None	Communal	Not operational
Bangale Milk processing plant	Bangale	Electricity available but not connected	None	Communal	Operational
Boka Camel Collection Centre	Boka	No electricity	None	Communal	Not operational

(source: County Department of Livestock)

There are two milk processing plants which are operational and two milk collection centre which are non-operational. Their locations are as shown above. Garsen & Tarasaa plants are on-grid but not connected. Bangale collection centre is on-grid but not connected. Boka collection centre is off-grid. Regarding back-up supply, only Garsen plant has one. All the facilities are communally owned.

Slaughterhouses

Table 18: List of slaughterhouses and status of electricity access

Name	Location	Source of power	Power backup	Ownership	Average daily slaughter capacity	
					Cattle	Small Stock
Galole	Galole	Electricity	None	Private	0	10
Bura	Bura	None -on grid	None	Government	1	11
Madogo	Madogo	None -on grid	None	Government	0	8
Bangale	Bangale	None -on grid	None	Private	0	7
Garsen	Garsen	None -on grid	None	Government	1	11

(Source: County Department of Livestock)

Table 18 above provides details of several slaughter facilities in the County, including their names, locations, power sources, power backup status, ownership, and average daily slaughter capacity for cattle and small stock. The facilities are located in Galole, Bura, Madogo, Bangale, and Garsen.

- Galole abattoir operates on electricity as its power source and does not have any power backup. It is privately owned and slaughters an average of 10 small stocks daily.
- Bura abattoir is not connected to the grid and has no power backup. It is owned by the Government and slaughters an average of one cattle and 11 small stocks daily.
- Madogo abattoir lacks grid connectivity and backup power systems. It is Government-owned and slaughters an average of eight small stocks daily.
- Bangale abattoir is not connected to the grid and does not have power backup. It is privately owned and slaughters an average of seven small stocks daily.
- Garsen abattoir is not connected to the grid and lacks backup power. systems. It is owned by the government and slaughters an average of one cattle and 11 small stocks daily.

Fish aggregation cold store

Table 19: Electricity access at Kipini fish aggregration centre

Name	Location	Source of power	Power backup	Ice production capacity	Power rating (watts)	Average monthly power bills (KES)	Ownership
Kipini	Tana Delta	Electricity- adequate	None	3000kg/24h	18 kW	69,334	Public

(Source: County Department of Fisheries)

There is only one ice production facility for fish aggregation located in Kipini, within the Tana Delta region. It operates on electricity as its primary power source, with no backup power. It has a substantial ice production capacity of 3000 kg per 24 hours. On average, the facility incurs monthly power bills amounting to 69,334 KES. The ice production facility is publicly owned.

Pathways for universal electricity access

Milk processing & collection centre

Though the reasons for closure of the two collection centres are unknown, it is assumed that the facilities will be operative soon. The three facilities which are on-grid will be connected to three-phase grid supply. The collection centre which is off-grid will need an off-grid solution. For back-up power supply at the three on-grid facilities as well as for main supply at the off-grid collection centre, dual powered bulk milk chillers are recommended. The technology is relatively new but is gradually gaining traction in the Kenyan dairy sector. The bulk chillers are powered by both solar and grid.

Solar cooling milk chillers

Introducing dual-powered milk chillers, capable of operating on both the grid and solar energy, offers several significant benefits for milk processing facilities in regions like Tana River. Firstly, such chillers provide increased reliability and flexibility in power supply, ensuring uninterrupted operations even in areas prone to electricity outages or grid instability. By harnessing solar energy during daylight hours, these chillers can reduce reliance on the grid, thereby lowering energy costs and enhancing energy resilience. Additionally, the integration of solar power promotes environmental sustainability by reducing carbon emissions and mitigating the environmental impact associated with conventional energy sources. The two solutions are costed in the Table 20 below.

Table 20: Milk chillers- costing of electricity access solutions

Cost component	Specifications	Unit cost (KES)	Units	Cost (KES)
Grid connection	3 phase supply	500,000	3	1,500,000
Hybrid (AC/solar) powered Bulk Milk Cooling plants, cost of site assessment, procurement, installation, testing & commissioning	5000 litres	7,000,000	4	28,000,000
Total				**29,500,000**

Slaughter houses

The abattoirs play a vital role in the local meat industry, particularly in the slaughter of small stock. However, the lack of grid connectivity and backup power systems in some facilities poses challenges to their operational reliability, highlighting the need for appropriate interventions. In this regard, the four abbatoirs which are on-grid but without connection will be electrified with grid power. In addition, small solar PV backup will also be installed at the five abattoirs to mitigate against grid unreliability. These solutions are costed as summarised in Table 21 below.

Table 21: Slaughter houses- costing of electricity access solutions

Cost component	Specifications	Unit cost (KES)	Units	Cost (KES)
Grid connection	Single phase	300,000	4	1,200,000
Installation of Solar PV systems • Site assessment, planning & design • Solar PV Installation and Commissioning • Training and Capacity Building	1kW An average of 7$/W (IRENA 2016 & previous experiences in the county while implementing similar projects) Exchange rate- (130-150 KES/ $)	1,000,000	5	5,000,000
Total				**6,200,000**

Regarding utilising the waste generated to produce biogas, there exists good potential, as it can be seen from slaughter capacity. However, the size of biogas digesters as well the modalities around biogas utilisation would need to be evaluated further. This project can be included in the 2nd generation CEP.

Fish aggregation cold store

To mitigate against the substantial power bills and also to provide a back-up supply, a grid complementary solar PV system (without battery storage) is recommended. With this system, the facility will be running on solar during the peak sunshine hours and falling back on grid at night or during times when weather conditions are unfavourable. The exclusion of battery storage systems can help bring down the overall capital cost by about 31% (IRENA, 2016). Given the region's abundant solar resources and the facility's reliance on grid electricity, which is subject to outages, solar power offers a reliable and sustainable alternative that can enhance operational resilience and reduce energy costs over time. The intervention costing is as shown in the Table 22 below.

Table 22: Kipini fish storage- costing of electricity access solutions

Cost component	Specifications	Unit cost (KES)	Units	Cost (KES)
Installation of a grid complementary solar PV system: • Site assessment, planning & design • Solar PV installation and commissioning • Training and capacity building	18 kW An average of 7$/W (IRENA 2016 & previous experiences in the county while implementing similar projects) Exchange rate- (130-150 KES/ $)	22,000,000	1	22,000,000
Total				**22,000,000**

3.1.2.5 Water sources supplying water for irrigation

Electricity Access status

Boreholes primarily supplying water for irrigation

According to the County Directorate of Agriculture, there are 20 boreholes which primarily provide water for irrigation. All the complete boreholes are already equipped with functional solar water pumping systems and as such, there is no electricity access intervention needed. The initiative was supported by the Small-Scale Irrigation and Value Addition Project (SIVAP).

Water pans primarily supplying water for livestock consumption

According to the county Directorate of Agriculture, there are a total of six water pans which primarily provide water for livestock consumption. All the pans are complete and already equipped with functional solar water pumping systems and as such, there is no electricity access intervention needed. The project was supported by the SIVAP.

River water pumping for irrigation

Table 23: Water pumping from river Tana for irrigation- no. of farmers & pumping methods

Sub-counties	All
Ward	All
Village	All
Water source	River Tana
Approximate no. of farmers	45,000
Average daily water demand per farmer (litres)	30,000 litres per Acre
Average water lifting head (m)	10
Current source of pumping energy	Solar powered pumps (25%) and fuel powered water pumps (75%)
Average cost of pumping energy per month	5,000 (for fuel pumps)
Average acreage per farmer	2 Acres
Types of crops grown	Maize and Green grams
No. of seasons per year	3 seasons

(Source: County Department of Crops)

The above data, offers insights into agricultural practices and water usage among farmers reliant on the River Tana as their water source. It indicates a substantial agricultural presence with approximately 45,000 farmers cultivating maize and green grams across the region. Each farmer, on average, requires a significant daily water demand of 30,000 litres per acre, with an average acreage of two acres per farmer. The current water lifting head stands at 10 meters, and farmers utilise both solar-powered pumps and fuel-powered pumps for irrigation, with an average monthly cost of pumping energy amounting to Ksh. 5,000. Majority of the farmers (more than 75%) use fuel-powered pumps. Additionally, the region experiences three cropping seasons per year, suggesting a high dependence on irrigation for agricultural production.

Pathways for universal electricity access

Introducing solar water pumps for river water pumping

Introducing solar-powered pumps to replace fuel pumps for irrigation among farmers reliant on the River Tana offers several compelling justifications. Solar-powered pumps offer significant cost savings over fuel-powered pumps in the long term. While the initial investment for solar pumps may be higher, they have lower operating and maintenance costs since they rely on free solar energy. Farmers can save substantially, reducing their overall irrigation costs and improving their financial sustainability (World Bank 2018).

However, given the high capital expenditure (CAPEX)cost, the County Government would rather pursue a market-based approach. The market-based approach will aim to leverage market forces, private sector engagement, and consumer demand to facilitate the adoption of renewable energy solutions for agricultural irrigation. The initiative will involve collaboration between private sector stakeholders, financial institutions, technology providers, and local farmers to create a sustainable market ecosystem for solar-powered pumps. Through this market-based approach, the project aims to catalyse the growth of a vibrant market for solar-powered pumps in these regions, enabling farmers to access affordable, clean energy solutions for irrigation while promoting economic development, food security, and environmental sustainability.

The project will be implemented by the County Department of Agriculture supported by the Directorate of Energy. The County Government will play the following facilitative roles:

- Providing market assessment data on approximate market size. As can be seen from the Table 26 below, there is already a sizable market. Nevertheless, further market analysis is necessary to assess market dynamics, including pricing, distribution channels, and consumer preferences.
- The County Government will further support the roll out of targeted marketing campaigns, awareness-raising activities, and demonstration events to promote the benefits of solar-powered pumps and educate farmers about the advantages of renewable energy for irrigation. Farmer field days, technology showcases, and testimonials from early adopters will be used to showcase successful case studies and generate interest among potential buyers.
- The County Government will also put into place robust monitoring and evaluation mechanisms to track the adoption, impact, and scalability of solar-powered pumps among the farming community. Key performance indicators, such as the number of installations, water savings, crop yields, and income generation, are monitored to assess the effectiveness of the interventions and inform strategic decision-making.

With the above support in place, private companies will enter the market and establish distribution networks and sales channels to make solar-powered pumps accessible and available to farmers across the Tana River region. Partnerships with local retailers, agro-dealers, farmer cooperatives, and community-based organisations will be forged to facilitate product promotions, sales, and after-sales support services. The private companies will also be expected to innovate business models which ensure access and affordability. This goal will be achieved through deployment of affordable financing instruments, such as loans, leasing, or pay-as-you-go (PAYG) financing, with a view to enabling farmers to invest in solar irrigation systems. Subsidies, grants, or incentives may be offered to early adopters or marginalised groups to reduce upfront costs and promote uptake among underserved communities.

Costing (cost to be borne by the County Government)

Table 24: Costing- introducing solar pumps for river water pumping

Activity	Unit	Unit cost (KES)	No. of units	Cost (KES)
Offering market activation support through; • Demonstration & product promotion events • Farmer field days • Technology showcases	lumpsum			5,000,000
Monitoring and evaluation	lumpsum			1,000,000
Total				**6,000,000**

3.1.2.6 Water sources supplying water for consumption

Electricity Access status

Boreholes under Tawasco

According to data provided by Tana River Water and Sewerage Company (Tawasco), there are a total of 17 boreholes under the entity's management. All the boreholes are already equipped with functional water pumping systems and as such, there is no electricity access intervention needed.

Boreholes under the County Government

There are a total of 94 boreholes in the County, primarily supplying water for consumption. The list of these boreholes, locations and source of pumping power is as shown below. Majority of boreholes (77) are pumping with solar, six with electricity, one with a diesel generator while 10 are not equipped with a pumping system. The names of the unequipped boreholes as well the one which is pumping with a generator are shown on table 26.

Table 25: Pumping methods for county operated boreholes

Sub-county	Ward	No of boreholes	Source of Pumping Power			
			Solar	Electricity	Generator	Not equipped
Tana North	Sala	6	6			
	Madogo	7	5			2
	Bangale	2	2			
	Hirimani	1	1			
	Chewele	6	4	1		1
Tana River	Wayu	7	6		1	
	Kinakomba	10	9	1		
	Mikinduni	13	9	1		3
	Chewani	8	7			1
ana Delta	Garsen South	3	2			1
	Kipini East	4	4			
	Kipini West	8	8			
	Garsen North	9	8			1
	Garsen Central	6	4	1		1
	Garsen West	4	2	2		
Total		**94 (100%)**	**77 (81.9%)**	**6 (6.4%)**	**1 (1.1%)**	**10 (10.6%)**

(Source: County Department of Water Access)

Boreholes not equipped/ pumping with Generator

Table 26: Boreholes not equipped/ pumping with Genset (County operated boreholes)

Sub-county	Ward	Names
Tana North	Madogo	Bula Salama
		Mbalambala
	Chewele	Chardende
Tana River	Wayu	Kalalani (Genset)
	Mikinduni	Kelokelo1, 2 & 3
	Chewani	Chewani
Tana Delta	Garsen South	Tarasaa
	Garsen North	Baomo
	Garsen Central	Hewani

Water pans & small earth dams

Table 27: Pumping methods utilised for water pans and small earth dams

Constituency	Pumping Method			Total
	Hand pump	Direct draw off by humans	Solar pump	
Bura	2	47	0	49
Galole	4	38	1	43
Garsen	2	26	3	31
Total	8 (6.5%)	111 (90.2%)	4 (3.3%)	123 (100%)

(Source: County Department of Water Access)

In Bura Constituency, out of a total of 49 water pans and small earth dams, two are equipped with hand pumps, 47 are operated by humans through direct draw-off, and none are powered by solar pumps. In Galole constituency, out of a total of 43 water pans and small earth dams, four are equipped with hand pumps, 38 are operated by humans through direct draw-off, and one utilises a solar pump. In Garsen Constituency, out of a total of 31 water pans and small earth dams, two are equipped with hand pumps, 26 are operated by humans through direct draw-off, and three are powered by solar pumps.

Overall, across all constituencies, there are eight water pans and small earth dams equipped with hand pumps, 111 operated by humans through direct draw-off, and four utilising solar pumps, resulting in a total of 123 water pans and small earth dams. This data underscores the predominance of human-operated pumping methods for water pans and small earth dams, with a minor but notable adoption of solar pumps in some constituencies, indicating a potential for further integration of renewable energy solutions in water management infrastructure.

The water holding capacities of water pans and earth dams in the region vary significantly, spanning from 20 to 50,000 cubic meters (M3). While some of these water pans and earth dams were constructed through initiatives led by the County Government, the majority were initiated and funded through collaboration with various development partners. The National Government through the Coast Water Services Board, National Drought Management Authority and the National Irrigation Board has been contributing to this noble initiative.

Pathways for universal electricity access

Boreholes

It is proposed to equip the 10 unequipped boreholes with solar water pumping systems. It's also desirable to equip the 1 borehole using a diesel generator. Hence in total, 11 boreholes will be equipped with solar water pumping systems. Solar water pumping systems offer a renewable and environmentally friendly solution for powering boreholes, leveraging the abundant solar energy resources available in the county. The costing is as shown below.

Table 28: Cost of solarising 11 boreholes

Cost component	Specifications	Unit cost (KES)	Units	Cost (KES)
Installation of solar water pumping systems: • Site assessment, planning & design • Pumping system installation and commissioning • Training and capacity building	Average abstraction depth – 25M3 Average yield - 20m3/hour Pump capacity - 7.5 to 30 kW	12,000,000 (Cost based on previous similar projects implemented by the County)	11	132,000,000.00
Total				**132,000,000.00**

Water pans & small earth dams

Access to clean and reliable water is essential for agricultural activities, livelihoods, and community well-being. However, many rural areas, including those in Tana River County, face challenges in accessing water due to unreliable or inadequate pumping infrastructure (Kunen, et al. 2015). In light of this, we propose an intervention to equip 119 water pans and earth dams with solar pumping solutions. This initiative aims to harness renewable energy to provide sustainable and efficient water access for communities and livestock, thereby promoting socio-economic development and resilience in our county.

This shared responsibility of mobilising resources will be apportioned based on the initial sources of funds to construct the water structures. The Table 29 below presents this disaggregation. The list of all these structures is contained in the annexures to this document.

Table 29: Disaggregation of water pans & small earthdams according to sponsoring entities

S/No	Implementing agency	Number of water pans/ earth dams	Number of water pans/ earth dams already equipped with solar water pumping infrastructure	Number of water pans/ earth dams in need of solar water pumping infrastructure
1	County Government	15	0	15
2	National Government agencies	56	1	55
3	Development partners	52	3	49
	Total	123	4	119

Table 30: Cost of equipping & fencing off water pans and small earth dams

Cost component	Specifications	Unit cost (KES)	Units	Cost (KES)
Installation of solar water pumping systems: • Site assessment, planning & design • Pumping system installation and commissioning • Training and Capacity Building	- DC pumps with solar panels (head >10 m, flow > 10 M3/hr overhead tank & support structure & fencing off the structure	1,200,000	119	142,800,000.00
Total				**142,800,000.00**

Cost apportionment

Table 31: Apportionment of solarising water pans and small earth dams according to sponsoring agencies

S/No	Implementing agency	Number of water pans/ earth dams	Unit cost (KES)	Cost (KES)
1	County Government	15	1,200,000	18,000,000.00
2	National Government agencies	55	1,200,000	66,000,000.00
3	Development partners	49	1,200,000	58,800,000.00
	Total	**119**		**142,800,000.00**

3.1.2.7 Street lighting

Street lighting penetration

According to the County Department of Public Works and urban planning there are 30 market centre in need of street lighting. Out of these, 13 market centres have no access to electricity while 17 of them have access to get main grid electricity connection. Of the 17 market centres with access to grid electricity, one market centre (Tarasaa) experiences unreliable and unstable power supply. Similarly, of 17 market centres with access to grid electricity, 13 are located in Tana Delta, while four are found in Tana River Sub-County.

Despite 17 market centres having access to grid electricity, the need for street lighting is still enormous. The estimated need for street lights stands at 510 and there is an additional need for 25 High Mast Flood Lights. In the 13 markets without access to grid electricity, the estimated need for street lights stands at 510, with an additional need for 29 high mast flood lights (HMFLs). Out of the 13 market centres without grid access, five are in Tana Delta, four in Tana North while four in Gale Dyertu.

Similarly, there are three roads in on-grid markets which have been prioritised for installation of 240 street lights. These roads are all located in Tana River Sub-County and include (Kalaule-KPLC- Malindiyangwena marram road; Kone-Mikinduni - Emmaus tarmac road and Malindiya Ngwena - Chewani Murram road).

Table 32: Summary of market centres prioritized for installation of street lights

Cost component	Sub county	No. of market centres	Street lights	High Mast Flood Lights
Market centres with grid connection	Tana Delta	13	430	22
	Tana River	4	80	7
Market centres without grid connection and off-grid	Tana Delta	5	510	8
	Tana North	4		7
	Gale Dyertu	4		10
Total		**30**	**1,020**	**54**

(Source: County Department of Public Works and Urban Planning)

Table 33: Roads prioritized for installation of street lights

Cost component	Sub county	Name of market centre	Street lights
Kalaule-KPLC- Malindiyangwena marram road	Tana River	Hola town	40 street lights
Kone-Mikinduni - Emmaus tarmac road		Hola town	100 street lights
Malindiya Ngwena - Chewani Murram road)		Hola town	100 street lights
Total			240

(Source: County Department of Public Works and Urban Planning)

Pathways for universal street lighting

Access to electricity for street lighting is vital to enhancing security and reducing crime, not only in market centres but also in human settlements. From the above status of access to electricity in market centres, it is important that 1,260 street lights and 54 HMFLs be installed.

Table 34: List of trade centres with grid power and in need of street lighting

Name	Sub-county	Ward	Approx. no of lights needed
Idsowe	Tana Delta	Garsen South	120 street lights & 3 High Mast flood lights
Minijila	Tana Delta	Garsen South	100 street lights & 1 High Mast flood light
Tarasaa	Tana Delta	Garsen South	1 High Mast flood light
Ngao	Tana Delta	Garsen South	30 street lights & 1 High Mast flood lights
Chara	Tana Delta	Kipini West	2 High Mast flood lights
Kipini	Tana Delta	Kipini East	100 street lights
Hara	Tana River	Kinankomba	1 High Mast flood light
Wenje	Tana River	Kinankomba	80 street lights & 2 High Mast flood light
Duwayo	Tana River	Kinankomba	2 High Mast flood light
Handampia	Tana River	Kinankomba	2 High Mast flood light
Golbanti	Tana Delta	Garsen-South	2 High Mast flood light
Hewani	Tana Delta	Garsen North	2 High Mast flood light
Chamwanamuma	Tana Delta	Kipini West	2 High Mast flood light
Wema	Tana Delta	Garsen North	2 High Mast flood light
Kulesa	Tana Delta	Garsen North	2 High Mast flood light
Maziwa	Tana Delta	Garsen North	80 street lights & 2 High Mast flood light
Semikaro	Tana Delta	Kipini West	2 High Mast flood light

Table 35: List of trade centres without grid power but in need of street lighting

Name	Sub-county	Ward	Approx. no of lights needed
Waldena	Gale Dyertu	Wayu	4 High Mast flood lights
Chifiri	Gale Dyertu	Wayu	1 High Mast flood light
Wayu A & B	Gale Dyertu	Wayu	3 High Mast flood lights
Daba	Gale Dyertu	Wayu	2 High Mast flood lights
Subukia	Tana North	Hirirmani	2 High Mast flood lights
Walesorea	Tana North	Hirimani	2 High Mast flood lights
Sala	Tana North	Sala	2 High Mast flood lights
Nanighi	Tana North	Chewele	1 High Mast flood lights
Katsangani	Tana Delta	Kipini West	2 High Mast flood lights
Ozi	Tana Delta	Kipini East	1 High Mast flood lights
Kitere	Tana Delta	Garsen North	3 High Mast flood lights
Mikameni	Tana Delta	Garsen North	1 High Mast flood lights
Mnazini	Tana Delta	Garsen North	2 High Mast flood lights

Solutions Costing for Street lighting

Table 36: Solutions costing for street lighting

Cost component	Specifications	Unit cost (KES)	Units	Cost (KES)
Installing solar powered street lights in off-grid market centres.	Integrated solar powered streetlights (automatic on/off, motion sensor for energy saving) height = 8 meters, no of lamps = 1pc, lamp wattage = 90w to 150w	100,000	510	51,000,000
Installing solar powered street lights in both on-grid market centres	Grid powered street lights height = 8 meters, no of lamps = 1pc to 2 pcs lamp wattage = 60w to 90w	90,000	510	45,900,000
Installing High Mast Flood Lights in off-grid market centres.	Solar powered Highmasts Height=30 meters No of lamps = 10 pcs Lamp wattage 200w to 250w	4,500,000	29	130,500,000
Installing High Mast Flood Lights in on-grid market centres.	Grid powered Highmasts Height=30 meters No of lamps = 10 pcs Lamp wattage 350w to 400w each	4,200,000	25	112,500,000
Installing street lights along three prioritized roads	Grid powered streetlights; height = 8 meters, no of lamps = 1pc to 2 pcs lamp wattage = 60w to 90w	90,000	240	21,600,000
TOTAL				**361,500,000**

3.1.2.8 Micro Small and Medium Enterprises (MSMEs)

Electricity Access status

Energy is the lifeblood of modern enterprises, fuelling operations, driving productivity, and enabling growth. However, access to reliable, affordable, and sustainable energy remains a critical challenge for many businesses. According to the County Directorate of Trade, there are a total of 2,320 registered businesses operating in major urban centres. These businesses mainly comprise micro enterprises such as M-Pesa (mobile phone outlets) shops, small retail and hardware shops, food kiosks and food kiosks, among others. There are also Small and Medium Enterprises (SMEs) operating in manufacturing, service, mining and hospitality industries.

To understand the energy needs of this business community, a total of 131 businesses were randomly sampled from amongst this target population. For a population of 2,320 businesses, this is the sample size which is needed to yield survey results with 95% confidence level and a 5% margin of error (Bartlett, Kotrlik & Higgins 2001). In the interest of gathering rich and relevant insights on electricity and cooking energy needs, the sample was specifically drawn from food kiosks and restaurants, bakeries, milling entities, mining companies, filling stations, welding and workshops, supermarkets and big hotels. The actual number of businesses sampled per category was determined using the weight of that category relative to the total businesses in the eight categories of interest. This weight was determined by dividing the number of businesses in a particular category by the total number of businesses in the eight categories of interest.

The eight categories of MSMEs interviewed, the number of MSMEs per category and the sub-counties' distribution is as shown on Table 37.

Table 37: Categories of mSMEs surveyed to assess energy access situation in the county

S/N	Type of MSMEs	Tana River	Tana Delta	Tana North	Total
1	Food kiosks & restaurants	39	16	33	88
2	Mining companies			2	2
3	Filling stations	3	6	1	10
4	Welding & workshops	4	2	6	12
5	Bakery			2	2
6	Millers	3	2		5
7	Supermarkets	2			2
8	Big hotels (Lodges)	5	3	3	11
	Total	**57**	**29**	**47**	**131**
	Required sample size = 132 (=5%, CL=95%) Bartlett, Kotrlik & Higgins (2001) pg.6				

Status of MSMEs access to electricity

Based on survey results, Table 38 gives a breakdown of the electrification status of businesses surveyed:

Table 38: Electrification status of businesses sampled

Parameter	Frequency	%
Electrified businesses	124	95
Unelectrified businesses	7	5
Total	**131**	**100**

Pathways for universal electricity access

This data shows that the majority of businesses surveyed are electrified, accounting for 95% of the total respondents. All the electrified businesses are supplied by Kenya Power and are connected to single phase supply. However, it is essential to address the needs of the remaining 5% of unelectrified businesses to ensure equitable access to energy and support their growth and development. Since the majority of these unelectrified businesses are in off-grid areas, they will potentially benefit in the near future from grid expansion, intensification and densification initiatives, which have been proposed under the section on electrification master planning for households.

3.1.2.9 Summary of electricity generation and consumption in the county

Table 39: Existing grid network

Transmission sub-stations		Sub-transmission lines (Length in km)			Distribution primary sub -stations		Medium voltage distribution lines (Length in km)		Distribution transformers	
No.	Installed Capacity (MVA)	66 kV	132 kV	220 kV	No.	Installed Capacity (MVA)	11 kV	33 kV	No.	Installed Capacity (MVA)
2	38			132.9	1	2.5	33.31	728.02	231	19.505

(Source: Kenya Power)

Table 40: Customers connected to grid network and power consumption

Customer base					Total annual units (kWh)
Commercial & Industrial	Domestic	Street lights	SMEs	Grand Total	
2	21,867	42	781	22,692	674,889

(Source: Kenya Power)

Three significant projects are on the horizon, each expected to consume a considerable amount of grid power. They include, the County Aggregation and Industrial Park (CAIP) in Chifiri; the affordable housing initiative which aims to construct 7,000 units in Hola; and the Greenherat Project at Minjila. While discussions with the Kenya Power office in Hola suggest that the current grid infrastructure has adequate capacity to accommodate the additional load, the County Government remains committed to engaging with the National Government to reinforce and upgrade the existing grid network. This proactive approach ensures that the electricity infrastructure keeps pace with the growing demand spurred by these key developmental projects, facilitating reliable power supply and supporting the County's economic growth aspirations.

3.1.2.10 Barriers, risks & mitigation measures - universal electricity access

Electrification efforts are primarily coordinated and executed by national-level actors, although there has been a growing emphasis on decentralised structures and technologies in recent electrification policies. The primary obstacle lies in the limited capacity of County Governments to implement electrification projects, with additional challenges stemming from issues of legitimacy, overlapping responsibilities, transparency, and information-sharing. Moreover, accountability among national actors is lacking, alongside insufficient inclusiveness and participation of local communities (Volkert and Klagge, 2022). However, enactment of the Energy Act, 2019 was timely since it adequately addresses this challenge. Indeed, the 5th Schedule vests the role of implementation of counties electrification projects with the County Government. The County Government must, therefore, rise to the occasion and leverage on this provision and proactively push for implementation of the above proposed electrification projects.

Another expected hurdle concerns the mobilisation of adequate financial resources. Funding electrification initiatives across various sectors requires a substantial budget. Counties primarily depend on the equitable share of revenue allocated by the National Government to finance their projects. However, this funding faces numerous competing priorities and is often disbursed irregularly. This barrier notwithstanding, the County Government must innovatively explore all opportunities with a view to making sure that the various proposed interventions are actualised within the shortest time possible. In this endeavour, the it must begin by appreciating the unique role played by electricity access as a key pre-requisite for socio-economic development. With this appreciation, it will be possible to prioritise energy projects. Secondly, the County Government must forge strategic partnerships with all partners - National Government agencies such as REREC, which has a matching fund arrangement of KES 5 million per constituency for electrification projects, development partners and private sector players, so as to aggressively mobilise resources and make universal County electrification goal a reality.

3.2 Access to clean cooking solutions

3.2.1 Key stakeholders in clean cooking services and projects

Clean cooking plays a pivotal role in fostering socio-economic development by addressing multiple interconnected challenges. Access to clean cooking fuels and technologies enhances health outcomes by reducing indoor air pollution, which is a significant contributor to respiratory diseases, particularly among women and children who are often responsible for household cooking. Moreover, transitioning to clean cooking solutions can alleviate the time burden on women and girls, who typically spend hours collecting traditional fuels like firewood, enabling them to pursue education and income-generating activities. Additionally, the adoption of clean cooking technologies promotes environmental sustainability by mitigating deforestation and reducing greenhouse gas emissions. By unlocking these benefits, clean cooking contributes to improved public health, gender equality, and environmental conservation, ultimately driving inclusive socio-economic development.

Clean cooking initiatives in Tana River County have been scarce, reflecting a lack of prioritisation from both the national and County Governments, as well as development partners. This oversight has led to widespread reliance on biomass fuels and inefficient cooking practices, exacerbating environmental and health challenges in the County.

In 2024, the National Government, in collaboration with UNDP, distributed 2000 improved stoves to households most in need. Additionally, between 2023 and 2024, the Clean Cooking Association of Kenya (CCAK), in partnership with Practical Action and through the UNDP-funded Acceleration to Clean Cooking Action project, provided business skills training to 100 energy businesses. In the preceding years of 2021 to 2023, World Vision implemented the Tana River Climate Change and Livelihoods Restoration Project (TCLIRP I &II) in Tana Delta. The Project had a component on training community members in the fabrication of Maendeleo stoves and sustainable charcoal production using drum kilns. Anglican Development Services (ADS Pwani) has also conducted training for nine community groups on the fabrication of Kenya Ceramic Jiko stoves, with ongoing efforts to educate these groups on the construction of fireless cookers.

The KOSAP is also supporting three companies – Equity Bank, Kenya Women Finance Trust (KWFT) and Greenlight Planet - through the result-based financing arrangement to enter and penetrate the cleaning cooking market in the County.

While the efforts outlined above are commendable, their impact in addressing the overarching need for clean cooking solutions remains relatively insignificant. This underscores the necessity of this document, which aims to serve as a catalyst for mobilising resources and uniting all stakeholders - including the national government, County Government, development partners, and the private sector - behind the shared objective of prioritising the clean cooking agenda. By raising awareness, highlighting the importance of clean cooking, and outlining actionable steps for intervention, this document seeks to galvanise concerted efforts towards achieving widespread adoption of clean cooking technologies. Through collaborative action and sustained commitment, it is envisioned that significant progress can be made in improving household health, reducing environmental degradation, and fostering socio-economic development in the County.

3.2.2 Access situations, interventions & proposed progression to universal access by 2028

3.2.2.1 Households

To evaluate the cooking energy landscape in the County, a household survey was conducted in November 2023, encompassing a total of 422 sampled households drawn from Tana Delta, Tana North and Tana River sub-counties. The survey adopted a stratified sampling research methodology, ensuring representation from both urban and rural settings. With a sample size designed for a 90% confidence level and a 5% margin of error, the distribution included 300 households in rural areas and 122 predominantly urban households. The selection of interviewed households utilised the random walk method, commencing from spread-out points on a boundary map.

Cooking energy situation

Primary cooking fuels

In rural areas, the majority, comprising 81.70%, indicated reliance on firewood as their primary fuel for cooking while 17.30% of the respondents reported using charcoal as their primary fuel for cooking. A smaller proportion of households, comprising 0.70% respondents reported using Liquified Petroleum Gas (LPG), while only one respondent (0.30%) mentioned using sawdust as their primary cooking fuel.

In urban areas, the majority of urban households, comprising 62.30%, rely on charcoal for cooking, 33.60% use firewood. A smaller proportion, 2.50%, indicated using LPG as their primary cooking fuel.

Secondary cooking fuels

In rural areas, 31% of respondents reported using charcoal as their secondary fuel for cooking, while 13.30% indicated using firewood as a secondary fuel. A majority of households, comprising 55.70%, stated that they do not use any secondary fuel for cooking. In urban areas, 30.30% of respondents reported using charcoal as their secondary fuel for cooking, while 24.60% indicated using firewood. Additionally, 9% of respondents reported using LPG as their secondary fuel. Majority of households, comprising 35.10%, stated that they do not use any secondary fuel for cooking.

Tertiary cooking fuels

In rural areas, 4.3% of respondents reported using farm residues (crop waste) as their tertiary fuel for cooking, while 0.70% indicated using firewood. The vast majority of households, comprising 95.0%, stated that they do not use any tertiary fuel for cooking. In urban areas, 3.30% of respondents reported using charcoal as their tertiary fuel for cooking, while another 3.30% indicated using farm residue (crop waste). Additionally, 1 respondent (0.80%) reported using firewood as their tertiary fuel, and another 0.80% mentioned using LPG. The majority of urban households, comprising 91.80%, stated that they do not use any tertiary fuel for cooking.

Cooking stoves

Table 41: Types of firewood and charcoal stoves being used in the county

	County average	Urban	Rural
Traditional three stone	94%	80%	98%
Firewood metallic stoves	2%	14%	0%
Firewood Improved Cookstove (ICS)	5%	6%	2%
Charcoal metallic stove	54%	49%	58%
Charcoal Improved Cookstove (ICS)	46%	51%	42%

In rural households where the predominant cooking fuel is firewood, almost all households (98%) are burning this firewood on the traditional three stone open fire. With respect to uptake of improved charcoal stoves, more than half (58%) are burning the charcoal on the wasteful metallic stove.

In urban households, where charcoal is the predominant cooking fuel, 51% have adopted improved charcoal stoves. The rest (49%) are using the wasteful traditional metallic stove. For those households using firewood, the majority 80% and 14% are burning it on the traditional three stone and firewood metallic stoves.

The data depicts a significant dependence on biomass fuels, particularly firewood and charcoal, for cooking purposes in both rural and urban areas. There is also a high prevalence of traditional cooking methods such as three-stone open fires, firewood metallic stoves, and charcoal metallic stoves, which are often inefficient and associated with high levels of fuel consumption and wastage.

These traditional cooking practices not only contribute to environmental degradation due to deforestation and emissions but also pose health risks to households through indoor air pollution. Addressing this reliance on biomass fuels and inefficient cooking methods is critical for promoting sustainable energy practices, reducing environmental impacts, and improving the health and well-being of communities. Implementing cleaner and more efficient cooking technologies, such as improved cookstoves or alternative energy sources like biofuels, could offer viable solutions to mitigate these challenges and enhance energy sustainability in the county.

Pathways for access to clean cooking solutions

During the solutions validation workshop, it was acknowledged that the high dependence on biomass fuels coupled with the high prevalence of traditional stoves is exerting undue pressure on available biomass resources. It was reiterated that the status quo is unsustainable in the long-run. To this end, the following pathways to transition households to cleaner cooking methods by 2028 were proposed.

i) Replacement of three stone fire & firewood metallic stoves by more improved versions by 2028. In this regard and in the interest of ensuring that the goals are not only realistic but applicable to Tana River context, it was agreed that priority would be given to local improved versions (both portable & fixed) e.g. Kuni mbili etc.

Shredded straw briquettes

ii) Replacement of metallic charcoal stoves by more improved versions by 2028- priority to be given to local improved versions e.g. Kenya Ceramic Jiko (kCJ) etc.

iii) Promotion of bioethanol stoves - to have at least 1000 rural households and 3000 urban households adopt the technology by 2028.

iv) Promotion of LPG, to push the uptake in rural households from the present 400 to 2000 households by 2028 and to increase uptake in urban households from the present 2221 to 6000 households by 2028.

v) To promote uptake of biogas in 370 households profiled as having potential to uptake the technology. Measures for promoting biogas in households and institutions have been documented under the chapter on biofuels.

vi) Enactment of regulatory framework for charcoal production, transportation and marketing in line with Tana River County Forest Conservation and Management Bill 2024 (refer to section 1.5.2 on County energy policies & legislations). According to section 46. (1) *'The county Executive Committee Member in consultation with the relevant stakeholders shall prescribe Regulations for trading in timber, charcoal and other forest products within the county'*. In this regard, enacting regulations which dis-incentivize or prohibit charcoal production is crucial for addressing the pressing environmental, social, and economic challenges associated with this practice.

Charcoal production often involves unsustainable logging practices, leading to deforestation, habitat loss, and biodiversity degradation. To illustrate this point, according to Stockholm Environment Institute - SEI (2014), charcoal in Kenya is mainly produced on traditional earth kilns with an average recovery rate of 9-15%. This implies that to produce 1 kg of charcoal, 8.33 kg of raw woody biomass is needed. By prohibiting/ dis-incentivising charcoal production, the County Government will safeguard fragile forest ecosystems (proportion of indigenous to exotic tree species), mitigate climate change by preserving carbon sinks, and protect the livelihoods of communities dependent on forest resources. Additionally, such policies will promote the adoption of alternative, sustainable energy sources and technologies, leading to improved air quality, public health, and economic resilience. Overall, prohibiting charcoal production or significantly minimising its availability is essential for promoting sustainable development, conserving natural resources, and

fostering a healthier, more resilient society. Given the uncertainty surrounding the timelines for implementation and enforcement of charcoal regulations, the modelling assumes that charcoal will continue to be available. However, it is important to note that the enactment of these regulations holds great potential to stimulate the adoption of cleaner cooking solutions by limiting the supply of charcoal.

Rationale for recommending improved cook stoves, bio-ethanol and LPG

According to Baldwin (1988) energy delivered to the pot is a function of the quantity of fuel burnt (kg), its calorific value (k) and thermal efficiency of the stove used to combust the fuel (%). Therefore;

$$kg * k * \% = Q \quad \text{.....(i)}$$

Since calorific value (k) is constant, rearranging equation (i) above by holding fuel quantity constant (kg), the amount of heat energy delivered to the pot (Q) becomes directly proportional to the thermal efficiency of the stove used to combust the fuel (%).

$$kg * k * \% = Q$$

$$(kg * k) * \% = Q$$

$$\%\propto Q \quad \text{..... (ii)}$$

Similarly, re-arranging equation (i) above by holding the heat energy delivered to the pot (Q) constant, stove's thermal efficiency (%) becomes inversely proportional to the fuel quantity consumed (k).

$$kg * k * \% = Q$$

$$\% = \frac{Q}{(kg * k)}$$

$$\%\propto \frac{1}{kg} \quad \text{.....(iii)}$$

Equations (ii) and (iii) prove that deploying stoves of a higher thermal efficiency will therefore automatically bring about a reduction in fuel consumption and therefore a saving on fuel budget. In addition to improved cook stoves (those with higher thermal efficiency), cooking technologies such as solar, electricity, biogas, LPG, natural gas, alcohol based liquid fuels are recommended since they are cleaner at the point of use – devoid of noxious emissions responsible for household air pollution- and, in most cases, cheaper than firewood and charcoal (WHO, 2022).

Modelling the pathways for transitioning to improved cook stoves, bio-ethanol and LPG

The number of households in the County from 2023 to 2028 have been projected based on population figures. Based on the number of households in 2019 as per the 2019 Census, a growth trajectory based on average annual population growth as projected by the World Bank was applied.

According to the World Bank, the Kenya population grew by 2% in 2020 and by 1.9% in 2021 and 2022. The annual population growth from 2023 to 2028 has been forecast based on an average annual growth rate of 2.1% which corresponds to the average annual population growth rate for the last 10 years (2022 to 2013). Based on this analysis, the number of rural and urban households from 2023 to 2028 were projected. This forecast on overall population and the number of households from 2023 to 2028 is listed in the annexure. An Excel model for transitioning the households to cleaner cooking methods while applying the above discussed pathways and accounting for population growth was designed and executed to obtain the projections.

Although there are indications that the urban population may grow faster than the rural population, the analysis did not find an authoritative source to inform the dynamics of rural-to-urban migration, and actual growth values, during the period under consideration. Therefore, the modelling assumed that rural and urban populations in the County would grow at a similar average rate. Based on this analysis, projections were made for the status of fuel and stove usage under the intervention scenario is shown in Table 42 below.

Intervention scenario projections

Table 42: Projections for transitioning all households to cleaner cooking methods by 2028

Intervention scenario- biomass stoves	Projections between 2024 to 2028					
Description	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Cumulative totals- HHs adoption of firewood ICS	1,717	1,753	9,390	23,428	46,466	71,505
Cumulative totals- HHs adoption of charcoal ICS	20,033	20,422	23,419	29,825	38,239	48,662
Cumulative totals- HHs using LPG as primary/ secondary fuel	2,568	2,622	3,277	4,334	5,791	8,250
Cumulative totals- HHs using bioethanol as primary/ secondary fuel	-	-	400	1,200	2,500	4,000
Cumulative totals- HHs using bio-gas as primary/ secondary fuel			40	120	230	370

Table 43: Projections for transitioning rural households to cleaner cooking methods by 2028

Intervention scenario- biomass stoves	Projections between 2024 to 2028					
Description	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
HHs transitioning from stone open fire & firewood metallic stoves to ICS		-	6,400	12,000	20,000	20,000
HHs already burning firewood on improved firewood stoves	1,074	1,096	1,119	1,143	1,167	1,191
Cumulative totals- HHs adoption of firewood ICS	1,074	1,096	7,519	19,543	39,567	59,591
HHs transitioning from metallic to improved charcoal stoves			1,300	4,000	5,000	7,000
HHs already burning charcoal on improved charcoal stoves	11,382	11,589	11,801	12,017	12,238	12,463
Cumulative totals- HHs adoption of charcoal ICS	11,382	11,589	13,101	17,317	22,538	29,763
HHs adopting LPG			400	400	400	400
HHs already using LPG	393	401	409	418	427	436
Cumulative totals- HHs using LPG as primary fuel	393	401	809	1,218	1,627	2,036
Cumulative totals- HHs adopting bio-ethanol as primary/ secondary fuel	-	-	200	400	700	1,000
Households up taking biogas			40	80	110	140
Cumulative totals- HHs adopting biogas as primary/ secondary fuel (refer Biofuels chapter for more details)			**40**	**120**	**230**	**370**

Table 44: Projections for transitioning urban households to cleaner cooking methods by 2028

Intervention scenario- biomass stoves	Projections between 2024 to 2028					
Description	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
HHs transitioning from metallic to improved charcoal stoves			1,300	2,000	3,000	3,000
HHs already burning charcoal on improved charcoal stoves	8,651	8,833	9,019	9,208	9,401	9,599
Cumulative totals- HHs adoption of charcoal ICS	8,651	8,833	10,319	12,508	15,701	18,899
HHs transitioning from stone open fire & firewood metallic stoves to ICS			1,200	2,000	3,000	5,000
HHs already burning firewood on improved firewood stoves	643	657	670	685	699	714
Cumulative totals- HHs adoption of firewood ICS	643	657	1,870	3,885	6,899	11,914
HHs adopting LPG			200	600	1,000	2,000
HHs already using LPG	2,176	2,221	2,268	2,316	2,364	2,414
Cumulative totals- HHs using LPG as primary/ secondary/ tertiary fuel	2,176	2,221	2,468	3,116	4,164	6,214
Cumulative totals- HHs using bio-ethanol as primary/ secondary fuel	**-**	**-**	**200**	**800**	**1,800**	**3,000**

Number and type of stoves to be disseminated to actualise the intervention scenario

The tables below show the number of stoves which need to be disseminated in order to transition all the households to cleaner cooking methods by 2028. As previously explained, when prioritising improved firewood and charcoal stoves, the emphasis will be placed on locally-produced models to enhance availability and affordability. This approach recognises the importance of supporting local manufacturers and artisans while also ensuring that the stoves are tailored to the specific needs and preferences of the community. By promoting locally produced models, the initiative aims to stimulate local economies, create employment opportunities, and foster innovation within the cooking technology sector. Additionally, locally produced stoves are often more affordable and accessible to households, making them more likely to be adopted on a wider scale. The sub-county distribution of these clean cooking solutions is shown in the annex.

Kuni safi cooking stove

Table 45: Number of clean stoves to be disseminated in all the households by 2028

Stove categories	Financial years					
Description	**2023-2024**	**2024-2025**	**2025-2026**	**2026-2027**	**2027-2028**	**Total**
Improved firewood stoves		7,600	14,000	23,000	25,000	69,600
Improved charcoal stoves		2,600	6,000	8,000	10,000	26,600
LPG stoves		600	1,000	1,400	2,400	5,400
Bio-ethanol stoves		400	800	1,300	1,500	4,000
Biogas systems		40	80	110	140	370
Total		**11,240**	**21,880**	**33,810**	**39,040**	**105,970**

Table 46: Number of clean stoves to be disseminated in rural households by 2028

Stove categories	Financial years					
Description	**2023-2024**	**2024-2025**	**2025-2026**	**2026-2027**	**2027-2028**	**Total**
Improved firewood stoves		6,400	12,000	20,000	20,000	58,400
Improved charcoal stoves		1,300	4,000	5,000	7,000	17,300
LPG stoves		400	400	400	400	1,600
Bio-ethanol stoves		200	200	300	300	1,000
Biogas systems		40	80	110	140	370
Total		**8,340**	**16,680**	**25,810**	**27,840**	**78,670**

Table 47: Number of clean stoves to be disseminated in urban households by 2028

Stove categories	Financial years					
Description	**2023-2024**	**2024-2025**	**2025-2026**	**2026-2027**	**2027-2028**	**Total**
Improved charcoal stoves		1,300	2,000	3,000	3,000	9,300
Improved firewood stoves		1,200	2,000	3,000	5,000	11,200
LPG stoves		200	600	1,000	2,000	3,800
Bio-ethanol stoves		200	600	1,000	1,200	3,000
Total		**2,900**	**5,200**	**8,000**	**11,200**	**27,300**

Discounted capital cost of these solutions

Discounting the capital expenditure (capex) involves adjusting the projected costs based on the prevailing inflation rate. In this case, an annual average inflation rate of 6.4% has been applied to the costs in the planning year, which is 2024. This inflation rate is derived from the Central Bank of Kenya's (https://www.centralbank.go.ke/inflation-rates/) annual inflation rate over the last ten years. By applying this inflation rate, the projected costs for subsequent years are adjusted to account for the expected increase in prices over time. This adjustment is necessary to ensure that the budget estimates remain realistic and reflective of the actual purchasing power of the currency. By discounting the capex, the financial planning considers the potential impact of inflation on project costs, allowing for more accurate budgeting and resource allocation.

Table 48: Discounted capex of proposed clean cooking methods

Stove categories	Specifications	Planning year	Capex during implementation years (KES)				Total capex (KES)
		Unit cost (KES) in 2024	2024-2025	2025-2026	2026-2027	2027-2028	
Improved firewood stoves	Local model e.g. Kuni mbili	3,000.00	24,259,200.00	47,548,032.00	83,113,959.94	96,123,101.49	251,044,293.43
Improved charcoal stoves	Local model e.g. KCJ	2,000.00	5,532,800.00	13,585,152.00	19,272,802.30	25,632,827.06	64,023,581.37
LPG stoves	13 kgs (cylinder, gas and burner)	12,000.00	7,660,800.00	13,585,152.00	20,236,442.42	36,911,270.97	78,393,665.39
Bio-ethanol stoves	An example of Koko networks stove	6,000.00	2,553,600.00	5,434,060.80	9,395,491.12	11,534,772.18	28,917,924.10
Biogas systems	8-12 M3	300,000.00	12,768,000.00	27,170,304.00	39,750,154.75	53,828,936.84	133,517,395.59
Total							**555,896,859.88**

A capital expenditure (capex) totalling KES 555,896,859.88 is required to implement the solutions over the designated duration. The delivery of these solutions is expected to be facilitated through a combination of market-based and non-market-based interventions. Resources for implementation will be mobilised from various sources, including county internal funds, national government allocations, interventions from development partners, and private sector initiatives. Market-based interventions will be spearheaded by the private sector, with support from the county government through the creation of a conducive operating environment and partnerships that may include subsidies and result-based grants. Non-market-based delivery will focus on providing solutions to the most vulnerable households in need. Implementation will be overseen by the county government, in collaboration with the national government, development partners, and the private sector, reflecting a concerted effort to address cooking energy access challenges comprehensively and inclusively.

Recognising the effectiveness and sustainability of private sector-led initiatives, the county government will embark on an awareness creation campaign to educate households about the significance of adopting cleaner cooking methods. This campaign aims to raise awareness about the health, environmental, and economic benefits associated with cleaner cooking technologies, while at the same time strengthening supply through building the capacity of local stove artisans and businesses. Additionally, the county government will take proactive steps to develop and enact a regulatory framework for charcoal production, transportation, and marketing. This framework will align with the provisions outlined in the Tana River County Forest Conservation and Management Bill 2024, as discussed under transition pathway VI. By implementing these measures, the county aims to promote the sustainable use of charcoal resources, mitigate environmental degradation, and enhance the long-term viability of cleaner cooking solutions in the county.

Table 49: Costing of market activation interventions - clean cooking solutions

Activity	Unit	Unit cost (KES)	No. of units	Cost (KES)
Offering market activation support through; • Demonstration and product promotion events • Training workshops for local artisans, businesses etc.) • Capacity building (local artisans, businesses etc.) • Monitoring & evaluation	lumpsum			10,000,000
Formulation of county charcoal regulations	lumpsum			10,000,000
Total				**20,000,000**

3.2.2.2 Education institutions (ECDEs, primary schools, secondary schools & tertiary institutions)

Cooking energy situation

According to the Directorate of Education in the county government of Tana River, there are 318 ECDE centres. All the ECDEs primarily use a three-stone open fire stove for burning firewood for cooking. All the ECDE centres neither have secondary cooking technology nor fuel. Cooking is done in temporary kitchens.

There are 186 primary schools in the county of which 185 undertake cooking. Of the 185 schools which cook, nine schools primarily cook with charcoal burnt by Kenya Ceramic Jiko (KCJ) stove, 34 use firewood which is burnt on a variety of improved cookstoves, while 142 burn firewood on three-stone open fire stoves with firewood being the primary fuel for cooking. Six schools (Kone, Kipini, Bularig, Bohoni, Bulto-Mulito, and Matangeni) use LPG as secondary cooking fuel while 179 schools do not use any secondary cooking fuel or technology. Seventeen schools have modern kitchens, two have semi-modern kitchens, while 176 have temporary kitchens.

Moreover, there are 41 secondary schools in the county of which 33 use inefficient cookstoves. One school uses charcoal burnt on KCJ, while 40 schools use firewood primarily for cooking. Only eight schools use improved cookstoves. eight schools have modern kitchens suitable for improved institutional cookstoves, while 33 schools have temporary kitchens unsuitable for installation of improved institutional cookstoves. Moreover, four schools (Tarasaa, Bangale, Gandeni, and Marfano) use LPG as secondary cooking technology, eight schools use charcoal, while 29 schools do not use any type of secondary cooking technology.

The county has 10 VTCs. All the VTCs cook using three-stone open fire stoves for burning firewood in temporary kitchens which are not suitable for installation of improved institutional cookstoves. All the VTCs have no secondary cooking technologies and fuels.

Table 50: Cooking situation in educational institutions

Category	No.	Primary fuel	Primary technology	Average monthly Quantity (kg)	Average monthly cost (KES)	Secondary fuel	Secondary technology	Average monthly Quantity (kg)	Average monthly cost (KES)
ECDEs	318	Firewood	3 stone open fire stove	120	6,000	Charcoal	Metallic stove	8 bags	4,000
Primary schools	9	Charcoal	KCJ	40 bags	20,000	LPG	Fabric Gas cooker		
	34	Firewood	Improved Cookstoves	100	5,000				
	142	Firewood	3 stone open fire stove	160	8,000				
Secondary schools	21	Firewood	3 stone open fire stove	400	20,000	Charcoal	Metallic Charcoal stove	30 bags	15,000
	19	Firewood	Improved stoves	312	15,600	LPG	LPG Burner	18 kgs	5,000
	1	Charcoal	Improved stoves	52 bags	26,000	LPG	LPG Burner	18 kgs	5,000
VTCs	10	Firewood	3 stone open fire stove	46	2,300	None	None		

(Source: County Directorate of Education-National Government)

Pathways for access to clean cooking solutions

In the ECDEs, there is a need to transition the 318 centres from the use of three-stone open fire stoves to improved institutional (Bellerive) stoves. In the short term, there is a need to reduce firewood consumption in the ECDEs by using more efficient firewood stoves and introduction of LPG or bioethanol stoves as secondary cooking technology. In the medium term, there should be complete adoption of LPG / Bioethanol stoves as primary cooking technologies thereby replacing firewood stoves. The transition into adoption of improved institutional stoves would involve the construction of modern kitchens in all the 318 ECDE centres. Details of ECDEs with proposed cooking solutions are available in the annexes section of this CEP.

Solutions and Costing for Cooking in ECDEs

Solution: Installing improved cookstoves (Bellerive model) at ECDEs using three-stone open fire and construction of modern kitchens.

Table 51: Cooking solutions costing for ECDE centres

Cost component	Specifications	Unit cost (KES)	Units	Cost (KES)
Bellerive institutional stoves	100 litres (150-200 students)	200,000	318	62,000,000
Modern kitchens		5,000,000	318	1,590,000,000
Total				1,652,000,000

Data from the Directorate of Education indicates that there are 186 primary schools, of which there is no cooking in one primary school (KOTI primary). There is a need to transition the 185 schools from the use of three-stone open fire stoves to improved institutional (Bellerive) stoves. In the short-term, there is a need to reduce firewood consumption by using more efficient institutional firewood stoves and introduction of LPG or bioethanol stoves as secondary cooking technology. In the medium term, there should be complete adoption of Bioethanol stoves as primary cooking technologies thereby replacing firewood stoves. On the other hand, given that some primary schools are electrified, transition into electric cooking should be considered in the long term. This would involve the adoption of Modern Electric Cooking devices. The transition into adoption of improved institutional stoves would involve the construction of modern kitchens in all the 168 primary schools which have temporary kitchens. Details of primary schools with proposed cooking solutions are available in the annexes section of this CEP.

Solutions and Costing – Cooking in Primary schools

Solution: Installing improved cookstoves (Bellerive models / rocket types), construction of modern kitchens and installation of human waste biogas system.

Table 52: Cooking solutions costing for primary schools

Cost component	Specifications	Unit cost (KES)	Units	Cost (KES)
Bellerive institutional stoves	100 litres (150-200 students)	200,000	81	16,200,000
	200 litres (201-350 students)	250,000	56	14,000,000
	350 litres (351-700 students)	300,000	37	11,100,000
	400 litres (701-800 students)	350,000	3	1,050,000
	500 litres (801-1000 students)	400,000	1	400,000
	800 litres (Above 1000 students)	450,000	7	3,150,000
Total			**185**	**45,900,000**
Human waste biogas system	Capacity 72 cubic meters	4,000,000	25	100,000,000
Modern kitchens		5,000,000	168	840,000,000
Total				**985,900,000**

For cooking in secondary schools, there is a need to transition the 33 schools from the use of inefficient stoves to more efficient institutional (Bellerive) stoves. This will reduce firewood consumption in the secondary schools by using more efficient institutional firewood stoves and introduction of LPG or bioethanol stoves as secondary cooking technology. In the medium term, there should be complete adoption of LPG / Bioethanol stoves as primary cooking technologies thereby replacing firewood stoves in all the 41 secondary schools. Given that some secondary schools are electrified, transition into electric cooking should be considered in the long term. This would involve the adoption of Modern Electric Cooking devices. The transition into adoption of improved institutional stoves would involve the construction of modern kitchens in all the 33 secondary schools which have temporary kitchens.

Table 53: List of 33 Secondary schools in need of improved institutional stoves (Bellerive) and modern kitchens

Name of school	Sub County	Primary Fuel	Kitchen Type
Chanani	Tana River	Firewood	Temporary
Wachakone	Tana River	Firewood	Temporary
Chanani	Tana River	Firewood	Temporary
Majengo sec	Tana River	Firewood	Temporary
Masabubu Secondary	Tana River	Firewood	Temporary
Waldena Secondary School	Gale Dyertu	Firewood	Temporary
Rafiki sec	Tana River	Firewood	Temporary
Milalulu Sec School	Tana River	Firewood	Temporary
Galole Model Sec School	Tana River	Firewood	Temporary
Daku. Sec	Tana River	Firewood	Temporary
Ndura	Tana River	Firewood	Temporary
Wachakone Mixed Day	Tana River	Firewood	Temporary
Kipini Sec.	Tana Delta	Firewood	Temporary
Garsen High	Tana Delta	Firewood	Temporary
Marfano Sec.	Tana Delta	Charcoal	Temporary
Mapunga Sec.	Tana Delta	Firewood	Temporary
Kitere Sec.	Tana Delta	Firewood	Temporary
Minhaji Sec.	Tana Delta	Firewood	Temporary
Buyani Sec.	Tana Delta	Firewood	Temporary
Oda Sec.	Tana Delta	Firewood	Temporary
Hurara Sec.	Tana Delta	Firewood	Temporary
Kipao Sec.	Tana Delta	Firewood	Temporary
Hashaka Sec.	Tana Delta	Firewood	Temporary
Dalu Sec.	Tana Delta	Firewood	Temporary
Kipini Girls Sec	Tana Delta	Firewood	Temporary
Madogo Secondary	Bangale	Firewood	Temporary
Kora Secondary	Bangale	Firewood	Temporary
Mororo Mixed Day	Bangale	Firewood	Temporary
Singwaya Sec	Tana North	Firewood	Temporary
Huruma Sec	Tana North	Firewood	Temporary
Charidende	Tana North	Firewood	Temporary
Fayya Girls	Tana North	Firewood	Temporary
Nanighi	Tana North	Firewood	Temporary

Solutions and Costing – Cooking in Secondary schools

Solution: Installing improved cookstoves (Bellerive models / rocket types), construction of modern kitchens and installation of human waste biogas system.

Table 54: Cooking solutions costing for secondary schools

Cost component	Specifications	Unit cost (KES)	Units	Cost (KES)
Bellerive institutional stoves	100 litres (150-200 students)	200,000	12	2,400,000
	200 litres (201-350 students)	250,000	11	2,750,000
	350 litres (351-700 students)	300,000	9	2,700,000
	400 litres (701-800 students)	350,000	1	350,000
Total			**33**	**8,200,000**
Human waste biogas system	Capacity 72 cubic meters	4,000,000	5	20,000,000
Modern kitchens		5,000,000	33	165,000,000
Total				**193,200,000**

For the VTCs, there is a need to transition the 10 centres from the use of three-stone open fire stoves to improved institutional (Bellerive) stoves. In the short-term, there is a need to reduce firewood consumption in the VTCs by using more efficient firewood stoves and introduction of LPG or bioethanol stoves as secondary cooking technology. In the medium term, there should be complete adoption of LPG / Bioethanol stoves as primary cooking technologies thereby replacing firewood stoves. The transition into adoption of improved institutional stoves would require the construction of modern kitchens in all the 10 VTC centres. Since 80% of the VTCs are electrified, transitioning into electric cooking should be considered in the long term. This would involve the adoption of more efficient and clean Modern Electric Cooking (MEC) devices.

Table 55: VTCs in need of improved institutional firewood stoves

Name of VTC	Sub County	Primary Fuel	Primary Stove	Proposed solution
Kipini VTC	Tana Delta	Firewood	Tradition firewood jiko	Improved Institutional (Bellerive) Stove
Tarasaa VTC	Tana Delta	Firewood	Tradition firewood jiko	Improved Institutional (Bellerive) Stove
Odha VTC	Tana Delta	Firewood	Tradition firewood jiko	Improved Institutional (Bellerive) Stove
Garsen VTC	Tana Delta	Firewood	Tradition firewood jiko	Improved Institutional (Bellerive) Stove
Maziwa VTC	Tana Delta	Firewood	Tradition firewood jiko	Improved Institutional (Bellerive) Stove
Tana river training centre for innovation and youth empowerment	Tana River	Firewood	Tradition firewood jiko	Improved Institutional (Bellerive) Stove
Tumaini VTC	Tana North	Firewood	Tradition firewood jiko	Improved Institutional (Bellerive) Stove
Madogo VTC	Tana North	Firewood	Tradition firewood jiko	Improved Institutional (Bellerive) Stove
Hurara VTC	Tana Delta	Firewood	Tradition firewood jiko	Improved Institutional (Bellerive) Stove
Wenje VTC	Tana River	Firewood	Tradition firewood jiko	Improved Institutional (Bellerive) Stove

Cooking Solutions and Costing - VTCs

Solution: Installing improved cookstoves (Bellerive models / rocket types) and construction of modern kitchens.

Table 56: Cooking solutions costing for VTCs

Cost component	Specifications	Unit cost (KES)	Units	Cost (KES)	Funding mechanism
Bellerive institutional stoves	200 litres (201-350 students)	250,000	9	2,250,000	Cost-sharing arrangement
	350 litres (351-700 students)	300,000	1	300,000	Cost-sharing arrangement
Modern kitchens		5,000,000	10	50,000,000	Cost-sharing arrangement
Total				**52,550,000**	

3.2.2.3 National Service Institutions (Prisons and National Youth Service)

Cooking energy situation

According to the office of the County Commissioner, Tana River County has one GK Prison in Hola. The facility relies primarily on firewood for cooking which is burnt on an Improved (Kuni Safi) Boiler Stove installed in a modern kitchen. The facility has no secondary cooking technology or fuel. Similarly, cooking at National Youth Service Institute at Madogo is primarily done using firewood which is burnt on a three-stone open fire stove. The institute has no secondary cooking technology and fuels. Cooking is done in a temporary kitchen which is not suitable for installation of improved institutional cookstoves.

Table 57: Cooking situation in Hola Prison and NYS Madogo

Category	No.	Primary fuel	Primary technology	Average monthly Quantity (kg)	Average monthly cost (KES)	Secondary fuel	Secondary technology	Average monthly Quantity (kg)
Hola GK Prison	1	Firewood	Improved Kuni Safi	855	42,750	None	None	Nil
NYS Madogo	1	Firewood	three-stone open fire	540	27,000	None	None	Nil

Although Hola GK prison uses an efficient primary cooking technology, there is good potential for displacing firewood consumption with LPG/Bioethanol, and introduction of e-cooking since it is connected to the main grid. This solution would also apply to the NYS centre in Madogo.

Pathways for access to clean cooking solutions

Although cooking at Hola GK prison is done using improved cookstoves/boiler, there is need to transition the facility to adoption of LPG/Bioethanol stoves for cooking in the short and medium term. This could begin by adopting LPG/ Bioethanol as secondary cooking technologies and finally as primary cooking technologies and fuels. Given that the facility is electrified, transitioning into electric cooking should be considered in the long term as a secondary cooking technology.

Cooking at NYS requires reduction of firewood consumption by adopting more efficient firewood stoves and introduction of LPG or bioethanol stoves as secondary cooking technology. In the short term, there should be complete adoption of LPG/ Bioethanol stoves as primary cooking technologies, thereby replacing firewood stoves. Given that the institute is electrified and has a small population, transitioning into electric cooking should be considered in the medium term as a secondary cooking technology.

Solutions and Costing – Prisons and NYS

Solution: Installing improved firewood stoves (Bellerive models / rocket types) and construction of modern kitchen at NYS Madogo. Introduction of LPG / bioethanol stove at Hola GK prison.

Table 58: Solution costing for Hola Prison and NYS Madogo

Cost component	Specifications	Unit cost (KES)	Units	Cost (KES)
Improved firewood stoves	200 litres (201-350 students)	250,000	1	250,000
LPG	Burner and cylinder 13 kgs	16,000	2	32,000
Bioethanol stoves	2 burners 65% efficient	5,000	2	10,000
Modern Electric Cookers	Induction cooker	40,000	1	40,000
Modern kitchen		5,000,000	1	5,000,000
Total				**5,332,000**

3.2.2.4 Health facilities

Cooking energy situation

According to the county government's Department of Health Services, there are three Level 4 hospitals, three Level 3 hospitals, and 47 Level 2 hospitals in the county. Cooking is done in Level 4 hospitals only. The primary cooking technology at Hola Referral Hospital is Fabric Gas cooker with four burners, while the secondary cooking technology is a metallic stove which burns charcoal. In Bura and Ngao sub-county hospitals, the primary cooking technology is a combination of a metallic stove and Kenya Ceramic Jiko (KCJ), an improved charcoal stove which burns charcoal, while the secondary cooking technology is a Fabric Gas cooker with four burners.

Table 59: Cooking situation in level 3 and 4 hospitals

Category	No.	Primary fuel	Primary technology	Average monthly Quantity (kg)	Average monthly cost (KES)	Secondary fuel	Secondary technology	Average monthly Quantity (kg)	Average monthly cost (KES)
Level 4	1	LPG	Fabric Gas cooker with 4 burners		26,000	Charcoal	Metallic stove	6 bags	3,000
Level 3	2	Charcoal	Metallic stove/KCJ stove	7 bags	3,500	LPG	Fabric Gas cooker with 4 burners	13kg	3,000

Overally, the Level 4 hospital is running on a clean primary fuel, except for use of charcoal on a metallic stove for secondary cooking. However, there is good potential for displacing charcoal consumption in Level 4 and Level 3 facilities with LPG/ Bioethanol, and introduction of e-cooking since these facilities are connected to the grid.

Pathways for access to clean cooking solutions

The Department of Health Services in collaboration with the energy department should work towards introducing electric cooking in Level 4 hospitals to replace Fabric LPG Burners used as primary cooking technology in the short-term, and eventually make electric cooking the primary technology in the long-term. This will also see the shift from using LPG as the primary cooking technology to a secondary cooking technology in the long-term.

For the health facilities primarily using charcoal but burning this charcoal on the metallic stoves, there is a need for an intervention to displace the metallic stoves with more improved charcoal stoves with the aim of total displacement by 2028.

Level 4 hospital (Hola Referral) consuming substantial amounts of LPG, there is a need to introduce biogas systems which are fed by a mixture of human waste and kitchen waste.

Bioethanol presents a compelling alternative to traditional cooking fuels like firewood and charcoal, offering a sustainable, clean, and efficient energy solution that addresses both environmental and health concerns while supporting economic development and energy access initiatives. It is offered on pay-as-you-use arrangement thereby rendering it more affordable and convenient.

There should be a transition from the use of metallic charcoal stoves as primary cooking technologies to LPG in the short-term, and introduction of electric cooking as the secondary cooking technology. In the medium-term, there should be a shift to electric cooking with LPG becoming secondary cooking technology.

These transition pathways will ensure elimination of charcoal stoves in health facilities and reduction of the use of LPG, while increased adoption of electric cooking technologies will be both cost effective and environmentally sound.

Costing - Cooking Energy Solutions for Health Facilities

Table 60: Cooking solutions costing for health facilities

Cost component	Specifications	Unit cost (KES)	Units	Cost (KES)
Improved Charcoal Stoves	Large Multipurpose Stove	4,000	3	12,000
Bioethanol stoves	2 burners 765% efficient	5,000	3	15,000
Modern Electric Cookers	Induction cooker	40,000	3	120,000
Human waste biogas system	Capacity 72 cubic meters	4,000,000	1	4,000,000
Total				**4,147,000**

3.2.2.5 Micro Small and Medium Enterprises (mSMEs)

Cooking energy situation

As already explained in section 3.2.4.7, to understand the energy needs of this business community, a total of 131 businesses were randomly sampled from among this target population of 2,320 businesses. Out of the 131 businesses sampled, 60 cook at the premises and are therefore consumers of cooking energy. They mainly include food restaurants, small eateries, big hotels, butcheries and bakeries. The category which does not cook at the premises consist of businesses such as filling stations, workshops, supermarkets, millers etc.

Table 61: mSMEs which cook/ do not cook at premises

Parameter	Frequency	%
Businesses which cook at the premises	60	46
Businesses which do not cook at the premises	71	54
Total	**131**	**100**

Primary fuels and stoves

Primary fuels

Breakdown of the fuel types used by businesses, along with their average consumption per month and average cost per month is presented in the table below. Charcoal is the dominant primary cooking fuel and is used by 58% of the businesses. Firewood is the second dominant primary fuel and is used by 33% of the businesses. The contribution of LPG and electricity to primary cooking energy needs is minimal at 5% and 3% respectively. The three enterprises using LPG are big hotels and this explains the high average cost incurred. The two enterprises using electricity are bakeries.

Table 62: Primary cooking fuels, average monthly consumption and average monthly costs (mSMEs)

Fuel type	No of businesses	Frequency (%)	Average consumption per month in kg/ kwh per business	Average cost per month in KES per business
Charcoal	35	58	759	7,935.00
Firewood	20	33	279	2,280.00
LPG	3	5	74	58,567.00
Electricity	2	3	221	6,500.00
Total	**60**			

Primary stoves used for charcoal and firewood

Table 63: Primary stoves used for burning charcoal and firewood (mSMEs)

Stove used to burn the fuel	Charcoal		Firewood	
Primary fuel	No. of businesses using Metallic charcoal stove	No. of businesses using improved charcoal stove	No. of businesses using 3 stone open fire	Total
Charcoal	18 (51%)	17 (49%)		35
Firewood			20 (100%)	20
Total	**18**	**17**	**20**	**55**

As it can be discerned, slightly more than half of the businesses which primarily cook with charcoal usually burn it on metallic stoves. On the other hand, all those businesses which primarily cook with firewood normally burn it on three-stone open fire. This scenario depicts a dire situation in need of urgent attention since the two cooking devices are wasteful and polluting.

Secondary fuels and stoves

Table 64: Secondary cooking fuels, average monthly consumption and average monthly costs (mSMEs)

Primary fuel	Secondary fuel(s)	Number		Average consumption per month in kg/ kwh	Average cost per month in KES
			Frequency (%)		
Charcoal	Firewood	4	11	127.5	1100
	LPG	5	14	8.8	1780
	Electricity	1	3	75	3000
	None	25	71		
Total		35			
Firewood	Charcoal	15	75	125.18	1220
	None	5	25		
Total		**20**	**11**		
LPG	None				
Electricity	None				

Table 65: Secondary stoves used for burning charcoal and firewood (mSMEs)

Stove used to burn the fuel		Firewood	Charcoal		Total
Primary fuel	**Secondary fuel**	**No. of businesses using 3 stone open fire**	**No. of businesses using metallic charcoal stove**	**No. of businesses using improved charcoal stove**	
Charcoal	Firewood	4 (100%)			4
Firewood	Charcoal		12 (80%)	3 (20%)	15
Total		**4**	**12**	**3**	

Just like is the case with primary fuels, all the enterprises which use firewood as a secondary fuel usually burn it on three-stone open fire. On the other hand, the majority (80%) of businesses which use charcoal as a secondary fuel burn it on the wasteful metallic charcoal stove. Only a mere 20% have embraced improved charcoal stoves.

As per the data provided by the County Directorate of Trade, there are a total of 135 registered hotels, eateries and restaurants in the county. Of course, the actual number must be higher bearing in mind there must be a good number of such businesses which operate informally and are therefore not registered. The table below shows estimations on annual quantities of wood biomass resources utilised by these businesses to provide cooking energy.

Table 66: Average total annual wood biomass resource consumed by mSMEs

	Primary fuel	No. of total reliant businesses	Average consumption per month per business (kg)	Total average annual wood biomass resource consumption for all the businesses (kg)
Primary fuels	Charcoal[1]	78 (58%*135)	759	5,940,592.81 (78*759*12*8.33)
	Firewood	45 (33% *135)	279	149,153.40 (45*279*12)
Secondary fuels	Firewood	9 (11%*78)	127.5	13,127.40 (9*127.5*12)
	Charcoal	34 (75%*45)	125.18	422,313.51 (34*125.18*12*8.33)
	Total			**6,525,187.12**

The high reliance on charcoal and firewood by the businesses must be exerting a lot of pressure on the county's woody biomass resources. As seen from table 8 above, the 135 registered hotels, eateries and restaurants deplete a total of 6,525,187.12 kgs of this resource every year. This translates to approximately 9,977 five-year-old trees being felled every year. According to GIZ (2021), such a tree weighs approximately 654 kg. As earlier postulated, the amount of wood biomass consumed must be higher given there must be more such businesses which operate outside the purview and regulation of the county government. The situation is being exacerbated by the high prevalence of metallic charcoal stoves and traditional three-stone open fires.

Pathways for access to clean cooking solutions

Category 1: 51% of businesses primarily using charcoal but burning this charcoal on the metallic stoves (Table 5). There is a need for an intervention to displace the metallic stoves with more improved charcoal stoves with the aim of total displacement by 2028. The thermal efficiency of a metallic charcoal stove is around 24% (Ehrensperger et al. 2016). Since thermal efficiency of a cooking device is inversely proportional to the amount of fuel consumed ($\% \propto \frac{1}{kg}$), uptake of stoves of a higher thermal efficiency, say a Kenya Ceramic Jiko (KCJ), which according to Ehrensperger et al. (2016) has an impressive average thermal efficiency of between 25% to 40% can help reduce charcoal fuel demand by roughly 30%. However, this document aspires to be brand-neutral and as such, it does not recommend particular stove models but rather advocates for displacement of metallic charcoal stoves with more improved charcoal versions.

To completely displace the metallic stoves, a total of at least 40 enterprises would need to be targeted (51% *58% *135). Since as explained earlier on, this number is likely to be higher, the target has been set at 200.

Category 2: 33% of businesses primarily using firewood but burning this firewood on the traditional three-stone open fire (Table 5). There is a need for displacing these stoves with more improved versions. Both locally improved versions (e.g. the *Kuni Mbili* model) as well as the more advanced stoves which occupy higher performance tiers are recommended. At least 45 (33% * 135) enterprises would need to be targeted, but since the number of operational eateries and restaurants must be way higher than 135, the initial target has also been set at 200.

Category 3: All businesses using firewood and charcoal as secondary fuels (table 6). For this category, it is proposed to displace the two solid biomass fuels with bio-ethanol. This is because bioethanol can equally perform well when it comes to certain cooking roles such prolonged boiling which are traditionally a preserve of firewood and charcoal. Though as per the analysed data the number of affected businesses is 19, the target will be set at 200.

[1]According to Stockholm Environment Institute -SEI (2014) https://apps.worldagroforestry.org/downloads/Publications/PDFS/BR14109.pdf, charcoal in Kenya is mainly produced on traditional earth kilns with an average recovery rate of 9-15%. This implies that to produce 1 kg of charcoal, 8.33 kg of raw woody biomass is needed. Total woody biomass needed for producing the amount of charcoal consumed has been adjusted by this factor.

Category 4: Big hotels consuming substantial amounts of LPG (Table 4). It will be proposed to introduce biogas systems which are fed by a mixture of human waste and kitchen waste. The registered big hotels in the county are 16, but an initial target of hotels to uptake the technology by 2028 has been set at 5.

As shown in Table 4 above, the businesses are already incurring substantial charcoal and firewood costs. As such, there is already an incentive to invest in more efficient charcoal and firewood devices which can help minimise the fuel budgets in the long run.

On its part, bioethanol presents a compelling alternative to traditional cooking fuels like firewood and charcoal, offering a sustainable, clean, and efficient energy solution that addresses both environmental and health concerns while supporting economic development and energy access initiatives. It is offered on pay-as-you-use arrangement thereby rendering it more affordable and convenient.

Biogas generation from human waste is still a growing technology in Kenya. However, in other parts of the world like China, Nepal and India, this technology is well entrenched. The technology is thus well proven and functional (Mugambi 2014). In Kenya, and specifically in the neighbouring counties of Kilifi and Taita Taveta, there are institutions already generating biogas from a blend of human, kitchen and animal wastes. Overall, the uptake of human waste-fed biogas systems in Kenya will be driven by a combination of energy access needs, environmental considerations, health benefits, government support, and awareness creation. As awareness grows and technological advancements continue, biogas from human waste is expected to play an increasingly important role in provision of the institution's cooking energy requirements.

The above interventions will be spearheaded by the private sector.

The county government will only play the roles outlined below. Costs will be catered through similar interventions implemented under the section on clean cooking for households.

a) Facilitative role – by ensuring there is a conducive environment for the private sector players to enter and penetrate the market.

b) Advocacy role - by informing the private sector players about the existence of this market, providing necessary information, and actively lobbying and incentivising them to enter the market.

c) Enactment of regulatory framework for charcoal production, transportation and marketing in line with Tana River County Forest Conservation and Management Bill 2024 (refer to Section 1.6 on County Energy Policy and Legislations). Given the wasteful nature of the charcoal production process- as mentioned previously in this document, upto 8.33 kg of woody biomass is required to produce 1 kg of charcoal. The County Directorate of Energy will work with other arms of the county government to enact policies and regulations which either discourage charcoal burning or totally prohibit it altogether.

d) Enacting regulations which dis-incentivise or prohibit charcoal production is crucial for addressing the pressing environmental, social, and economic challenges associated with this practice. Charcoal production often involves unsustainable logging practices, leading to deforestation, habitat loss, and biodiversity degradation. By prohibiting/ dis-incentivising charcoal production, the county government will be able to safeguard fragile forest ecosystems (proportion of indigenous to exotic tree species), mitigate climate change by preserving carbon sinks, and protect the livelihoods of communities dependent on forest resources. Additionally, such policies will promote the adoption of alternative, sustainable energy sources and technologies, leading to improved air quality, public health, and economic resilience. Overall, prohibiting charcoal production or significantly minimising its availability is essential for promoting sustainable development, conserving natural resources, and fostering a healthier, more resilient society.

e) Monitoring and evaluation role – by periodically collecting, documenting and submitting annual reports on the Key Performance Indicators (KPIs) to the Cabinet Secretary in charge of the Ministry of Energy and Petroleum in line with the reporting requirements of INEP.

As seen from the above two tables, implementation of the above outlined interventions will significantly reduce consumption of firewood and charcoal, and simultaneously stimulate uptake of modern and cleaner fuels. Indeed, if all goes as per the envisioned progression, by 2028, it is only a small proportion of these businesses that will be primarily relying on charcoal and firewood - 22% and 13% respectively. And even by then, these solid biomass fuels will be burnt on improved cooking stoves.

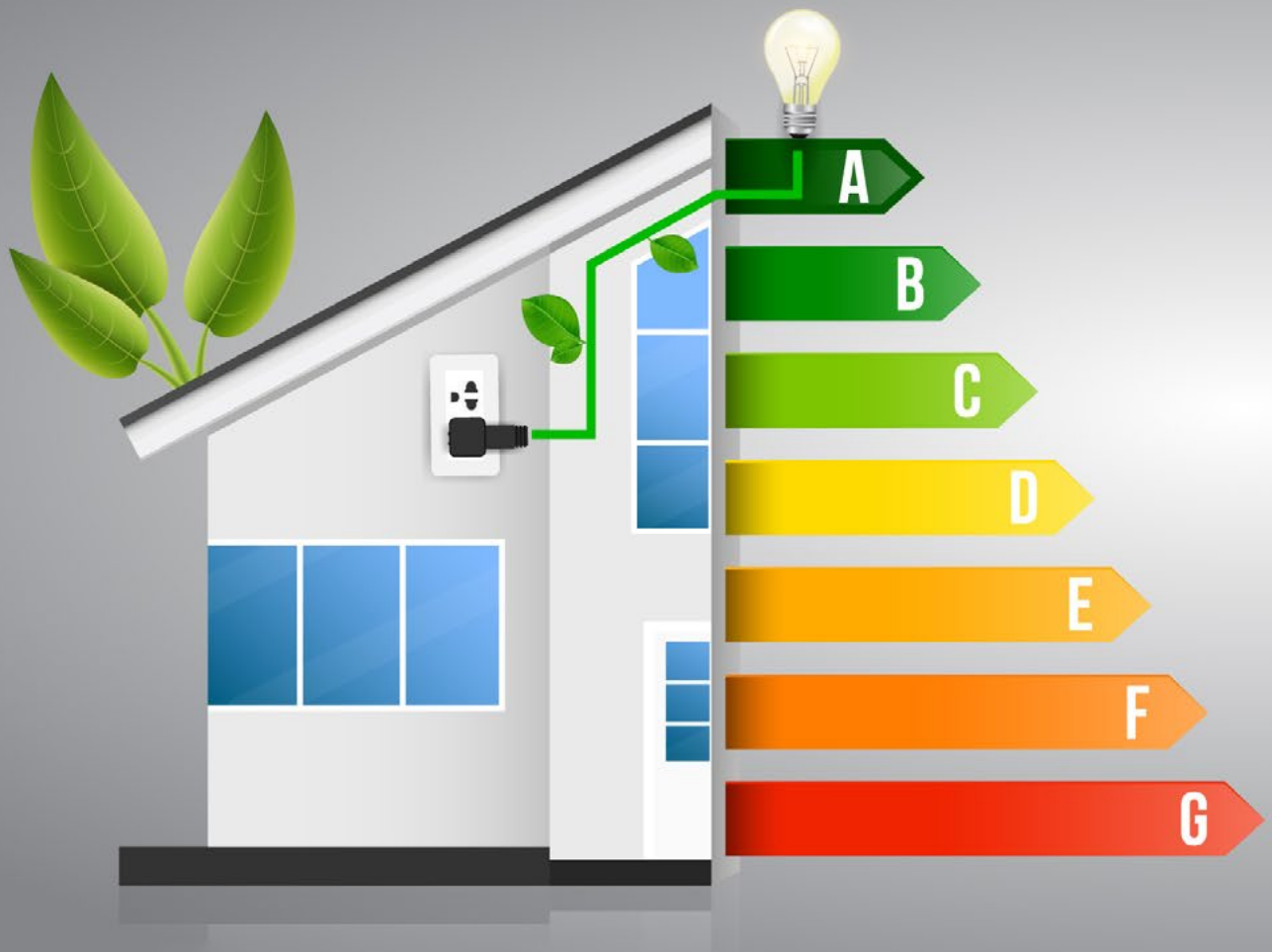
3.2.2.6 Barriers, risks & mitigation measures – clean cooking solutions

- Securing sufficient financial resources for clean cooking initiatives presents a significant challenge, especially considering the substantial budgets required - Currently, a considerable portion of these funds is allocated to the modernisation of institutional kitchens, which although non-energy related, is crucial for supporting energy intervention efforts. To address this challenge, proactive strategies and strategic partnerships will be essential for effective resource mobilisation.

- Non-prioritisation of clean cooking projects by the national government, county government and the development partners - Clean cooking matters are yet to be given the attention and prioritisation they deserve. It is envisioned that this document will provide the much-needed spring board for catapulting clean cooking issues into the centre of county development agenda.
- Nomadism - There are number of rural communities which still practice nomadism. As such, the cooking solutions proposed must be compatible with this lifestyle. To this end, the clean cooking stoves which will be disseminated in the affected areas should be portable.
- Freely available firewood - A good proportion of the households freely collect firewood from their farms. As such, they do not find the incentive to incur cost to acquire a modern cooking device. However, through awareness creation, the communities can be educated on the health, socio-economic and environmental benefits of these modern solutions and be persuaded to see the value in switching to cleaner solutions.
- Affordability - As indicated by the poverty level, majority of households are characterised by low disposable incomes. The rural and urban poor are particularly affected.
- Beliefs and negative attitude to technology - Unfounded beliefs and attitudes might hinder adoption and uptake of proposed modern cooking solutions. For example, during community engagement forums, it came out that some people consider meals prepared by three stone open tastier. It also came out that smoky kitchens are believed to infuse a certain good flavour on food. To counter such beliefs, firstly the proposed solutions should not greatly deviate from the technologies presently in use. As such, the inertia will be much lower since the new devices will be perceived as a slight improvement of the past. Secondly, information dissemination will come in handy in breaking these retrogressive myths.

4

ENERGY EFFICIENCY AND CONSERVATION



Energy Efficiency lables

Chapter 4.0

ENERGY EFFICIENCY AND CONSERVATION

4.1 Introduction

Energy efficiency entails deployment of appliances and devices which consume less energy while producing a similar or higher output relative to devices which consume more. Energy conservation on the other hand refers to adoption of behaviours, habits and practices which enable consumption of less amounts of energy. Implementation of Energy Efficiency and Conservation (EE&C) measures yields many benefits, both at generation and consumption levels. At points of consumption, EE&C helps minimise costs incurred during power generation. Additionally, it lessens the overall demand on the grid, leading to manageable peak loads and, therefore, a more stable and reliable grid network. At the points of energy use, EE&C leads to lower energy bills. From an environmental perspective, there are also benefits since energy generation and consumption is often associated with carbon emissions. In this regard, there is compelling justification to champion EE&C in all sectors of the economy which consume energy services and products (Munene, Odongo & Nyambane 2019).

The Energy Act, 2019, sections 193, 194, 195 and 196 has given county governments a very broad mandate when it comes to championing of EE&C matters in the county. Section 193 mandates County Governments to take all measures necessary to promote efficient use of energy and its conservation in buildings, industries and households. Section 194 instructs them to establish a fund for the purposes of promotion of efficient use of energy and its conservation within the county. Sections 195 & 196 empowers the Governments to enforce compliance of EE&C measures including ensuring compliance with energy audits for facilities consuming more than 180,000 kWh per annum as well as ensuring there is compliance with Minimum Energy Performance Standards (MEPS) for appliances specified under the Energy (Appliances' Energy Performance and Labelling) Regulations 2016.

The draft Tana River County Environment Policy, 2024 (refer to section 1.5.2 on County Energy Policy & Legislations), provides that the County Government of Tana River shall put into place measures to promote energy efficiency and conservation in transport, households and buildings.

As outlined in the INEP framework, the CEP plays a critical role in identifying and implementing measures and interventions to promote EE&C across various sectors within the County. This comprehensive approach encompasses households, buildings, industries, and transportation, recognising the interconnectedness of energy use and its impact on socio-economic development and environmental sustainability. The CEP aims to develop tailored strategies and initiatives to improve energy efficiency and promote conservation practices in households through public awareness and behaviour change communication campaigns. Similarly, in buildings, the plan focuses on implementing energy-efficient building codes, promoting green building practices, and enforcing energy audits to reduce energy consumption and carbon emissions. In industries, the plan emphasises the enforcement of 4-year cycle audit requirement in all designated facilities in the County. This will stimulate adoption of energy management systems, technology upgrades, and capacity-building initiatives to enhance energy efficiency, reduce production costs, and improve competitiveness. Finally, in transportation, the Plan seeks to promote the use of fuel-efficient vehicles and incentivise proliferation of electric mobility and encourage non-motorised transport methods. By integrating these measures and interventions into their CEPs, County Governments can catalyse a transition towards a more sustainable and resilient energy systems, contributing to economic prosperity, environmental protection, and improved quality of life for residents.

4.2 Households

The promotion of EE&C measures at households will primarily focus on disseminating information regarding the most energy-efficient appliances available. This approach recognises the pivotal role of consumer awareness and informed decision-making in driving the adoption of energy-saving technologies. Through targeted educational campaigns, households will be provided with comprehensive information on the energy efficiency ratings, features, and benefits of adopting energy efficient appliances. Additionally, dissemination efforts will highlight the long-term cost savings, environmental benefits, and potential rebates or incentives associated with choosing energy-efficient appliances. By empowering households with knowledge and resources to make informed choices, the promotion of energy-efficient

appliances aims to facilitate the widespread adoption of EE&C practices, leading to reduced energy consumption, lower utility bills, and a more sustainable energy future.

To create awareness on most energy efficient appliances, it is proposed to implement an awareness and behaviour change campaign in the County to disseminate information on EE&C practices and behaviours. This campaign will mostly be anchored on the Energy (Appliances' Energy Performance and Labelling) Regulations, 2016 which prescribe MEPS for lamps, fridges, motors and air conditioners. The regulations are presently under review to add Light Emitting Diode (LED) bulbs, TVs, computers and cookers. The standards provide a framework for testing and labelling the appliances.

For appliance labelling, a 5-star labelling scheme is employed whereby the most efficient appliances are assigned five stars while the least performing ones have only one star. Based on this labelling scheme, end-users can identify the most efficient appliances available in the market. The labelling scheme, therefore, when coupled with right awareness can provide a good compass for guiding consumers to make informed purchase decisions. They can better appreciate that energy efficiency of an appliance has a bearing on the amount of energy (both electric and non-electric) consumed and consequently the cost of energy incurred.

This awareness creation project will entail:

1) Development of applicable awareness creation content – anchored on the regulations described above.
2) Producing this content.
3) Disseminating the content through talk shows, County energy days, social media awareness campaigns, public barazas, theatre/kits, school-based programmes, sporting events and publicity materials.
4) Implementing a Monitoring and Evaluation (M&E) framework for assessing outcomes.

Costing

Project: Awareness creation and behaviour change campaign to promote Energy Efficiency & Conservation in Households

Table 67: Awareness creation and behaviour change campaign to promote Energy Efficiency & Conservation in Households

	Activity	Cost in KES
1	Development of applicable awareness creation content	2,000,000.00
2	Content production	2,000,000.00
3	Content dissemination:	5,000,000.00
4	Monitoring & Evaluation	1,000,000.00
	Total	**10,000,000.00**

4.3 Buildings

Buildings

According to Kenya National Efficiency and Conservation Strategy (KNECCS), 2020, design and construction of buildings in Kenya is regulated by the Planning and Building Regulations, 2009 and the Building Code, 2006. The strategy acknowledges that these regulatory documents do not comprehensively address the aspect of EE&C in buildings.

In this regard, the strategy proposes the following measures which will supposedly be put in place by 2025:

1) Develop and gazette MEPS for buildings
2) Improve the energy performance of new buildings through ensuring that at least 10% of newly built floor areas are compliant with energy efficiency requirements in the total building stock and Adopt American Society of Heating, Refrigerating and Air-Conditioning Engineers buildings energy conservation standards, or equivalent, for public and commercial buildings
3) Improve lighting energy efficiency in existing public buildings by at least 50%
4) Promote new green public buildings- ensure at least 25% of buildings under affordable housing are green buildings.

On its part, the Energy, 2019 provides that 'a county government with the authority of EPRA may 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 use of energy in the buildings in that County".

To promote energy efficiency and conservation in buildings, it is proposed to customise County Building Codes and incorporate EE&C measures. After enactment of the new codes, EE&C measures will be added to the menu of parameters considered before approval of structural and architectural plans as well as before issuance of certificates of occupancy. However, in so doing, the County Government should leverage on the on-going work under KNECCS.

The proposed raft of measures, generated through the input of Technical Working Group Members, are as follows:

I. Domesticating/ assimilating into the County Building Codes, the draft Energy (Solar Water Heating) Regulations, 2022.

Section 18: All premises shall have in their design a provision for solar water heating system installation.

Section 19:

(i) County Governments shall, as necessary, develop legislation on the minimum annual contribution of solar water heating systems to premises' hot water demand.

(ii) County legislation made under this sub-regulation shall exempt from the requirements premises:

a) With technical limitations

b) Incapable of incorporating solar water heating systems due to their special circumstances

c) Supplied with hot water from a cogeneration plant in or proximate to the premises

d) Utilising electricity generated from renewable energy and the excess is used to heat water as a dump load (waste heat recovery)

(iii) The daily hot water demand shall be calculated using the specific hot water demand values specified in Part A of the 7th Schedule.

II. Utilising solar energy for outdoor lighting.

III. Allowing reasonable allowance of at least three meters between the building perimeter and the plot boundary. This will allow utilisation of natural lighting inside the buildings. This consideration is mainly necessary in urban areas with high building density.

IV. Utilisation of efficient lighting methods in buildings' interior. These include at least three stars light bulbs (as per MEPS labelling scheme), embrace of dimmer switches and motion sensor bulbs for walkways and verandahs.

V. Deployment of solar water pumps and wind pumps.

VI. Use of energy efficient lifts (as per MEPS standards for motors, at least three stars as per MEPS labelling scheme).

VII. Use of efficient cooling technologies (as per MEPS standards for air conditioners, at least three stars as per MEPS labelling scheme).

VIII. Ensuring the buildings are well oriented for maximum sunshine exposure. Ideally most of the windows, where possible, should face eastwards.

IX. Ensuring, to the extent possible, that buildings benefit from natural ventilation. This will be achieved by prescribing the number, size and orientation of windows.

X. Embracing translucent roofs where applicable for enhancing natural lighting.

In light of the above, a project dubbed 'Reviewing County Building Codes and Incorporating EE&C Measures' is proposed. The project will entail customisation of county building codes to incorporate EE&C measures outlined above.

The "Reviewing County Building Codes and Incorporating EE&C Measures" project aims to enhance energy efficiency and conservation practices in the construction sector by revising existing county building codes to incorporate EE&C standards and requirements. Recognising the significant impact of buildings on energy consumption, this project seeks to promote sustainable building practices, reduce energy costs, and mitigate environmental impacts.

Activities

Review existing building codes: Conduct a comprehensive review of the current county building codes and regulations to identify gaps, deficiencies, and opportunities for integrating EE&C measures.

Stakeholder consultation: Engage key stakeholders, including government agencies, industry experts, architects, engineers, builders, and environmental organisations, in a consultative process to gather input, feedback, and recommendations for enhancing building codes with EE&C provisions.

Development of EE&C guidelines: Develop detailed guidelines, standards, and specifications for incorporating EE&C measures into building design, construction, renovation, and maintenance practices, aligning with EE&C measures outlined above.

Capacity building: Provide training, workshops, and educational programmes to building professionals, contractors, and regulatory authorities on the importance of EE&C measures, compliance with updated building codes, and implementation of energy-efficient building practices.

Pilot projects: Identify pilot projects within the County to demonstrate the feasibility and effectiveness of implementing EE&C measures in real-world construction projects. Monitor and evaluate the performance of these projects to assess energy savings, cost-effectiveness, and environmental benefits.

Public awareness and outreach: Launch a public awareness campaign to educate residents, property owners, and developers about the importance of energy efficiency in buildings, the benefits of EE&C measures, and the role of updated building codes in promoting sustainable development.

Policy advocacy: Advocate for the adoption and enforcement of updated building codes with EE&C provisions through policy dialogues, stakeholder engagements, and collaboration with relevant government agencies and county assembly.

The project will be implemented by the County Directorate of Public Works & Housing supported by the County Directorate of Energy.

Costing

Table 68: Costing measures for promoting EE&C in buildings

	Activity	Cost in KES
1	Review existing building codes	2,000,000.00
2	Stakeholder consultation	2,000,000.00
3	Development of EE&C guidelines	2,000,000.00
4	Capacity building	2,000,000.00
5	Public awareness and outreach	2,000,000.00
6	Policy advocacy	2,000,000.00
	Total	**12,000,000.00**

4.4 Industries

Industries

As per the Energy Act of 2019, Part VIII, County Governments are mandated to:

- Direct, if necessary, designated facilities (industries/ factories/ complexes) consuming more than 180,000 kWh per annum, to have energy audits conducted. Designated facilities are currently required to carry out energy audits after every four years.
- 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.
- Train personnel and specialists in techniques for the efficient use of energy and its conservation.
- Specify the matters to be included for the purposes of inspection.
- Appoint as many inspecting officers as necessary for the purpose of enforcing energy efficiency and conservation measures.

The number of designated industries in Tana River County is unknown. However, according to Kenya Power, there are only two industrial and commercial customers, implying there are few industries in the county.

To promote EE&C in industries, the County Government can begin by mapping all designated industries. Thereafter, it can support the EPRA in enforcing the energy audit requirement by appointing and capacity building inspection officers, with the target of ensuring universal compliance.

Project: Promoting EE&C in designated industries by enforcing compliance of energy audit requirements

Costing

Table 69: Promoting EE&C in designated industries by enforcing compliance of energy audit requirements

	Activity	Cost in KES
1	Mapping all designated industries	2,000,000.00
2	Enforcing compliance with energy audit requirement	3,000,000.00
	Total	5,000,000.00

4.5 Transport

As a basis for promoting EE&C in the transport sector, the INEP framework has prescribed a template for collecting baseline data from the transport sector. This data is supposed to be provided by the National Transport and Safety Authority (NTSA), as well as the County Government. The template is as shown below.

Energy Efficiency and Conservation

No.	Item	Unit	Quantity
1	No of electric two wheelers operating within the County	No.	
2	No of electric three wheelers operating within the County	No.	
3	No of electric four wheelers operating within the County	No.	
4	No. of vehicles operating within the County	No	
5	No. of vehicles owned by residents & operating within the County	No.	
6	Proportion of people using NMT (Non-Motorised Transport)	%	
7	No. of vehicles inspected per annum	No.	
8	No. of motorcycles registered in the County	No.	
9	No. of electric-mobile charging facilities	No.	

However, despite efforts to get data from relevant departments, they did not bear fruits. As such, it is impossible to propose measures for promoting EE&C under the transport sector. However, the County Government should continue to cultivate the right environment for attracting investments in green transport (e-mobility). It should also put into place measures which can encourage Non-Motorized Transport (NMT). NMT can be encouraged through development of dedicated infrastructure for non-motorised transport, including bicycle lanes, pedestrian walkways, and shared pathways, to provide safe and convenient routes for cyclists and pedestrians. They should also be proper signage, markings, and lighting to enhance visibility and safety for non-motorised users Hopefully, during subsequent reviews of the CEP document, it shall be possible to obtain this data and to, consequently, propose specific interventions which can promote EE&C in the transport sector at the County level.

4.6 Barriers, risks and mitigation measures

Energy efficiency improvement projects are never realised because of the existence of several barriers which could be from within the organisation or from external sources. Although the operational interventions required to tackle the efficiency problems are rather simple from a technical sense, lack of awareness, technical capacity and organisational structure and bad finances can impede their implementation. Barriers can be categorised differently.

Among these categories are principal agent problems, lack of information, transaction costs or organisational structure. Industry barriers may exist at various points in the decision-making process, and in the implementation and management of measures to improve energy efficiency. Barriers may take many forms, and are determined by the business environment and include decision making processes, energy prices, lack of information, lack of confidence in the information, or high transaction costs for obtaining reliable information, as well as limited capital availability.

Other barriers are the “invisibility” of energy efficiency measures and the difficulty of quantifying the impacts, and slow diffusion of innovative technology into markets. Absence of corporate energy policy, lack of awareness on energy efficiency strategies, insufficient skills and knowledge on energy efficiency matters, competing corporate priorities and insufficient financial resources to fund measures are listed as some of the barriers to implementing energy efficiency measures. Decision-making processes in firms are a function of its rules of procedure, business climate, corporate culture, managers’ personalities and perception of the firm’s energy efficiency.

It is hoped that implementation of this Plan will help prioritise EE&C issues at the County.

5

BIO-ENERGY RESOURCES

Biogas storage bags

Chapter 5.0

BIO-ENERGY RESOURCES

5.1 Biogas for households

A biogas project which will target the 370 households profiled as having potential to uptake the technology under section 2.3 is proposed. This project is envisioned to herald a new era of sustainable energy provision in Tana River County. The plant digesters will be between eight and 12 cubic meters. These are the typical sizes for households. While the estimated unit cost of KES 300,000 per plant presents a substantial financial investment, totalling KES 111 million for the construction of 370 units, the County Government remains undeterred. Through strategic partnerships forged with various stakeholders-National Government, development partners and the private sector, the mobilisation of these resources is within reach, epitomising a collective commitment to realising this ambitious vision by 2030. Spearheaded by the collaborative efforts of the Energy Directorate and the Department of Livestock, this initiative not only promises to revolutionise energy access but also underscores the county's unwavering dedication to eventual elimination of use of wood fuel in the County.

Activities

The biogas project targeting 370 households in Tana River County will encompass a series of coordinated activities aimed at successful implementation and long-term sustainability. These activities include:

1. **Partnerships and Resource Mobilization:** Strengthening partnerships with relevant stakeholders, including government agencies, NGOs, and private sector entities, to mobilise financial and technical resources necessary for project success.
2. **Community Sensitization and Engagement:** Organising awareness campaigns and community meetings to educate residents on the benefits of biogas technology, garner support, and ensure active participation. Under this activity, a number of units will be constructed at select households to demonstrate technology efficacy and functionality.
3. **Technical Design and Procurement:** Collaborating with experts to design biogas plant digesters tailored to household needs, followed by procuring necessary materials for construction.
4. **Construction and Installation:** Overseeing the construction and installation of biogas plant digesters at selected households, ensuring adherence to technical specifications and safety standards.
5. **Training and Capacity Building:** Providing comprehensive training to households on biogas system operation, maintenance and safety to ensure effective utilisation and longevity. Arrangements will further be put into place to train a pool of local artisans with construction and maintenance skills.
6. **Sustainability Planning:** Developing strategies for the sustainable management and maintenance of biogas systems, including mechanisms for ongoing support, repair, and replacement as needed.
7. **Knowledge Sharing and Replication:** Documenting project experiences and lessons learned to facilitate knowledge sharing with other communities and encourage the replication of similar initiatives in the country.
8. **Monitoring and Evaluation:** Establishing monitoring mechanisms to track progress, measure impact, and address any challenges encountered during implementation, with periodic evaluations informing adjustments and improvements.

Costing

Table 70: Costing- biogas project for households

Cost component	Unit	Unit cost (KES) in 2024	No. of units	Discounted Cost (KES)
Capital investment	No. of biogas digesters	300,000	370	111,000,000
Partnerships and Resource Mobilization, Community Sensitization and Engagement, Training and Capacity Building and M&E	Lumpsum			10,000,000
Total				**121,000,000**

5.2 Biogas for institutions & mSMEs from human waste

Schools and health facilities

Schools in Kenya harbour large portion of the population. These numbers can effectively produce adequate and regular feed for biogas systems. A properly fed human biogas plant can successfully support and sustain school energy needs. Installation of a human biogas system offers several uses in such a setting. It involves the installation of biodigesters that break down organic waste, such as food scraps and animal dung, to produce methane. This gas is then harnessed for cooking energy needs of the school.

The data analysed from the nexus sectors of health and education revealed that 25 primary schools and five secondary schools in Tana River County have the potential for generation of human waste biogas. Similarly, Hola Level 4 Referral Hospital was also found to have capacity for biogas production. The list of schools and health facility which meet the minimum threshold for installation of biogas systems is found in annex section.

The total cost of installing biogas systems in the 31 facilities is estimated at KES 124 million. Integration of biogas systems into schools in Tana River County would not only address the energy needs of educational institutions, but also foster a culture of sustainability and environmental stewardship among students. This initiative aligns with Kenya's commitment to achieving the Sustainable Development Goals (SDGs) and provides a model for other regions to follow. These schools would lead by example, contributing not only to a brighter and cleaner future for students but also to the overall well-being of the communities they serve. Despite the high capital costs which are needed for installation of biogas systems in schools, such projects could be implemented with support from development partners through a cost-sharing funding mechanism.

Micro, Small and Medium Enterprises

As elaborated in the section outlining clean cooking pathways for Micro, Small, and Medium Enterprises (MSMEs), the utilisation of biogas for institutional purposes, derived from a mixture of human, kitchen, and animal wastes, remains a fledgling technology in Kenya. Despite this, there is an ambitious target to install five digesters at major hotels by 2028. While this initiative will be spearheaded by the private sector, it is imperative for the County Government to take a proactive role in ensuring the realisation of this target. Through strategic partnerships, the County Government can facilitate market linkages between these hotels and technology providers, thereby creating an enabling environment for the successful implementation of biogas projects in institutional settings.

Moreover, the capital expenditure for implementing these systems remains prohibitively high. A 72 cubic meter system will cost about KES 4 million. It is crucial to explore avenues to make these systems more affordable. This can be achieved through partnerships with development partners and private capital providers. By leveraging these partnerships, it may be possible to secure funding or financing mechanisms that can help offset initial investment costs, thus making biogas systems more accessible to these hotels.

Nevertheless, by effectively disseminating relevant information and providing ongoing market support, the adoption of this technology by the hotel industry can be firmly established over time. Through targeted awareness campaigns, training sessions, and incentives, stakeholders can be educated about the benefits and potential cost savings associated with biogas systems. Additionally, providing ongoing support and guidance to hotels in navigating the implementation process can further encourage uptake and ensure the long-term success of this sustainable energy solution.

5.3 Bio-ethanol

As previously highlighted in this document, bioethanol presents a promising alternative to traditional cooking fuels such as firewood and charcoal, as it can effectively fulfill cooking tasks such as boiling that require sustained heat. Furthermore, companies like KOKO Networks have introduced innovative delivery models which allow users to conveniently purchase bioethanol in small quantities on a daily basis.

Considering the significant number of households currently relying on charcoal and firewood, there exists a considerable market opportunity for bioethanol. It is anticipated that the market activation measures outlined in the section on 'pathways for transitioning households to clean cooking solutions' will serve as a catalyst to support bioethanol companies in entering the Tana River market. By implementing strategies such as awareness campaigns, subsidies, and incentives, these initiatives can help create demand for cleaner cooking alternatives like bioethanol, thereby facilitating the expansion of bioethanol suppliers into these untapped markets.

Bio-ethanol stove

And as envisioned, it is hoped that by 2028, at least 4000 households will have transitioned from charcoal and firewood to bioethanol. It is further envisioned 2028, at least 200 restaurants will also have substituted firewood and charcoal for bioethanol.

5.4 Castor oil plant farming in Tana Delta region

Caster Oil Plant

Castor (Scientific name: Ricinus communis) oil emerges as a promising biofuel crop due to its versatility, with both its seeds and stalks offering potential for conversion into biodiesel and bioethanol (Osorio et al. 2022). Particularly in the Tana Delta region, castor oil plants thrive exceptionally well, exhibiting rapid growth and robust vegetative properties. Recognising this potential, the County Government will continuously scout for potential investors to establish partnerships aimed at incentivizing large-scale castor oil plant farming. By securing guaranteed markets through contract farming agreements, farmers will be motivated to expand their cultivation of castor oil crop, thereby tapping into its potential as a valuable source of biofuel. This proactive approach underscores the county's dedication to fostering sustainable agricultural practices and enhancing the local biofuel industry.

5.5 Barriers, risks and mitigation measures

High capital expenditure (Capex) costs for biogas digesters inhibits affordability. This can be addressed through leveraging on strategic partnerships and use of innovative delivery models. The County Government will continue to scout for such opportunities and partnerships.

Beliefs and myths. There are misconceptions that biogas from human waste can contaminate food. To address this misconception, it is crucial to provide education and awareness about the scientific process behind biogas production and emphasise the safety measures involved in its use. Highlighting successful examples of similar systems implemented in other institutions in the County can also help dispel myths and build confidence in the technology's reliability and safety.

6

ENERGY PROGRAMMES & PROJECTS

Tana Hydro Power Plant

Chapter 6.0

ENERGY PROGRAMMES & PROJECTS

6.1 Projects & programmes to be implemented by national government

6.1.1 Description

Project 1:

Equipping County water pans and small earth dams with solar water pumping infrastructure: A collaborative initiative between the County Government, National Government agencies and development partners. Its implementation will be spearheaded by the County Department of Water Access.

Project 2:

Promoting biogas uptake by livestock farmers in Tana River County: An ambitious biogas project which will target the 370 households profiled as having potential to uptake the technology is proposed. The digesters will be between eight and 12 cubic meters. The project will be led by the Energy Directorate with support from the Department of Livestock.

Project 3:

Ensuring universal access to electricity in primary and secondary schools through grid and solar PV connections: The project will be implemented by the Directorate of Education in the National Government supported by the County Directorate of Energy.

Project 4:

Ensuring universal access to clean cooking solutions in primary and secondary schools: The project will be implemented by the Directorate of Education in the National Government supported by the County Directorate of Energy.

Project 5:

Enhancing access to clean cooking solutions in NYS and correctional facilities: The project will be implemented by the Directorate of Education in the National Government supported by the County Directorate of Energy.

6.1.2 Summary

Table 71: Projects & programmes to be implemented by national government

No.	Objective	Project/ Programme	Timelines	Specific Activities	Implementing Agency	Project Cost (KES)- Inflation discounted cost	Source of fund	Targeted Beneficiaries	Status (New/ Ongoing)
1.	To install solar powered water pumping infrastructure at water pans and small earth dams in the County.	Equipping County water pans and small earth dams with solar water pumping infrastructure.	2024-2028	Site assessment, planning & design Stakeholder engagement Pumping system installation and commissioning Training and Capacity Building	County department of Water Access, backstopped by the County Directorate of Energy	66,000,000.00	National government through its various agencies; NIB, NDMA, CDF etc.	Approximately 55 water pans & small earth dams in the County	New
2.	To promote biogas uptake by households in Tana River County	Promoting biogas uptake by livestock farmers in Tana River County.	2024-2030	Partnerships and resource mobilisation, community sensitisation and engagement, technical design and procurement, construction and installation, training and capacity building, sustainability planning, knowledge sharing and replication	National Government	30,000,000	National Government	100 households	New
3.	To connect primary and secondary schools to electricity	Enhancing universal access to electricity in all learning centres (connection to grid and solar PV)	2024-2028	Site assessment, planning & design Installation and commissioning	Directorate of Education backstopped by the County Directorate of Energy	114,000,000	National Government through its various agencies.	45 primary schools, Eight secondary schools	New
4.	To connect primary and secondary schools to electricity	Enhancing universal access to electricity in all learning centres (provide power backups)	2024-2028	Site assessment, planning & design Installation and commissioning	Directorate of education backstopped by the county directorate of energy	200,000,000	National Government through its various agencies.	67 primary schools, 22 secondary schools	New
5.	To connect primary and secondary schools to electricity	Enhancing universal access to electricity in all learning centres (rehabilitation of solar PVs)	2024-2028	Site assessment, planning & design Installation and commissioning	Directorate of education backstopped by the County Directorate of Energy	52,500,000	National Government through its various agencies.	71 primary schools, 11 secondary schools	New

No.	Objective	Project/ Programme	Timelines	Specific Activities	Implementing Agency	Project Cost (KES)- Inflation discounted cost	Source of fund	Targeted Beneficiaries	Status (New/ Ongoing)
6.	Provide clean cooking solutions in primary and secondary schools.	Enhancing access to clean cooking solutions in all learning centres (access to improved cookstoves)	2024-2028	Site assessment, planning & design Installation and commissioning	Directorate of education backstopped by the county directorate of energy	54,100,000	National government through its various agencies.	185 primary schools, 33 secondary schools, and One NYS centre One Prison	New
7.	Provide clean cooking solutions in primary and secondary schools	Enhancing access to clean cooking solutions in all learning centres (installing human waste biogas system)	2024-2028	Site assessment, planning & design Installation and commissioning	Directorate of Education backstopped by the County Directorate of Energy	120,000,000	National Government through its various agencies.	25 primary schools, Five secondary schools, and	New
8.	Provide clean cooking solutions in primary and secondary schools.	Enhancing access to clean cooking solutions in all learning centres (construction of modern kitchens)	2024-2028	Site assessment, planning & design Construction and commissioning	Directorate of Education backstopped by the county directorate of energy	1,005,000,000	National Government through its various agencies.	168 primary schools, 33 secondary schools, and	New
9.	Provide clean cooking solutions in GK Prison and NYS	Enhancing access to clean cooking solutions in NYS and correctional facilities (access to improved cookstoves)	2024-2028	Site assessment, planning & design Installation and commissioning	Department of Interior backstopped by the County Directorate of Energy	332,000	National Government through its various agencies.	One NYS centre One Hola GK Prison	New
10.	Provide clean cooking solutions in GK Prison and NYS	Enhancing access to clean cooking solutions in NYS and correctional facilities (construction of modern kitchens)	2024-2028	Site assessment, planning & design Construction and commissioning	Directorate of education backstopped by the County Directorate of Energy	5,000,000	National Government through its various agencies.	one NYS centre	New

6.2 Projects & programmes to be implemented by county government

6.2.1 Description

Project 1: Facilitating universal electricity access in Tana River Households by 2030: The project will be spearheaded by the County Directorate of Energy in close collaboration with the relevant National Government agencies (Kenya Power, REREC, KETRACO), development partners such as KOSAP as well as the private sector (private mini-grid developers).

Project 2: Transitioning all households to cleaner cooking methods by 2028: The project will entail spearheading households' uptake of cleaner cooking solutions comprising improved firewood and charcoal stoves, LPG, bioethanol and biogas. Implementation will be led by the County Directorate of Energy working in collaboration with the National Government and the private sector.

Project 3: Promoting biogas uptake by livestock farmers in Tana River County: An ambitious biogas project which will target the 370 households profiled as having potential to uptake the technology is proposed. The project will be led by the Energy Directorate with support from the Department of Livestock. Under this arrangement, the County Government is expected to facilitate installation of 100 digesters out of the total targeted 370 digesters.

Project 4: Promoting sustainable and clean cooking methods in eateries, restaurants, and hotels: As explained earlier on in this document, this project will be implemented jointly with private sector players. The County Government will play a facilitative role by putting into place the right environment for these private sector companies to enter the market and thrive.

Project 5: Formulation of County Charcoal Production, Transportation and Marketing regulations in line with Tana River County Forest Conservation and Management Bill, 2024 (refer to section 1.6 on County Energy policy & Legislations.): This project will be implemented by the County Department of Environment, supported by the County Directorate of Energy.

Project 6: Enhancing dairy value chains through electrifying milk processing plants & collection centres and installation of dual powered bulk milk chillers for sustainable production: The project will be implemented by the County Department of Livestock with the County Directorate of Energy offering the necessary technical backstopping.


Project 1:


Project 2:


Project 3:


Project 4:


Project 5:


Project 6:

Project 7: Electrification of slaughter houses in the county - new grid connections and provision of solar PV backup systems: The project will be implemented by the County Department of Livestock with the County Directorate of Energy offering the necessary technical backstopping.

Project 8: Solarisation of Kipini Fish Aggregation Facility and installation of a grid complementary solar PV: The project will be implemented by the County Department of Fisheries with the County Directorate of Energy offering the necessary technical backstopping.

Project 9: Market based dissemination of solar powered water pumps to farmers along River Tana: A private sector led initiative with the objective of completely displacing the fuel pumps or significantly reduce their usage.

Project 10: Equipping County boreholes with solar water pumping infrastructure: A collaborative initiative between the County Government, National Government agencies and the development partners. Its implementation will be spearheaded by the County Department of Water Access.

Project 11: Equipping County water pans and small earth dams with solar water pumping infrastructure: A collaborative initiative between the County Government, National Government agencies and development partners. Its implementation will be spearheaded by the County Department of Water Access.


Project 7:


Project 8:


Project 9:

Project 10:


Project 11:

Project 12: Awareness creation and behaviour change campaign to promote energy efficiency and conservation in households: The project will be led by the Department of Communication working in conjunction with the Directorate of Energy.

Project 13: Reviewing County building codes and incorporating EE&C measures: The project will be implemented by the County Directorate of Public Works & Housing supported by the County Directorate of Energy.

Project 14: Promoting EE&C in designated industries by enforcing compliance of energy audit requirements: The project will be spearheaded by the County Directorate of Energy working in conjunction with the County Department of Trade and Industrialisation.

Project 15: To install streetlights in market centres and roads: To spearheaded by the Department of Public Works and Urban Planning supported by the Department of Energy.

Project 16: Ensuring universal access to electricity and water heating in health facilities through grid and solar PV connections, and upgrading to three-phase electricity supply: The project will be implemented by the County Department of Health supported by the County Directorate of Energy.

Project 17: Ensuring universal access to electricity ECDEs and VTCs through grid and solar PV connections, and upgrading to three-phase electricity supply in VTCs: The project will be implemented by the County Department of Education supported by the County Directorate of Energy.


Project 12:


Project 13:


Project 14:


Project 15:


Project 16:


Project 16:

6.2.2 Summary

Table 72: Projects & programmes to be implemented by county government

No.	Objective	Project/ Programme	Timelines	Specific Activities	Implementing Agency	Project Cost (KES)	Source of fund	Targeted Beneficiaries	Status (New/ Ongoing)
1.	To ensure all households will have access to electricity by 2030	Facilitating universal electricity access in Tana River County households by 2030.	2024-2030	Resource mobilisation, infrastructure development, delivery of electrification solutions	County Government of Tana River in collaboration with: Kenya Power, REREC, KETRACO, KOSAP, development partners and private sector	76,809,232	County Government National Government development partners and private sector	44,000 households	New
2.	To phase out traditional three-stone open fire and metallic charcoal stoves while also stimulating uptake of LPG, bioethanol and biogas	Transitioning all households & SMEs to cleaner cooking methods by 2028	2024-2028	Lobbying and creation of strategic partnerships, market activation, awareness creation & training workshops, demonstration & showcasing of technology, M&E	County Directorate of Energy in collaboration with the National Government, Development partners & the private sector	Market strengthening support (5,000,000) Capex cost (555,896,859.88)	County Government, National Government, development partners and private sector	All households and SMEs (eateries & hotels) using 3 stone open fire & charcoal metallic stoves	New
3.	To promote biogas uptake by households in Tana River County	Promoting biogas uptake by livestock farmers in Tana River County.	2024- 2030	Partnerships and resource mobilization, community sensitisation and engagement, technical design and procurement, construction and installation, training and capacity building, sustainability planning, knowledge sharing and replication	County Government	41,000,000	County Government	100 households	New

No.	Objective	Project/ Programme	Timelines	Specific Activities	Implementing Agency	Project Cost (KES)	Source of fund	Targeted Beneficiaries	Status (New/ Ongoing)
4.	To enact policies and regulations which will prohibit/ minimise charcoal production from indigenous tree species	Formulation of county charcoal production, transportation and marketing regulations	2024-2028	Research & analysis, stakeholders consultations & engagements, policy development & drafting, capacity building & enforcement mechanisms, public awareness & education	County Directorate of Environment	10,000,000	County Government of Tana River	Entire County	New
5.	To connec twomilk processing plants & one milk collection centre to grid power, and to install dual powered bulk milk chillers/ retrofit the existing coolers to incorporate the dual power functionality at the fourexisting milk chillers	Enhancing dairy value chains through electrifying milk processing plants & collection centres and installation of dual powered bulk milk chillers for sustainable production	2024-2028	Site assessment, planning & design, procurement, installation, testing & commissioning	County Directorate of Livestock, backstopped by Energy Directorate	29,500,000	County Government of Tana River	Two milk chillers & 2 milk collection facilities in the county.	New
6.	To connect abattoirs to grid power and to provide solar PV backups	Electrification of slaughter houses in the County - new grid connections and provision of solar PV backup systems.	2024-2028	Site assessment, planning & design, procurement, installation, testing & commissioning	County Directorate of Livestock, backstopped by energy directorate	6,200,000	County Government of Tana River	Five slaughterhouses in the county	New

No.	Objective	Project/ Programme	Timelines	Specific Activities	Implementing Agency	Project Cost (KES)	Source of fund	Targeted Beneficiaries	Status (New/ Ongoing)
7.	To install a grid complementary solar PV system at Kipini centreFish Aggregation Facility	Solarization of Kipini fish Aggregation Facility	2024-2028	Site assessment, planning & design, solar PV installation and commissioning, & training and capacity building	County directorate of fisheries, backstopped by Energy Directorate	22,000,000	County Government of Tana River	Kipini Fish Aggregation Facility	New
8.	To promote uptake & adoption of solar powered pumps by farmers practicing farming along River Tana	Market based dissemination of solar powered water pumps to farmers along River Tana.	2024-2028	Demonstration & product promotion events, Farmer field days, Technology showcases, M&E	County Directorate of crops, supported by County Directorate of Energy	6,000,000	County Government of Tana River	Farmers practicing irrigation along River Tana	New
9.	To install solar powered water pumping infrastructure in unequipped boreholes under the management of the County Government.	Equipping County boreholes with solar water pumping infrastructure.	2024-2028	Site assessment, planning & design Stakeholder engagement Pumping system installation and commissioning Training and capacity building	County Department of Water Access, backstopped by the County Directorate of Energy	132,000,000	County Government of Tana River	11 boreholes	New
10.	To install solar powered water pumping infrastructure at water pans and small earth dams in the County.	Equipping county water pans and small earth dams with solar water pumping infrastructure.	2024-2028	Site assessment, planning & design Stakeholder engagement Pumping system installation and commissioning Training and capacity building	County Department of Water Access, backstopped by the County Directorate of Energy	18,000,000	County Government of Tana River	Approximately 15 water pans & small earth dams in the County	New

No.	Objective	Project/ Programme	Timelines	Specific Activities	Implementing Agency	Project Cost (KES)	Source of fund	Targeted Beneficiaries	Status (New/ Ongoing)
11.	To implement an awareness and behaviour change campaigns in the County to disseminate information on EE&C practices and behaviours.	Awareness creation and behaviour change campaigns to promote EE&C in households.	2024-2028	Development of applicable awareness creation content – anchored on MEPS regulations, Producing this content, Disseminating the content through talk shows, county energy days, social media awareness campaigns, public barazas, theatre/kits, school-based programmes, sporting events and publicity materials, Implementing an M&E framework for assessing outcomes.	County Department of Communication, backstopped by the County Directorate of Energy	10,000,000.00	County Government of Tana River	Households	New
12.	To enhance EE&C practices in the construction sector by revising existing County building codes to incorporate EE&C standards and requirements.	Reviewing county building codes and incorporating EE&C measures.	2024-2028	Review existing building codes Stakeholder consultation Development of EE&C guidelines Capacity building Public awareness and outreach Policy advocacy	County Directorate of Public Works & Housing	12,000,000.00	County Government of Tana River	The building sector	New
13.	To ensure designated facilities in the County are complying with the four-year audit cycle requirement.	Promoting EE&C in designated industries by enforcing compliance of energy audit requirements.	2024-2028	Mapping all designated industries Enforcing compliance with energy audit requirements	County Directorate of Energy	5,000,000.00	County Government of Tana River	The industrial sector	New

No.	Objective	Project/ Programme	Timelines	Specific Activities	Implementing Agency	Project Cost (KES)	Source of fund	Targeted Beneficiaries	Status (New/ Ongoing)
14.	To connect ECDEs and VTCs and health facilities to electricity	Enhancing universal access to electricity in all learning and health facilities (connection to grid and solar PV systems)	2024-2028	Site assessment, planning & design Installation and commissioning	Departments of Education and Health backstopped by the County Directorate of Energy	588,900,000	County Government through its various partners	153 ECDES connected to grid, 153 ECDEs connected to solar PV Five VTCs upgraded to 3 phase Two VTCs connected to solar PV 37 health centres connected to solar PV	New
15.	To connect ECDEs and VTCs and health facilities to electricity	Enhancing universal access to electricity in all learning and health facilities (rehabilitation of solar PV systems)	2024-2028	Site assessment, planning & design Rehabilitation and commissioning	Departments of Education and Health backstopped by the County Directorate of Energy	2,700,000	County Government through its various partners	Nine ECDES	New
16.	To connect ECDEs and VTCs and health facilities to electricity	Enhancing universal access to electricity in all learning and health facilities (providing power backups)	2024-2028	Site assessment, planning & design Installation and commissioning	Departments of Education and Health backstopped by the County Directorate of Energy	138,000,000	County Government through its various partners	Eight VTCs Three Level 3 health facilities 10 level two health facilities	New

No.	Objective	Project/ Programme	Timelines	Specific Activities	Implementing Agency	Project Cost (KES)	Source of fund	Targeted Beneficiaries	Status (New/ Ongoing)
17.	To VTCs to electricity	Enhancing universal access to electricity in all VCTs (upgrading to 3 phase)	2024-2028	Site assessment, planning & design Installation and commissioning	County directorate of energy	2,500,000	County government through its various partners	Five VTCs	New
18.	To connect ECDEs and VTCs and health facilities to electricity	Enhancing universal access to electricity in all health facilities (installing solar water heaters)	2024-2028	Site assessment, planning & design Installation and commissioning	Departments of Education and Health backstopped by the County Directorate of Energy	140,000,000	County Government through its various partners	Three Level 4 hospitals 50 level three and two hospitals	New
19.	To install streetlights in market centres and roads	Enhancing universal access to electricity in markets centres (connecting to grid and solar PV)	2024-2028	Site assessment, planning & design Installation and commissioning	Departments of Public Works and Urban Planning backstopped by the County Directorate of Energy	366,000,000	County Government through its various partners	510 solar PV streetlights 510 on-grid streetlights 29 solar PV HMFL 25 on-grid HMFL 240 on-grid streetlights	New
20.	To provide clean cooking solutions in ECDEs , VTCs and health facilities	Enhancing access to clean cooking solutions in all learning centres (access to improved cookstoves)	2024-2028	Site assessment, planning & design Installation and commissioning	Directorates of Education and Health backstopped by the County Directorate of Energy	64,697,000	County Government through its various partners	318 ECDEs, 10 VTCs and Three health facilities	New

No.	Objective	Project/ Programme	Timelines	Specific Activities	Implementing Agency	Project Cost (KES)	Source of fund	Targeted Beneficiaries	Status (New/ Ongoing)
21.	To provide clean cooking solutions in ECDEs , VTCs and health facilities	Enhancing access to clean cooking solutions in all learning centres (human waste biogas system)	2024-2028	Site assessment, planning & design Installation and commissioning	Directorates of Education and Health backstopped by the County Directorate of Energy	4,000,000	County Government through its various partners	One health facility	New
22.	To provide clean cooking solutions in ECDEs , VTCs and health facilities	Constructing modern kitchens suitable for improved cooking solutions	2024-2028	Site assessment, planning & design Construction and commissioning	Directorates of Education and Health backstopped by the County Directorate of Energy	1,640,000,000	County Government through its various partners	318 ECDEs, 10 VTCs and	New

6.3 Projects & programmes to be implemented by development partners

6.3.1 Description

Project 1: Equipping county water pans and small earth dams with solar water pumping infrastructure: A collaborative initiative between the County Government, National Government agencies and development partners. Its implementation will be spearheaded by the County Department of Water Access.

Project 2: Promoting biogas uptake by livestock farmers in Tana River County: An ambitious biogas project which will target the 370 households profiled as having potential to uptake the technology is proposed. The project will be led by the Energy Directorate with support from the Department of Livestock. Under this arrangement, development partners are envisioned to facilitate the installation of a total of 100 digesters out of the total targeted 370 digesters.

Project 1:

Project 2:

6.3.2 Summary

Table 73: Projects & programmes to be implemented by development partners

Objective	Project/ Programme	Timelines	Specific Activities	Implementing Agency	Project Cost (KES)	Source of fund	Targeted Beneficiaries	Status (New/ Ongoing)
To install solar powered water pumping infrastructure at water pans and small earth dams in the County.	Equipping County water pans and small earth dams with solar water pumping infrastructure.	2024-2028	Site assessment, planning & design Stakeholder engagement Pumping system installation and commissioning Training and capacity building	County Department of Water Access, backstopped by the County Directorate of Energy	58,800,000.00	Various development partners; World Bank, Agro Germany, Islamic relief, Kenya Red Cross etc..	Approximately 49 water pans & small earth dams in the County	New
To promote biogas uptake by households in Tana River County	Promoting biogas uptake by livestock farmers in Tana River County.	2024-20230	Partnerships and resource mobilisation, community Sensitization and engagement, technical design and procurement, construction and installation, training and capacity building, sustainability planning, knowledge sharing and replication	County Government	30,000,000	County Government	100 households	New

6.4 Projects & programmes to be implemented by private sector

6.4.1 Description

Project 1: Promoting sustainable & clean cooking methods in households, eateries, restaurants, and hotels: The project will be implemented in conjunction with the County Government. While the County Government's role will be to create a ripe environment for business to flourish, actual marketing and dissemination will be undertaken by private sector companies. The companies will enter the market and roll out innovative business models which will incentivise acquisition and enhance affordability.

Project 2: Promoting biogas uptake by livestock farmers in Tana River County: An ambitious biogas project which will target the 370 households profiled as having potential to uptake the technology is proposed. The project will be led by the Energy Directorate with support from the Department of Livestock. Under this arrangement, the private sector is expected to facilitate the installation of a total of 70 digesters out of the total targeted 370 digesters.

Project 3: To promote biogas digesters which utilise a blend of human, kitchen and animal wastes at the big hotels in the County: The target is to have at least five such hotels take up the technology by 2028.

Project 4: Market based dissemination of solar powered water pumps to farmers along River Tana: A private sector led initiative in collaboration with the County Government with the objective of completely displacing fuel powered pumps or significantly reduce their usage.


Project 1:

Project 2:


Project 3:


Project 4:

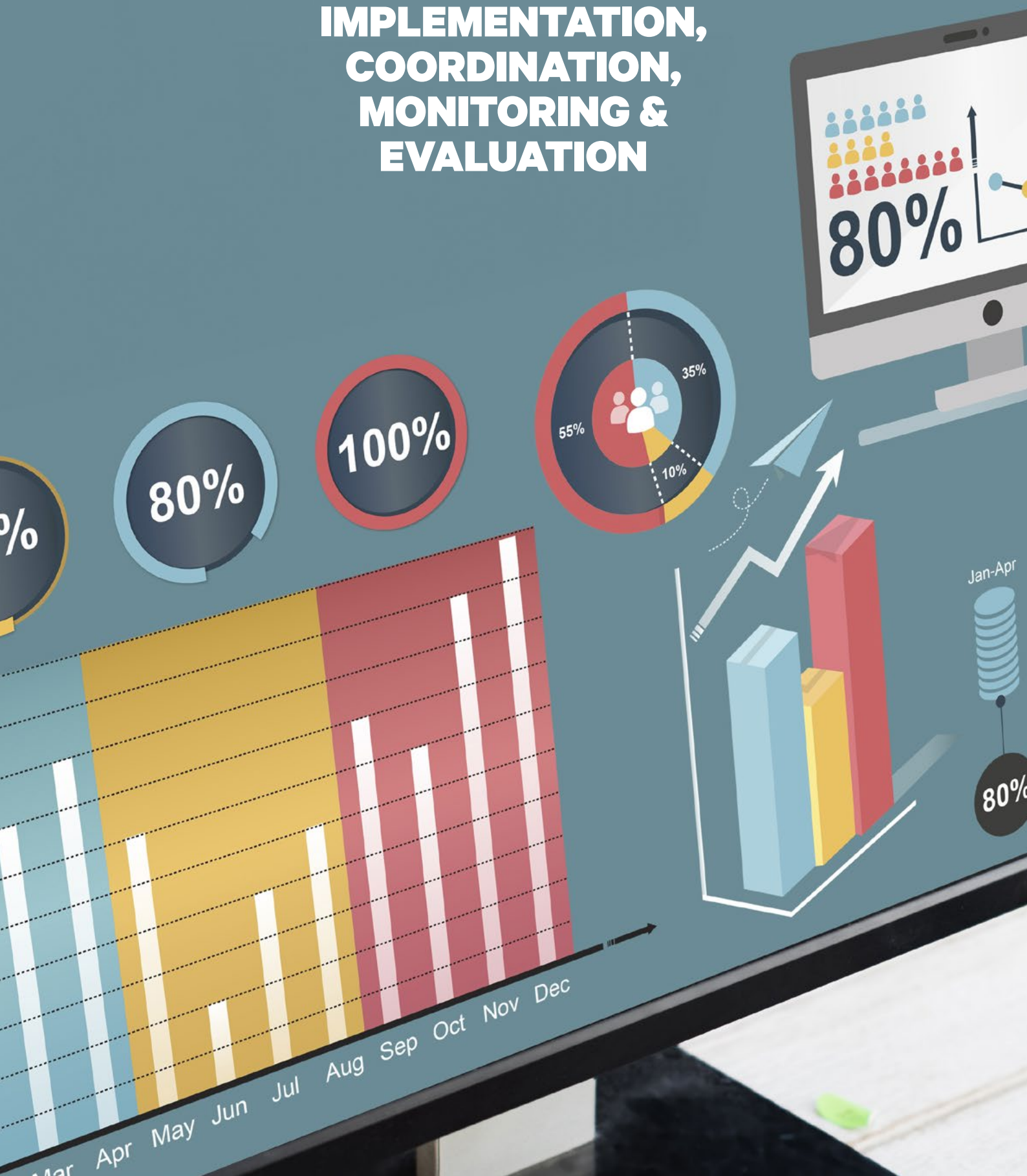
6.4.2 Summary

Table 74: Projects & programmes to be implemented by private sector

No.	Objective	Project/ Programme	Timelines	Specific Activities	Implementing Agency	Project Cost (KES)	Source of fund	Targeted Beneficiaries	Status (New/ Ongoing)
	To disseminate clean cooking fuels and stoves amongst households, eateries, restaurants and hotels operating in the county.	Promoting Sustainable & clean cooking methods in households, Eateries, Restaurants, and Hotels	2024-2028	Registering market presence & putting into place measures to incentivize acquisition and enhance affordability	Private companies dealing in stoves	N/A	N/A	Households,, Eateries, hotels & restaurants	New
	To construct biogas digesters which utilize a blend of human, kitchen and animal wastes	Promoting Sustainable & clean cooking methods in Eateries, Restaurants, and Hotels	2024-2028	Registering market presence & putting into place measures to incentivize acquisition and enhance affordability	Private companies offering the solution	N/A	N/A	5 big hotels in the county	New
	To promote uptake & adoption of solar powered pumps by farmers practicing farming along River Tana	Market based dissemination of solar powered water pumps to farmers along River Tana.	2024-2028	Entering the market & putting into place measures to incentivize acquisition and enhance affordability	Private companies dealing in solar water pumps	N/A	N/A	Farmers practicing irrigated agriculture with water drawn from river Tana.	New
	To promote biogas uptake by households in Tana River County	Promoting biogas uptake by livestock farmers in Tana River County.	2024-2030	Partnerships and Resource Mobilisation,Community Sensitisation and Engagement, Technical Design and Procurement, Construction and Installation, Training and Capacity Building, Sustainability Planning, Knowledge Sharing and Replication	County government	N/A	Private sector	70 households	New

7

IMPLEMENTATION, COORDINATION, MONITORING & EVALUATION



Chapter 7.0

IMPLEMENTATION, COORDINATION, MONITORING & EVALUATION

7.1 Projects & programmes to be implemented by national government

Table 75: M&E framework - Projects & programmes to be implemented by National Government

No.	Project/ Programme	Outcome indicators	Baseline		Annual targets				Total target by 2028	Data collection Responsibility	Reporting entity
			Value	Year	2024-2025	2025-2026	2026-2027	2027-2028			
1.	Facilitating universal electricity access in Tana River households by 2030	No. of households connected to electricity	22,000	2023	6300	6300	6300	6300 2028-2029-6300 2029-2030-6300 2030-2031- 6300	44,000 HHs by 2030	County Directorate of Energy	County Directorate of Energy
2.	Equipping County water pans and small earth dams with solar water pumping infrastructure.	No. of waterpans & small earth dams equipped with solar powered pumping infrastructure	1	2023	5	15	15	20	55	County Directorate of Water access	County Directorate of Energy
3.	Promoting biogas uptake by livestock farmers in Tana River County.	No. of household biogas digesters installed	0	2024	10	20	30	40	100	County Directorate of Energy	County Directorate of Energy
4.	Enhancing universal access to electricity in all learning centres	No of primary schools connected to solar PV electricity	71	2024	10	10	10	15	45	Directorate of Education	County Directorate of Energy
		No. of secondary schools connected to solar PV electricity	11	2024	4	4			8	Directorate of Education	County Directorate of Energy
5	Enhancing universal access to electricity in all learning centres	No. of primary schools connected to power backups	0	2024	7	20	20	20	67	Directorate of Education	County Directorate of Energy
		No. of secondary schools connected to power backups	0	2024	2	5	10	5	22	Directorate of Education	County Directorate of Energy

No.	Project/ Programme	Outcome indicators	Baseline		Annual targets				Total target by 2028	Data collection Responsibility	Reporting entity
5.	Enhancing universal access to electricity in all learning centres	No of primary schools with solar PV rehabilitated	0	2024	11	20	20	20	71	Directorate of Education	County Directorate of Energy
6.	Rehabilitating solar PV in secondary schools	No of secondary schools with solar PV rehabilitated	0	2024	5	5	1		11	Directorate of Education	County Directorate of Energy
7.	Enhancing access to clean cooking solutions in all learning centres	No of primary schools adopting clean cooking solutions	0	2024	35	50	50	50	185	Directorate of Education	County Directorate of Energy
8.	Enhancing adoption of clean cooking solutions in secondary schools	No of secondary schools adopting clean cooking solutions	8	2024	3	10	10	10	33	Directorate of Education	County Directorate of Energy
	Enhancing access to clean cooking solutions in NYS and correctional facilities	No of prisons adopting clean cooking solutions	1	2024		1			1	Ministry of Interior and I Coordination of National Govt	County Directorate of Energy
		No of NYS adopting clean cooking solutions	0	2024		1			1	Ministry of Interior & Coordination of National Govt	County Directorate of Energy
9.	Enhancing access to clean cooking solutions in all learning centres	No of primary schools with human waste biogas system	0	2024	5	5	10	5	25	Directorate of Education	County directorate of energy
		No of secondary schools with human waste biogas system	0	2024	1	1	1	2	5	Directorate of Education	County Directorate of Energy
10.	Enhancing access to clean cooking solutions in all learning centres	No of primary schools with modern kitchens	17	2024	18	50	50	30	168	Directorate of Education	County directorate of energy
		No of secondary schools with modern kitchens	8	2024	10	10	10	3	33	Directorate of Education	County Directorate of Energy

7.2 Projects & programmes to be implemented by county government

Table 76: M&E framework - Projects & programs to be implemented by National Government

No.	Project/ Programme	Outcome indicators	Baseline		Annual targets				Total target by 2028	Data collection Responsibility	Reporting entity
			Value	Year	20242025	2025-2026	2026-2027	2027-2028			
1.	Transitioning all households & SMEs to cleaner cooking methods by 2028 (Households)	No. of improved firewood stoves distributed	1,753	2024	7,600	14,000	23,000	25,000	69,600	County Government, National Government, development partners & private sector	County Directorate of Energy
		No. of improved charcoal stoves distributed	20,422	2024	2,600	6,000	8,000	10,000	28,240	County Government, National Government, development partners & private sector	County Directorate of Energy
		No. of LPG cylinders (13 & 6 kgs) distributed	2622	2024	600	1,000	1,400	2,400	5,628	County Government, National Government, development partners & private sector	County Directorate of Energy
		No. of bioethanol stoves disseminated	0	2024	400	800	1,300	1,500	4,000	County Governement, , National Government, development partners & private sector	County Directorate of Energy
		No. of biogas systems installed	0	2024	40	80	110	140	370	County Government, National Government, development partners & private sector	County Directorate of Energy

No.	Project/ Programme	Outcome indicators	Baseline		Annual targets				Total target by 2028	Data collection Responsibility	Reporting entity
2.	Transitioning all households & SMEs to cleaner cooking methods by 2028 (SMEs- eateries, restaurants, and hotels)	No. of improved charcoal stoves disseminated	38 (49%*58%*135)	2024	40	40	41	41	200	Private companies	County directorate of energy
		No. of improved firewood stoves disseminated	0	2024	50	50	50	50	200	Private companies	County Directorate of Energy
		No. of LPG cylinders disseminated	7	2024	10	10	10	13	50	Private companies	County Directorate of Energy
		No. of bioethanol stoves disseminated	0	2024	20	20	20	40	100	Private companies	County Directorate of Energy
		No. of biogas systems installed at hotels	0	2024		1	2	2	5	Private companies	County Directorate of Energy
3.	Formulation & implementation of County charcoal production, transportation and marketing regulations	No. of policies enacted	0	2024				1	1	County Directorate of Environment	County Directorate of Energy
		No. of regulations enacted.	0	2024				1	1	County Directorate of Environment	County Directorate of Energy
4.	Enhancing dairy value chains through electrifying milk processing plants & collection centres and installation of dual powered bulk milk chillers for sustainable production	No. of milk facilities connected to 3 phase grid power supply	0	2024	2	1			3	County Directorate of Livestock	County directorate of energy

No.	Project/ Programme	Outcome indicators	Baseline		Annual targets				Total target by 2028	Data collection Responsibility	Reporting entity
		No. of dual powered bulk chillers installed either through new acquisitions or retrofitting works	0	2024			2	2	4	County Directorate of livestock	County Directorate of Energy
5.	Electrification of slaughter houses in the County - new grid connections and provision of solar PV backup systems.	No. of new grid connections	1	2023	2	2			5	County Directorate of Livestock	County Directorate of Energy
		No. of solar PV backup systems installed	0	2023			2	3	5	County Directorate of livestock	County Directorate of Energy
6.	Solarization of Kipini Fish Aggregation Facility	No. of grid complementary PV systems installed	0	2023				1	1	County Directorate of Fisheries	County Directorate of Energy
7.	Promoting uptake & adoption of solar powered pumps by farmers practicing farming along River Tana	No. of solar powered water pumps distributed	11,250	2023	5,000	5,000	10,000	13,750	33,750	County Directorate of Crops	County Directorate of Energy
	Equipping County boreholes with solar water pumping infrastructure	No. of boreholes equipped with solar powered pumping infrastructure	83	2024	5	6			11	County Directorate of Water Access	County Directorate of Energy

No.	Project/ Programme	Outcome indicators	Baseline		Annual targets				Total target by 2028	Data collection Responsibility	Reporting entity
8.	Equipping County water pans and small earth dams with solar water pumping infrastructure.	No. of water pans & small earth dams equipped with solar powered pumping infrastructure	0	2023		5	5	5	15	County Directorate of Water Access	County Directorate of Energy
	Awareness creation and behaviour change campaign to promote EE&C in households.	No of behaviour change communication & awareness creation campaigns rolled out	0	2024		1			1	County Directorate of Communication	County Directorate of Energy
9.	Reviewing County building codes and incorporating EE&C Measures.	No. of County building codes reviewed	0	2024				1	1	County Directorate of Public Works & Housing	County Directorate of Energy
	Promoting EE&C in designated industries by enforcing compliance of energy audit requirements.	No. of designated facilities complying with the four-year audit requirement	0	2024				1	1	County Department of Trade and Industrialisation	County Directorate of Energy
10.	Promoting biogas uptake by livestock farmers in Tana River County.	No. of household biogas digesters installed	0	2024	10	20	30	40	100	County Directorate of Energy	County Directorate of Energy

No.	Project/ Programme	Outcome indicators	Baseline		Annual targets				Total target by 2028	Data collection Responsibility	Reporting entity
11.	Enhancing universal access to electricity in all learning and health facilities	No of ECDEs connected to grid electricity	0	2024	50	50	50	56	153	County Departments of Education	County directorate of energy
		No of ECDEs connected to solar PV electricity	0	2024	50	50	50	56	153	County Department of Education	County directorate of energy
		No of Level 2 health facilities connected to solar PV electricity	0	2024	7	10	10	10	37	County Departments of Health	County Directorate of Energy
		No of VTCs connected to solar PV electricity	0	2024	1	1			2	County Departments of Education and Health	County Directorate of Energy
12.	Enhancing universal access to electricity in all health facilities	No of VTCs upgraded to three-phase electricity supply	3	2024	1	2	2		5	County Department of Education	County Directorate of Energy
13.	Enhancing universal access to electricity in all health facilities	No of ECDEs, primary schools & secondary schools with solar PV systems rehabilitated	0	2024	20	20	20	31	91	County Department of Education (County Goverment & National g Government)	County Directorate of Energy

No.	Project/ Programme	Outcome indicators	Baseline		Annual targets				Total target by 2028	Data collection Responsibility	Reporting entity
15	Enhancing universal access to electricity in all health facilities	No of VTCs with power backups	0	2024	3	3	2		8	County Department of Education	County Directorate of Energy
		No of Level 2 health facilities with power backups	0	2024	3	4	3		10	County departments of health	County Directorate of Energy
		No of Level 3 health facilities with power backups	0	2024	1	1	1		3	County Departments of Health	County Directorate of Energy
16	Enhancing universal access to electricity in all health facilities	No of level 4 health facilities with SWHs	0	2024	1	1	1		3	County Departments of Health	County Directorate of Energy
		No of level 3 health facilities with SWHs	0	2024	1	1	1		3	County department of Health	County Directorate of Energy
		No of level 2 health facilities with SWHs	0	2024	15	15	10	7	47	County Department of Health	County Directorate of Energy
17	Enhancing universal access to electricity in market centres	No of streetlights installed to grid	0	2024	200	200	200	150	750	County department of Trade and Industrialisation	County directorate of energy
		No of streetlights installed to solar PV	0	2024	150	150	150	60	510	County department of Trade and Industrialization	County Directorate of Energy
		No of highmast flood lights installed to grid	0	2024	5	10	5	5	25	County Department of Trade and Industrialisation	County Directorate of Energy
		No of Highmast flood lights installed to solar PV	0	2024	5	10	9	5	29	County Department of Trade and Industrialisation	County Directorate of Energy

No.	Project/ Programme	Outcome indicators	Baseline		Annual targets				Total target by 2028	Data collection Responsibility	Reporting entity
18	Enhancing access to clean cooking solutions in all learning and health centres	No of ECDEs with clean cooking solutions	0	2024	100	100	100	18	318	County Department of Education	County Directorate of Energy
		No of VTCs with clean cooking solutions	0	2024	4	4	1	1	10	County Departments of Education	County Directorate of Energy
		No of level 4 facilities with clean cooking solutions	1	2024	1	1	1		3	County Departments of Education and health	County Directorate of Energy
		No of ECDEs with modern kitchens	0	2024	100	100	100	18	318	County Departments of Education	County Directorate of Energy
		No of VTCs with modern kitchens	0	2024	4	4	1	1	10	County Departments of Education	County Directorate of Energy
		No of level 4 hospital with human waste biogas system	0	2024		1			1	County departments of health	County Directorate of Energy

7.3 Projects & programmes to be implemented by development partners

Table 77: M&E framework - Projects & programmes to be implemented by National Government

No.	Project/ Programme	Outcome indicators	Baseline		Annual targets				Total target by 2028	Data collection Responsibility	Reporting entity
			Value	Year	2024-2025	2025-2026	2026-2027	2027-2028			
1.	Equipping County water pans and small earth dams with solar water pumping infrastructure.	No. of water pans & small earth dams equipped with solar powered pumping infrastructure	3	2023	9	10	15	15	49	County Directorate of Water Access	County Directorate of Energy
2.	Promoting biogas uptake by livestock farmers in Tana River County.	No. of household biogas digesters installed	0	2024	10	20	30	40	100	County Directorate of Livestock	County Directorate of Energy

7.4 Projects & programmes to be implemented by private sector

Table 78: M&E framework - Projects & programs to be implemented by National Government

No.	Project/ Programme	Outcome indicators	Baseline		Annual targets				Total target by 2028	Data collection Responsibility	Reporting entity
			Value	Year	2024-2025	2025-2026	2026-2027	2027-2028			
1.	Promoting biogas uptake by livestock farmers in Tana River County.	No. of household biogas digesters installed	0	2024	10	20	20	20	70	County Directorate of Energy	County Directorate of Energy
2.	Market based distribution of solar powered water pumps to farmers along River Tana.	No. of solar powered water pumps distributed	11,250	2023	5,000	5,000	10,000	13,750	33,750	County Directorate of Crops	County Directorate of Energy
3.	Transitioning all households & SMEs to cleaner cooking methods by 2028 (SMEs- eateries, restaurants, and hotels)	No. of SMES adopting clean cooking methods- improved stoves, LPG, bioethanol	Refer to projects and programmes under the county government for these indicators	Households, eateries, restaurants, and hotels	County Directorate of Energy	County Directorate of Energy					
		No. of hotels taking up biogas systems	0	2024	1	1	1	2	5		

8

CONCLUSIONS

Chapter 8.0

CONCLUSIONS

This CEP represents a significant milestone in Tana River County's journey towards achieving sustainable energy access and fostering inclusive development. Through comprehensive stakeholder engagement, rigorous data analyses, and strategic planning, the CEP has emerged as a dynamic and responsive framework tailored to the County's unique energy landscape. By identifying key challenges, proposing appropriate solutions, and fostering collaboration among diverse stakeholders, the CEP lays the foundation for transformative change, unlocking opportunities for economic growth, environmental sustainability, and improved livelihoods for all residents. Moving forward, the successful implementation of the CEP will require continued commitment, coordination, and innovation from all stakeholders, as all work together towards a future powered by adequate, clean, reliable, and inclusive energy for generations to come.

It is acknowledged that not all the energy needs have been captured in this Plan. This is on account of the dynamic and evolving nature of energy access challenges within Tana River County. While the Plan strives to comprehensively address existing gaps and barriers, it recognises the possibility of emerging energy needs and unforeseen developments over time. However, this recognition does not signal defeat or inadequacy; rather, it signifies a proactive approach towards adaptability and continuous improvement. By incorporating a built-in mechanism for periodic review and evaluation, the CEP demonstrates a commitment to staying responsive and relevant in the face of changing circumstances. The scheduled review after three years offers a valuable opportunity to assess progress, identify new priorities, and incorporate lessons learned, ensuring that the energy plan remains effective, equitable, and reflective of the evolving needs and aspirations of the community. This iterative process not only enhances the resilience and flexibility of the CEP but also reinforces a culture of ongoing learning, innovation, and collaboration in addressing energy challenges.

Successfully implementing the Plan hinges on the County Government's ability to prioritise resource mobilisation, recognising the multifaceted nature of funding requirements and the diverse array of potential sources. Internal County departmental budgets represent a foundational source of funding, requiring strategic allocation and prioritization to ensure sufficient financial support for energy initiatives outlined in the plan. Additionally, tapping into National Government resources provides another avenue for funding, necessitating effective advocacy and collaboration with it to secure necessary allocations and grants. Development partners offer valuable financial and technical support, but accessing these resources requires proactive engagement, relationship-building, and alignment with partner objectives and priorities. Furthermore, leveraging private sector-led market-based interventions can unlock innovative financing mechanisms and attract investment capital, fostering sustainable energy solutions while stimulating economic growth. To effectively mobilise these resources, the County Government must adopt a proactive approach, engaging in strategic lobbying efforts, forging partnerships, and networking with stakeholders across sectors. By leveraging a combination of internal budgetary allocations, strategic partnerships, and networking opportunities, the County Government can harness the necessary resources to drive forward the implementation of the CEP, realising its vision of sustainable energy access and inclusive development for all residents.

For coordinated implementation and in line with INEP requirements, the County Government should expedite operationalisation of the CEPC. The CEPC will be responsible for coordinating and overseeing the CEP's implementation. The Committee will be chaired by the County Executive Committee (CEC) member responsible for energy. The mandate of CEPC will include:

- Provide strategic leadership and governance oversight towards the realization of energy sector objectives.
- Deliberate and approve the recommendations submitted by the Technical Committee
- Prepare CEP for approval at the County Assembly
- Set out the county energy planning objectives and ensure they are aligned to the national energy planning objectives.
- Review periodic progress reports on the implementation of agreed targets in the County Energy Plan.
- Resource mobilization, with allocation and distribution of mobilized resources.
- Promote coordinated technical support and policy dialogue on strategic energy issues with national government, other county governments, development partners, Faith Based Organizations, Non-governmental Organizations (NGOs) and Civil society and private sector partners.
- Ensure effective oversight through receiving and reviewing regular reports from the Technical Committee.

The membership of the CEPC shall constitute the following:

Table 79: County Energy Planning Committee (CEPC)

No.	Organization	Position
1.	The County Executive Committee Member responsible for Energy	Chairperson
2.	Chief Officer responsible for energy	Member
3.	The Director responsible for Energy	Secretary
4.	One (1) representative of the County Commissioner	Member
5.	The County Executive Committee Member responsible for Finance and Planning	Member
6.	The Chief Officer responsible for Economic Planning	Member
7.	The County Executive Committee Member responsible for Lands, Housing, Physical Planning and Urban development	Member
8.	The County Executive Committee Member(s) responsible for Water, Environment and Natural Resources	Member
9.	One (1) representative from Kenya Power and Lighting Company	Member
10.	One (1) representative from Rural Electrification and Renewable Energy Corporation	Member
11.	One (1) representative from Kenya Forest Service County Representative	Member
12.	Technical County Officer(s) responsible for either Coal, Renewable Energy and Electricity	Member
13.	A representative from Non-Governmental Organization	Member
14.	A representative from private sector	Member
15.	Not more than (5) Co-opted member from both State and Non-State Actors	Co-opted member

The necessity to bolster the manpower capacity within the Energy Directorate is paramount for the successful implementation of the CEP and the realisation of its objectives. Presently, the Energy Directorate operates with limited human resources, comprising only one Director overseeing both the Water and Energy departments, alongside a solitary Energy Officer. This staffing configuration poses significant challenges in effectively executing the mandates and initiatives outlined in the CEP, particularly given the expansive scope of energy-related activities across the County. To address this shortfall, urgent measures are required to strengthen the organisational structure of the Energy Directorate. This includes the establishment of an office of Assistant Director specifically dedicated to overseeing energy-related affairs, thereby providing additional leadership and managerial support. Furthermore, there is an urgent need to augment the workforce by recruiting additional energy officers, ensuring adequate coverage and representation across all five sub-counties: Tana River, Tana Delta, Tana North, Bangale, and Galle Dyertu. This decentralised staffing approach will facilitate closer engagement with local communities, enhance coordination, and streamline the implementation of energy projects and initiatives at the grassroots level.

Additionally, the development of a comprehensive policy framework is imperative to provide a robust regulatory foundation for anchoring the implementation of the CEP. Indeed, the draft Tana River County Environment Policy, 2024 does provide for development of a County Energy Policy (Refer to section 1.5.2 on County energy policy & legislations). This policy should delineate clear guidelines, mandates, and mechanisms for advancing energy access, promoting sustainability, and fostering innovation within the County.

Moreover, capacity building initiatives are essential to equip officers within the energy department with the requisite skills, knowledge, and expertise in energy technologies (wind, solar, hydro, biogas, cookstoves, biomass and biofuels) and use of GIS mapping in development of energy interventions. By investing in human capital development, the County can build a cadre of skilled professionals capable of driving forward the ambitious agenda outlined in the CEP, ensuring its effective implementation and long-term success in advancing energy access and sustainability goals.

Finally, there are numerous opportunities in this document which the private sector can tap into. From distribution of solar home systems under the LCEP, distribution of domestic and institutional clean cooking solutions, installation of domestic and institutional biogas systems, distribution of solar water pumps to smallholder farmers, and indeed many other numerous opportunities. To this end and in the coming days, the Department of Energy, in collaboration with the Department of Trade and other stakeholders will prepare an energy investment prospectus which will showcase and elaborate these opportunities.

9

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Chapter 9.0

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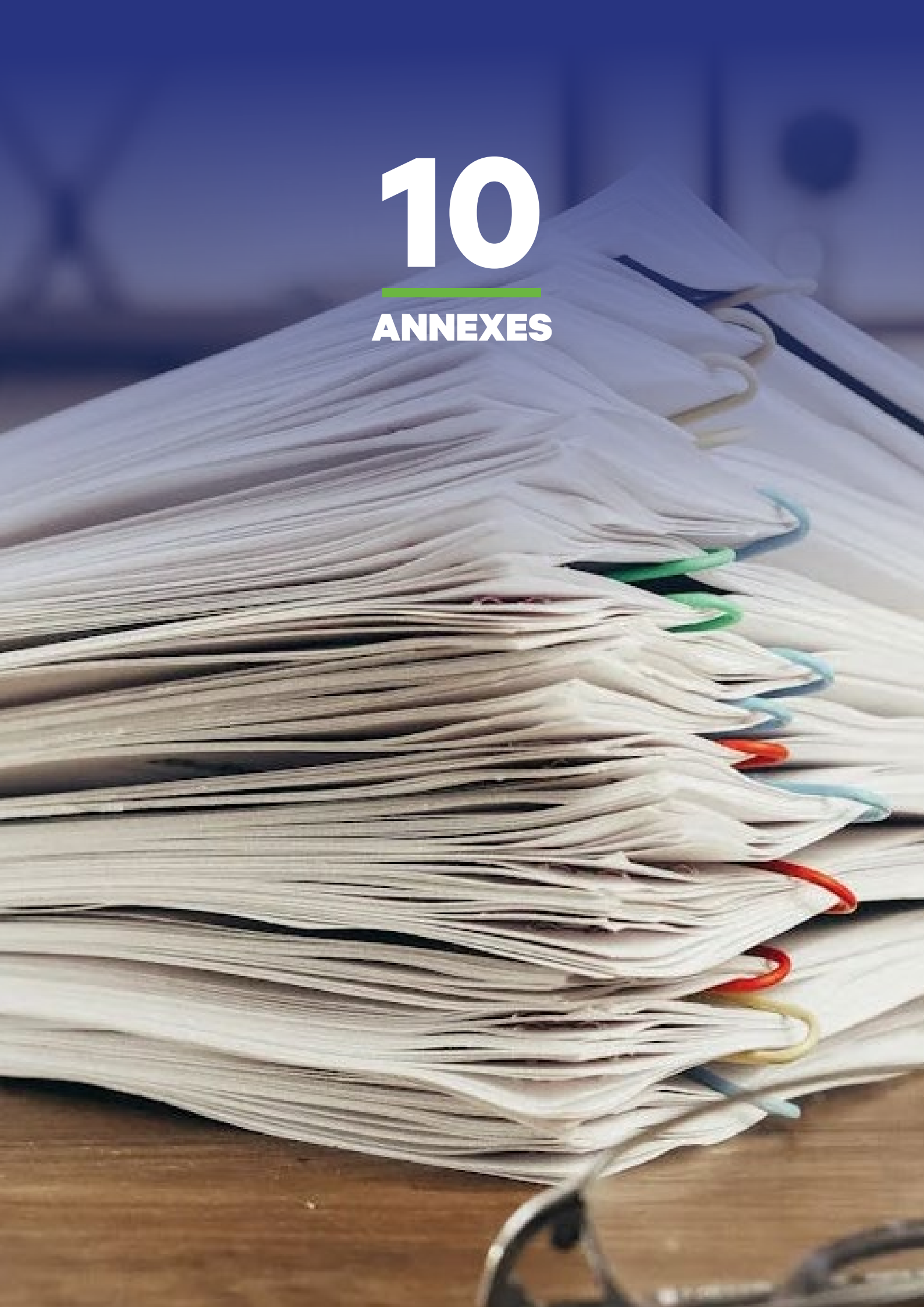
10

ANNEXES



Chapter 10.0

ANNEXES

Annex 1: Members of the County Energy Technical Committee

Table 80: Members of the County Energy Technical Committee

No.	NAME	DESIGNATION	ORGANIZATION
1	Felix K. Mumba	Ag. CCO - Water, Energy, Mining, Wildlife and Natural Resources	County Government of Tana River
2	Laura Mikal Dema	County Energy Officer	County Government of Tana River
3	Jachbed Mugo	County Renewable Energy Officer (CREO)	National Agency
4	Awadh Hamara	County Electrical Engineer	County Government of Tana River
5	Riadha Koshi	Environmental Officer	County Government of Tana River
6	James Mwamure	County Supervisor - REREC	National Agency
7	Mohamed Shambaro	SC Admin - Tana River	County Government of Tana River
8	Ramadhan Mwamwero	Crops Officer	
9	Edgar Mwamuye	Livestock Officer	County Government of Tana River
10	Anne Gwiyo	Ag. Dir - Special Programmes	County Government of Tana River
11	Mwanajuma Ndege	Fisheries Officer	County Government of Tana River
12	Vincent Keari Nyamweya	GIS Expert	County Government of Tana River
13	Millicent Ondieki	Gender Officer	County Government of Tana River
14	Alexander Kubende	Ag. Dir - Agriculture	County Government of Tana River
15	Kuso Hussein	Ass. Dir Climate Change	County Government of Tana River
16	Elisha Buya	Dir. Trade	County Government of Tana River
17	Oscar Endekwa	Dir. Health	County Government of Tana River
18	Ibrahim Hussein	County Statistics Officer - KNBS	National Agency
19	William Jillo Soye	Managing Director - Tawasco	County Government of Tana River
20	Amani Bawata	Ass. Dir Economic Planning	County Government of Tana River
21	Galole Jaffer	Dir. KFS	
22	Dennis Dhadho	Dir. Linkages	County Government of Tana River
23	Ken Okeyo	Ass. Dir. NDMA	National Agency
24	Silas Limo	Business Development Manager - KPLC	National Agency
25	James Mwamure	County Supervisor - REREC	National Agency
26	Nzioka Wambua	Dir. Livestock	County Government of Tana River
27	Alex Ogeto	Manager - Concern Worldwide	NGO
28	Sara Maiyo	County Project Manager - WHH	NGO
29	Oyoko Omondi	Manager, WVK Tana River County	NGO

30	James Kirimi	Manager - Tana Irrigation Scheme	National Agency
31	Peter Nolascoh	Manager - Bura Irrigation Scheme	National Agency
32	Salim Bashir	County Dir. NEMA	
33	Michael Gonda	Manager - KCB, Hola	Private Sector
34	Joseph Migwi	Manager, Equity Bank, Hola	Private Sector
35	Hassan Barisa	Chair - Kenya National Chamber of Commerce, Hola Chapter	Business Community

10.2 List of hybrid mini-grid sites proposed under Scenario 2 of households' electrification

Table 81: List of hybrid mini-grid sites proposed under Scenario 2 of LCEP

WARD	SUBCOUNTY	NAME	Longitude (l)	Latitude (l)	Population 2023	Households 2023	Supply option - Sc2
GARSEN WEST	GARSEN	ASSA	39.4231	-2.0474	576	88	Hybrid mini-grids
GARSEN WEST	GARSEN	KONE	39.0326	-2.3297	967	148	Hybrid mini-grids
GARSEN WEST	GARSEN	ONJILA	39.4304	-2.0789	293	45	Hybrid mini-grids
HIRIMANI	BURA	WALESORHEA	39.4554	-1.0626	836	128	Hybrid mini-grids
HIRIMANI	BURA	WALESORHEA	39.5268	-1.0880	938	143	Hybrid mini-grids
KINAKOMBA	GALOLE	HARORESA	39.8372	-1.7184	1411	215	Hybrid mini-grids
WAYU	GALOLE	HAKOKA	39.7075	-1.2911	597	91	Hybrid mini-grids
WAYU	GALOLE	WAYU	39.4807	-1.5720	1569	240	Hybrid mini-grids
WAYU	GALOLE	DAYATE	39.7959	-1.4796	1332	203	Hybrid mini-grids
WAYU	GALOLE	HAKOKA	39.6550	-1.2930	516	79	Hybrid mini-grids
WAYU	GALOLE	WAYU	39.6388	-1.5499	655	100	Hybrid mini-grids
WAYU	GALOLE	WAYU	39.4061	-1.5745	1700	260	Hybrid mini-grids
WAYU	GALOLE	TITILA	39.2061	-1.5348	1669	255	Hybrid mini-grids
WAYU	GALOLE	WALDENA	39.0256	-1.6079	5085	776	Hybrid mini-grids
WAYU	GALOLE	WAYU	39.5834	-1.5284	194	30	Hybrid mini-grids
WAYU	GALOLE	WAYU	39.5498	-1.5253	446	68	Hybrid mini-grids

10.3 List of hybrid mini-grid sites proposed under Scenario 3 of households' electrification

Table 82: List of hybrid mini-grid sites proposed under Scenario 3 of LCEP

WARD	SUBCOUNTY	NAME	Longitude (l)	Latitude (l)	Population 2023	Households 2023	Supply option - Sc3
GARSEN WEST	GARSEN	ASSA	39.4231	-2.0474	576	88	Hybrid mini-grids
GARSEN WEST	GARSEN	KONE	39.0326	-2.3297	967	148	Hybrid mini-grids
GARSEN WEST	GARSEN	ONJILA	39.4304	-2.0789	293	45	Hybrid mini-grids
HIRIMANI	BURA	WALESORHEA	39.4554	-1.0626	836	128	Hybrid mini-grids
HIRIMANI	BURA	WALESORHEA	39.5268	-1.0880	938	143	Hybrid mini-grids
WAYU	GALOLE	HAKOKA	39.7075	-1.2911	597	91	Hybrid mini-grids
WAYU	GALOLE	HAKOKA	39.6550	-1.2930	516	79	Hybrid mini-grids

10.4 Population Forecast 2023- 2028

Table 83: Population forecast 2023- 2028

Total population	Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	% Growth		2.0%	1.9%	1.9%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%
	Rural	240,220	245,024	249,680	254,424	259,767	265,222	270,791	276,478	282,284	288,212
	Urban	75,721	77,235	78,703	80,198	81,882	83,602	85,358	87,150	88,980	90,849
	Totals	**315,941**	**322,260**	**328,383**	**334,622**	**341,649**	**348,824**	**356,149**	**363,628**	**371,264**	**379,061**

10.5 Households Forecast 2023- 2028

Table 84: Households forecast 2023- 2028

Total households	Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	Rural	48,345	49,312	50,249	51,204	52,279	53,377	54,498	55,642	56,811	58,004
	Urban	19,897	20,295	20,681	21,073	21,516	21,968	22,429	22,900	23,381	23,872
	Totals	68,242	69,607	70,929	72,277	73,795	75,345	76,927	78,542	80,192	81,876

10.6 Sub-County distribution of clean cooking methods to be disseminated in all HHs between 2024 and 2028

Table 85: Sub-County distribution of clean cooking methods to be disseminated in all HHs between 2024 and 2028

Improved firewood stoves	% population	2024-2025	2025-2026	2026-2027	2027-2028	Total
Tana Delta	0.3502	2,661	4,903	8,054	8,755	24,373
Tana North	0.3696	2,809	5,174	8,500	9,239	25,721
Tana River	0.2803	2,130	3,924	6,446	7,006	19,506
Total		**7,600**	**14,000**	**23,000**	**25,000**	**69,600**
Improved charcoal stoves						
Tana Delta	0.3502	910	2,101	2,802	3,502	9,315
Tana North	0.3696	961	2,217	2,956	3,696	9,830
Tana River	0.2803	729	1,682	2,242	2,803	7,455
Total		**2,600**	**6,000**	**8,000**	**10,000**	**26,600**
LPG stoves						
Tana Delta	0.3502	210	350	490	840	1,891
Tana North	0.3696	222	370	517	887	1,996
Tana River	0.2803	168	280	392	673	1,513
Total		**600**	**1,000**	**1,400**	**2,400**	**5,400**
Bio-ethanol stoves						
Tana Delta	0.3502	140	280	455	525	1,401
Tana North	0.3696	148	296	480	554	1,478
Tana River	0.2803	112	224	364	420	1,121
Total		**400**	**800**	**1,300**	**1,500**	**4,000**

10.7 Sub-County distribution of clean cooking methods to be disseminated in rural HHs between 2024 and 2028

Table 86: Sub-County distribution of clean cooking methods to be disseminated in rural HHs between 2024 and 2028

Improved wood stoves	% population	2024-2025	2025-2026	2026-2027	2027-2028	Total
Tana Delta (35.02%)	0.3502	2,241	4,202	7,004	7,004	20,451
Tana North (36.96%)	0.3696	2,365	4,435	7,391	7,391	21,582
Tana River (28.03 %)	0.2803	1,794	3,363	5,605	5,605	16,367
Total		**6,400**	**12,000**	**20,000**	**20,000**	**58,400**
Improved charcoal stoves						
Tana Delta (35.02%)	0.3502	455	1,401	1,751	2,451	6,058
Tana North (36.96%)	0.3696	480	1,478	1,848	2,587	6,393
Tana River (28.03 %)	0.2803	364	1,121	1,401	1,962	4,848
Total		**1,300**	**4,000**	**5,000**	**7,000**	**17,300**
LPG stoves						
Tana Delta (35.02%)	0.3502	140	140	140	140	560
Tana North (36.96%)	0.3696	148	148	148	148	591
Tana River (28.03 %)	0.2803	112	112	112	112	448
Total		**400**	**400**	**400**	**400**	**1,600**
Bio-ethanol stoves						
Tana Delta (35.02%)	0	70	70	105	105	350
Tana North (36.96%)	0	74	74	111	111	370
Tana River (28.03 %)	0	56	56	84	84	280
Total		**200**	**200**	**300**	**300**	**1,000**

10.8 Sub-County distribution of clean cooking methods to be disseminated in urban HHs between 2024 and 2028

Table 87: Sub-County distribution of clean cooking methods to be disseminated in urban HHs between 2024 and 2028

Improved charcoal stoves	% population	2024-2025	2025-2026	2026-2027	2027-2028	Total
Tana Delta (35.02%)	0.3502	455	700	1,051	1,051	3,257
Tana North (36.96%)	0.3696	480	739	1,109	1,109	3,437
Tana River (28.03 %)	0.2803	364	561	841	841	2,606
Total		**1,300**	**2,000**	**3,000**	**3,000**	**9,300**
Improved firewood stoves						
Tana Delta (35.02%)	0.3502	420	700	1,051	1,751	3,922
Tana North (36.96%)	0.3696	443	739	1,109	1,848	4,139
Tana River (28.03 %)	0.2803	336	561	841	1,401	3,139
Total		**1,200**	**2,000**	**3,000**	**5,000**	**11,200**
LPG stoves						
Tana Delta (35.02%)	0.3502	70	210	350	700	1,331
Tana North (36.96%)	0.3696	74	222	370	739	1,404
Tana River (28.03 %)	0.2803	56	168	280	561	1,065
Total		**200**	**600**	**1,000**	**2,000**	**3,800**
Bio-ethanol stoves						
Tana Delta (35.02%)	0.3502	70	210	350	420	1,051
Tana North (36.96%)	0.3696	74	222	370	443	1,109
Tana River (28.03 %)	0.2803	56	168	280	336	841
Total		200	600	1,000	1,200	3,000

10.9 ECDEs in need of electricity connection and repair of PV systems

Table 88: ECDEs in need of electricity connection

No.	Sub-County	ECDE Centre	School Attached	Proposed solution
1.	Tana Delta	Assa	Assa Primary	Connect to electricity
2.	Tana Delta	Onjilla	Assa Primary	Connect to electricity
3.	Tana Delta	Danisa	Danisa	Connect to electricity
4.	Tana Delta	Dumi	Danisa	Connect to electricity
5.	Tana Delta	Furaha	Danisa	Connect to electricity
6.	Tana Delta	Bilisa	Bilisa	Connect to electricity
7.	Tana Delta	Korlabe	Bilisa	Connect to electricity
8.	Tana Delta	Imani	Imani	Connect to electricity
9.	Tana Delta	Didaade	Didaade	Connect to electricity
10.	Tana Delta	Ramadha	Dadaade	Connect to electricity
11.	Tana Delta	Iqra	Didaade	Connect to electricity
12.	Tana Delta	Maua	Maua	Connect to electricity
13.	Tana Delta	Tulu	Maua	Connect to electricity
14.	Tana Delta	Bora Imani	Maua	Connect to electricity
15.	Tana Delta	Onkolde	Onkolde	Connect to electricity
16.	Tana Delta	R/Mwewe	R/Mwewe	Connect to electricity
17.	Tana Delta	Gamba	Gamba	Connect to electricity
18.	Tana Delta	Peponi	Gamba Primary	Connect to electricity
19.	Tana Delta	Lango	Gamba Primary	Connect to electricity
20.	Tana Delta	Odoganda	Odoganda	Connect to electricity
21.	Tana Delta	Kibususera	Kibususera	Connect to electricity
22.	Tana Delta	Ngumu	Ngumu	Connect to electricity
23.	Tana Delta	Maziwa	Maziwa	Connect to electricity
24.	Tana Delta	Manna	Maziwa	Connect to electricity
25.	Tana Delta	Garsen	Garsen	Connect to electricity
26.	Tana Delta	Konkona	Garsen Primary	Connect to electricity
27.	Tana Delta	Vuria	Garsen Primary	Connect to electricity
28.	Tana Delta	Little Angels	Garsen Primary	Connect to electricity
29.	Tana Delta	Dalu	Dalu	Connect to electricity
30.	Tana Delta	Abaganda	Abaganda	Connect to electricity
31.	Tana Delta	Idsowe	Idsowe	Connect to electricity
32.	Tana Delta	Goodluck	Idsowe Primary	Connect to electricity
33.	Tana Delta	Sheli	Sheli	Connect to electricity
34.	Tana Delta	Gadeni	Gadeni	Connect to electricity
35.	Tana Delta	Galma	Galma	Connect to electricity
36.	Tana Delta	Marembo	Marembo	Connect to electricity
37.	Tana Delta	Minjila	Minjila	Connect to electricity
38.	Tana Delta	Minjila Agr	Minjila Primary	Connect to electricity
39.	Tana Delta	Kulesa	Kulesa	Connect to electricity
40.	Tana Delta	Kiembeni	Kulesa Primary	Connect to electricity
41.	Tana Delta	Bisadi Kone	Bisadi Kone	Connect to electricity
42.	Tana Delta	Iddi	Iddi	Connect to electricity
43.	Tana Delta	Bula Rahma	Bula Rahma	Connect to electricity
44.	Tana Delta	Golbanti	Golbanti	Connect to electricity
45.	Tana Delta	Hurara	Hurara	Connect to electricity

46.	Tana Delta	Galili	Galili	Connect to electricity
47.	Tana Delta	Gomesa	Galili Primary	Connect to electricity
48.	Tana Delta	Uhuru Kenyata	Uhuru Kenya	Connect to electricity
49.	Tana Delta	Dibe	Dibe	Connect to electricity
50.	Tana Delta	Tana Kurole	Tana Kurole	Connect to electricity
51.	Tana Delta	Handaraku	Handaraku	Connect to electricity
52.	Tana Delta	Lailoni	Handaraku	Connect to electricity
53.	Tana Delta	Semikaro	Semikaro	Connect to electricity
54.	Tana Delta	Nduru	Nduru	Connect to electricity
55.	Tana Delta	Mataarba	Nduru Primary	Connect to electricity
56.	Tana Delta	Tara	Nduru Primary	Connect to electricity
57.	Tana Delta	Najah	Najah	Connect to electricity
58.	Tana Delta	Furaha	Furaha	Connect to electricity
59.	Tana Delta	Kikoroto	Furaha Primary	Connect to electricity
60.	Tana Delta	Mademo	Furaha Primary	Connect to electricity
61.	Tana Delta	Gubani	Furaha Primary	Connect to electricity
62.	Tana Delta	Chamwanamuma	Chamwanamuma	Connect to electricity
63.	Tana Delta	Milimani	Tarasaa	Connect to electricity
64.	Tana Delta	Tarasaa	Tarasaa	Connect to electricity
65.	Tana Delta	Manyatta	Tarasaa Primary	Connect to electricity
66.	Tana Delta	Onwardei	Onwardei	Connect to electricity
67.	Tana Delta	Bura Anaan	Onwardei Primary	Connect to electricity
68.	Tana Delta	Arap Moi	Arap Moi	Connect to electricity
69.	Tana Delta	Kibokoni	Kibokoni	Connect to electricity
70.	Tana Delta	Bura Kofira	Bura Kofira	Connect to electricity
71.	Tana Delta	Maderte	Bura Kofira Primary	Connect to electricity
72.	Tana Delta	Ongonyo	Ongonyo	Connect to electricity
73.	Tana Delta	Odole	Odole	Connect to electricity
74.	Tana Delta	Samicha	Odole Primary	Connect to electricity
75.	Tana Delta	Shirikisho	Shirikisho	Connect to electricity
76.	Tana Delta	Marafa	Shirikisho Primary	Connect to electricity
77.	Tana Delta	Bora Moyo	Shirikisho Primary	Connect to electricity
78.	Tana Delta	Darga	Shirikisho Primary	Connect to electricity
79.	Tana Delta	Kipao	Kipao	Connect to electricity
80.	Tana Delta	Darartu	Kipao Primary	Connect to electricity
81.	Tana Delta	Mooti-Mooti	Kipao Primary	Connect to electricity
82.	Tana Delta	Haroru	Kipao Primary	Connect to electricity
83.	Tana Delta	Miticharaka	Miticharaka	Connect to electricity
84.	Tana Delta	Baraka	Miticharaka Primary	Connect to electricity
85.	Tana Delta	Katsangani	Katsangani	Connect to electricity
86.	Tana Delta	Mto-Tana	Katsangani Primary	Connect to electricity
87.	Tana Delta	Mto-Kilifi	Katsangani Primary	Connect to electricity
88.	Tana Delta	Mkwajuni	Katsangani	Connect to electricity
89.	Tana Delta	Kikomo	Kikomo	Connect to electricity
90.	Tana Delta	Riketa	Riketa	Connect to electricity
91.	Tana Delta	Matangeni	Matangeni	Connect to electricity
92.	Tana Delta	Kizuliani	Matangeni Primary	Connect to electricity
93.	Tana Delta	Bula Mnazi	Matangeni Primary	Connect to electricity
94.	Tana Delta	Kilelengwani	Kilelengwani	Connect to electricity
95.	Tana Delta	Kilunguni	Kilelengwani Primary	Connect to electricity

96.	Tana Delta	Tizama Lako	Kilelengwani Primary	Connect to electricity
97.	Tana Delta	Kau	Kau	Connect to electricity
98.	Tana Delta	Ziwani	Ziwani	Connect to electricity
99.	Tana Delta	Mvikoni	Ziwani Primary	Connect to electricity
100.	Tana Delta	Kaloleni	Ziwani Primary	Connect to electricity
101.	Tana Delta	Canaan Bora	Canaan Bora	Connect to electricity
102.	Tana Delta	Grace Pefa	Canaan Bora Primary	Connect to electricity
103.	Tana Delta	Mapunga	Mapunga	Connect to electricity
104.	Tana Delta	Tumaini	Mapunga Primary	Connect to electricity
105.	Tana Delta	Neema	Mapunga Primary	Connect to electricity
106.	Tana Delta	Kipini	Kipini	Connect to electricity
107.	Tana Delta	Shauri Moyo	Shauri Moyo	Connect to electricity
108.	Tana Delta	Ozi	Ozi	Connect to electricity
109.	Tana Delta	Mpeketoni	Ozi Primary	Connect to electricity
110.	Tana Delta	Majiweni	Majiweni	Connect to electricity
111.	Tana Delta	Millenia	Majiweni Primary	Connect to electricity
112.	Tana Delta	Mchelelo	Mchelelo	Connect to electricity
113.	Tana Delta	Gatundu	Gatundu	Connect to electricity
114.	Tana Delta	Baomo	Baomo	Connect to electricity
115.	Tana Delta	Kitere	Kitere	Connect to electricity
116.	Tana Delta	Choa	Kitere Primary	Connect to electricity
117.	Tana Delta	Kinyadu	Kinyadu	Connect to electricity
118.	Tana Delta	Peponi	Peponi	Connect to electricity
119.	Tana Delta	Mumbuji	Mumbuji	Connect to electricity
120.	Tana Delta	Bahati	Bahati	Connect to electricity
121.	Tana Delta	Mnazini	Mnazini	Connect to electricity
122.	Tana Delta	Mwina	Mwina	Connect to electricity
123.	Tana Delta	Lazima	Lazima	Connect to electricity
124.	Tana Delta	Bubesa	Bubesa	Connect to electricity
125.	Tana River	Rafiki	Rafiki Primary	Connect to electricity
126.	Tana River	Imani	Rafiki	Connect to electricity
127.	Tana River	Sorani	Rafiki	Connect to electricity
128.	Tana River	Harmony	Rafiki Primary	Connect to electricity
129.	Tana River	B/Salama	Rafiki Primary	Connect to electricity
130.	Tana River	Kalaule	Rafiki Primary	Connect to electricity
131.	Tana River	Hola	Hola	Connect to electricity
132.	Tana River	Noor Muslim	Hola Primary	Connect to electricity
133.	Tana River	Hola Methodist	Hola Primary	Connect to electricity
134.	Tana River	Bright Future	Hola Primary	Connect to electricity
135.	Tana River	Bismillahi	Laza	Connect to electricity
136.	Tana River	G.K Prison	Laza Primary	Connect to electricity
137.	Tana River	M/Ngwena	Laza Primary	Connect to electricity
138.	Tana River	High Vision	Laza Primary	Connect to electricity
139.	Tana River	Parent Hope	Laza Primary	Connect to electricity
140.	Tana River	Mikiduni	Mikinduni	Connect to electricity
141.	Tana River	Neema	Mikinduni	Connect to electricity
142.	Tana River	Emaus	Mikinduni	Connect to electricity
143.	Tana River	Kone	Kone	Connect to electricity
144.	Tana River	Tunu	Kone Primary	Connect to electricity
145.	Tana River	Watta	Kone Primary	Connect to electricity

146.	Tana River	Kiarikungu	Kiarikungu	Connect to electricity
147.	Tana River	Daba	Daba	Connect to electricity
148.	Tana River	Daba Aic	Daba	Connect to electricity
149.	Tana River	Kitole	Daba Primary	Connect to electricity
150.	Tana River	Malka Dende	Daba Pry	Connect to electricity
151.	Tana River	Waldena	Waldena Pry	Connect to electricity
152.	Tana River	Kone Kaliti	Waldena Pry	Connect to electricity
153.	Tana River	Haboye	Waldena Pry	Connect to electricity
154.	Tana River	Kotole	Waldena Pry	Connect to electricity
155.	Tana River	Doke	Waldena Pry	Connect to electricity
156.	Tana River	Koticha	Koticha Pry	Connect to electricity
157.	Tana River	Milima	Koticha Pry	Connect to electricity
158.	Tana River	Kalkacha	Kalkacha Pry	Connect to electricity
159.	Tana River	Odowan	Kalkacha Pry	Connect to electricity
160.	Tana River	Dayate	Kalkacha Pry	Connect to electricity
161.	Tana River	Nys	Kalkacha Pry	Connect to electricity
162.	Tana River	Maderte	Kalkacha Pry	Connect to electricity
163.	Tana River	Kalalani	Kalalani Pry	Connect to electricity
164.	Tana River	Dida Ade	Kalalani Pry	Connect to electricity
165.	Tana River	Titila	Titila Pry	Connect to electricity
166.	Tana River	Anabu	Titila Pry	Connect to electricity
167.	Tana River	Ongola	Titila Pry	Connect to electricity
168.	Tana River	Chanani	Chanani Pry	Connect to electricity
169.	Tana River	Hola Lisa	Hola Lisa Pry	Connect to electricity
170.	Tana River	Wayu Boru	Wayu Boru	Connect to electricity
171.	Tana River	Maua	Wayu Boru	Connect to electricity
172.	Tana River	Ghofisa	Wayu Boru	Connect to electricity
173.	Tana River	Matagala	Wayu	Connect to electricity
174.	Tana River	Gururi	Gururia Pry	Connect to electricity
175.	Tana River	Matagala	Wayu Ghofisa	Connect to electricity
176.	Tana River	Lenda	Lenda Pry	Connect to electricity
177.	Tana River	Bulto Mulitu	Bulto Mulitu Pry	Connect to electricity
178.	Tana River	Bulto Abarufa	Bulto Mulitu Pry	Connect to electricity
179.	Tana River	Chewani	Chewani Pry	Connect to electricity
180.	Tana River	Kumbi	Kumbi Pry	Connect to electricity
181.	Tana River	Bahati	Bahati Pry	Connect to electricity
182.	Tana River	Umoja	Umoja Pry	Connect to electricity
183.	Tana River	Rebai	Bahati Pri	Connect to electricity
184.	Tana River	Ghalamani	Ghalamani Pry	Connect to electricity
185.	Tana River	Chifiri	Chifiri Pry	Connect to electricity
186.	Tana River	Gambo	Gambo Pry	Connect to electricity
187.	Tana River	Hakoka	Hakoka Pry	Connect to electricity
188.	Tana River	Kesi	Kesi Pry	Connect to electricity
189.	Tana River	Lakole	Lakole Pry	Connect to electricity
190.	Tana River	Wachakone	Wachakone Pry	Connect to electricity
191.	Tana River	Jarha	Wachakone Pry	Connect to electricity
192.	Tana River	Makere	Makere Pry	Connect to electricity
193.	Tana River	Daku	Daku Pry	Connect to electricity
194.	Tana River	Bohoni	Bohoni Pry	Connect to electricity
195.	Tana River	Laini	Laini Pry	Connect to electricity

196.	Tana River	Nyagwani	Nyagwani Pry	Connect to electricity
197.	Tana River	Rhoko	Rhoko Pry	Connect to electricity
198.	Tana River	Ovo	Ovo Pry	Connect to electricity
199.	Tana River	Imani	Ovo Pry	Connect to electricity
200.	Tana River	Handampia	Handampia Pry	Connect to electricity
201.	Tana River	Gafuru	Gafuru Pry	Connect to electricity
202.	Tana River	Harambee	Gafuru Pry	Connect to electricity
203.	Tana River	Bondeni	Bondeni Pry	Connect to electricity
204.	Tana River	Kelokelo	Bondeni Pry	Connect to electricity
205.	Tana River	Maweni	Maweni Pry	Connect to electricity
206.	Tana River	Fanjua	Fanjua Pry	Connect to electricity
207.	Tana River	Majengo	Majengo Pry	Connect to electricity
208.	Tana River	Boji	Majengo Pry	Connect to electricity
209.	Tana River	Jaridodi	Jaridodi Pry	Connect to electricity
210.	Tana River	Masalani	Masalani Pry	Connect to electricity
211.	Tana River	Gubani	Gubani Pry	Connect to electricity
212.	Tana River	Duwayo	Duwayo Pry	Connect to electricity
213.	Tana River	Bububu	Bububu Pry	Connect to electricity
214.	Tana River	Maroni	Maroni Pry	Connect to electricity
215.	Tana River	Hara	Hara Pry	Connect to electricity
216.	Tana River	Baksano	Baksano Pry	Connect to electricity
217.	Tana River	Vukoni	Vukoni Pry	Connect to electricity
218.	Tana River	Wenje	Wenje Pry	Connect to electricity
219.	Tana River	Mkomani	Mkomani Pry	Connect to electricity
220.	Tana River	Vukoni	Vukoni Pry	Connect to electricity
221.	Tana River	Wenje	Wenje Pry Pry	Connect to electricity
222.	Tana River	Kipendi	Wenje Pry Pry	Connect to electricity
223.	Tana North	Bawama	Bawama	Connect to electricity
224	Tana North	Hirimani	Hirimani	Connect to electricity
225.	Tana North	Damaja	Damaja	Connect to electricity
226.	Tana North	Dukanotu	Dukanotu	Connect to electricity
227.	Tana North	Subo	Subo	Connect to electricity
228.	Tana North	Al-Maghan	Subo	Connect to electricity
229.	Tana North	Kidhori	Subo	Connect to electricity
230.	Tana North	Walesorea	Walesorea	Connect to electricity
231.	Tana North	Mitobini	Mitobini	Connect to electricity
232.	Tana North	Kibhileni	Mitobini	Connect to electricity
233.	Tana North	Sabukia	Sabukia	Connect to electricity
234.	Tana North	Titila”A”	Sabukia	Connect to electricity
235.	Tana North	Bilbil Kuku	Bilbil	Connect to electricity
236.	Tana North	Bilbil Gheriba	Bilbil	Connect to electricity
237.	Tana North	Matagala	Matagala	Connect to electricity
238.	Tana North	Hosingo	Hosingo	Connect to electricity
239.	Tana North	Amani (Bura)	Amani	Connect to electricity
240.	Tana North	Darime	Darime	Connect to electricity
249.	Tana North	Chewele	Chewele	Connect to electricity
250.	Tana North	Langoni	Chewele	Connect to electricity
251.	Tana North	Baleni	Chewele	Connect to electricity
252.	Tana North	Tune	Tune	Connect to electricity
253.	Tana North	Nanighi	Nanighi	Connect to electricity

254.	Tana North	Jara	Nanighi	Connect to electricity
255.	Tana North	Kakate	Nanighi	Connect to electricity
256.	Tana North	Wekoyo	Wekoyo	Connect to electricity
257.	Tana North	Ghamano	Ghamano	Connect to electricity
258.	Tana North	Damaka	Ghamano	Connect to electricity
259.	Tana North	Bisaadi	Godia	Connect to electricity
260.	Tana North	Jajavo	Jajavo	Connect to electricity
261.	Tana North	Wadesa	Wadesa	Connect to electricity
262.	Tana North	Titila"B"	Sabukia	Connect to electricity
263.	Tana North	Walestokocha	Hosingo	Connect to electricity
264.	Tana North	Ziwani Vango	Ziwani Vango	Connect to electricity
265.	Tana North	Boji (Madogo)	Boji (Madogo)	Connect to electricity
266.	Tana North	Mbalambala	Mbalambala	Connect to electricity
267.	Tana North	Pamba	Mbalambala	Connect to electricity
268.	Tana North	Mansugda	Mbalambala	Connect to electricity
269.	Tana North	Habakik	Habakik	Connect to electricity
270.	Tana North	Mulanjo	Mulanjo	Connect to electricity
271.	Tana North	Adhama	Mulanjo	Connect to electricity
272.	Tana North	Fafbare	Mulanjo	Connect to electricity
273.	Tana North	Bara	Mulanjo	Connect to electricity
274.	Tana North	Sala	Sala	Connect to electricity
275.	Tana North	Mororo	Mororo	Connect to electricity
276.	Tana North	E-Lnino	Mororo	Connect to electricity
277.	Tana North	Samira	Mororo	Connect to electricity
278.	Tana North	Upperhill	Mororo	Connect to electricity
279.	Tana North	Bulabaraka	Mororo	Connect to electricity
280.	Tana North	Malkamansa	Malkamansa	Connect to electricity
281.	Tana North	Korati	Korati	Connect to electricity
282.	Tana North	Hatata	Hatata	Connect to electricity
283.	Tana North	K/Delight	Hatata	Connect to electricity
284.	Tana North	Ziwani	Hatata	Connect to electricity
285.	Tana North	Maramtu	Maramtu	Connect to electricity
286.	Tana North	Amani (Maramtu)	Maramtu	Connect to electricity
287.	Tana North	Bakuyu	Maramtu	Connect to electricity
289.	Tana North	Amares	Amares	Connect to electricity
290.	Tana North	Anole	Anole	Connect to electricity
291.	Tana North	Kono Ramadhan	Kono Ramadhan	Connect to electricity
292.	Tana North	Matarsesa	Kono Ramadhan	Connect to electricity
293.	Tana North	Lagbadana	Kono Ramafadha	Connect to electricity
294.	Tana North	Adele	Adele	Connect to electricity
295.	Tana North	Ruko	Ruko	Connect to electricity
296.	Tana North	Buwa	Ruko	Connect to electricity
297.	Tana North	Kabba	Ruko	Connect to electricity
298.	Tana North	Taleo	Sala	Connect to electricity
299.	Tana North	Dhidha	Sala	Connect to electricity
300.	Tana North	Buradima	Korati	Connect to electricity
301.	Tana North	Sombo	Sombo	Connect to electricity
302.	Tana North	El-Rara	El-Rara	Connect to electricity
303.	Tana North	Kamaguru	Kamaguru	Connect to electricity
304.	Tana North	Boka	Boka	Connect to electricity

305.	Tana North	Baleneka	Baleneka	Connect to electricity
306.	Tana North	Bangal	Bangal	Connect to electricity
307.	Tana North	Yakrit	Bangal	Connect to electricity
308.	Tana North	Kaniki	Bangal	Connect to electricity
309.	Tana North	Guruko	Bangal	Connect to electricity
310.	Tana North	Mitiboma	Bangal	Connect to electricity
311.	Tana North	Bisargesa	Bisargesa	Connect to electricity
312.	Tana North	Kuriti	Kuriti	Connect to electricity
313.	Tana North	Bultobanta	Bultobanta	Connect to electricity
314.	Tana North	Lebile	Bultobanta	Connect to electricity
315.	Tana North	Tula	Tula	Connect to electricity

Table 89: ECDEs with faulty PV systems

No.	Name of ECDE centre	Sub County	Ward
1.	El-Rar	Tana North	Bangal
2.	Boka	Tana North	Bangal
3.	Ziwani Vango	Tana North	Sala
4.	Baleneka	Tana North	Bangal
5.	Bisargesa	Tana North	Bangal
6.	Kuriti	Tana North	Bangal
7.	Bultobanta	Tana North	Bangal
8.	Korati	Tana North	Madogo
9.	Malkamansa	Tana North	Madogo

10.10 List of primary schools in need of connection and repair of Solar PV system

Table 90: List of primary schools in need of electricity connection

No.	Name of Institution	Sub-County	Proposed solution
1.	Abaganda	Tana Delta	Connect to solar PV system
2.	Adele Primary	Bangale	Connect to solar PV system
3.	Assa	Tana Delta	Connect to solar PV system
4.	B/Kone	Tana Delta	Connect to solar PV system
5.	Baksano Primary	Tana River	Connect to solar PV system
6.	Bubesa	Tana Delta	Connect to solar PV system
7.	Bula Rahma	Tana Delta	Connect to solar PV system
8.	Chewani	Tana River	Connect to solar PV system
9.	Danisa	Tana Delta	Connect to solar PV system
10.	Furaha	Tana Delta	Connect to solar PV system
11.	Gadeni	Tana Delta	Connect to solar PV system
12.	Ghalamani Primary	Tana River	Connect to solar PV system
13.	Hayole	Tana Delta	Connect to solar PV system
14.	Jarirodi	Tana River	Connect to solar PV system
15.	Kau	Tana Delta	Connect to solar PV system
16.	Kibusu	Tana Delta	Connect to solar PV system
17.	Kilelengwani	Tana Delta	Connect to solar PV system
18.	Kinyadu	Tana Delta	Connect to solar PV system
19.	Kitere	Tana Delta	Connect to solar PV system
20.	Konkona	Tana Delta	Connect to solar PV system
21.	Konoramadha Primary	Bangale	Connect to solar PV system
22.	Lailoni Primary School	Tana Delta	Connect to solar PV system
23.	Maderte	Tana Delta	Connect to solar PV system
24.	Makere	Tana River	Connect to solar PV system
25.	Makini	Tana North	Connect to solar PV system
26.	Makini	Tana North	Connect to solar PV system
27.	Masalani	Tana River	Connect to solar PV system
28.	Maziwa	Tana Delta	Connect to solar PV system
29.	Mchelelo	Tana Delta	Connect to solar PV system
30.	Meti Primary	Tana North	Connect to solar PV system
31.	Miticharaka	Tana Delta	Connect to solar PV system
32.	Mto Kilifi	Tana Delta	Connect to solar PV system
33.	Ngumu	Tana Delta	Connect to solar PV system
34.	Odoganda	Tana Delta	Connect to solar PV system
35.	Ongonyo	Tana Delta	Connect to solar PV system
36.	Onkolde	Tana Delta	Connect to solar PV system
37.	Ozi	Tana Delta	Connect to solar PV system
38.	Shirikisho	Tana Delta	Connect to solar PV system
39.	Tana Kurole	Tana Delta	Connect to solar PV system
40.	Tarasaa	Tana Delta	Connect to solar PV system
41.	Tulu	Tana Delta	Connect to solar PV system
42.	Uhuru Kenyatta	Tana Delta	Connect to solar PV system
43.	Ushindi	Tana Delta	Connect to solar PV system
44.	Yaqrit Primary	Bangale	Connect to solar PV system
45.	Ziwani -Vango Primary	Bangale	Connect to solar PV system

Table 91: Primary schools with faulty PV systems

No.	Name of Primary School	Sub-County
1.	Anole Primary	Bangale
2.	Baleneka Primary	Bangale
3.	Baomo Primary	Tana Delta
4.	Bilbil Primary	Tana North
5.	Bisargesa Primary	Bangale
6.	Boka Primary	Bangale
7.	Bultomulito Primary	Tanariver
8.	Bura Kofira Primary	Tana Delta
9.	Chifiri Primary	Tana River
10.	Daba School Primary	Gale Dyertu
11.	Daku Primary	Tana River
12.	Dalu Primary	Tana Delta
13.	Darime Primary	Tana North
14.	Dibe Primary	Tana Delta
15.	Dukanotu Primary	Tana North
16.	Dukanotu Primary	Tana North
17.	Duwayo Primary	Tana River
18.	El-Rar Primary	Bangale
19.	Galili Primary	Tana Delta
20.	Galma Primary	Tana Delta
21.	Gatundu Primary	Tana Delta
22.	Gururi Primary	Gale Dyertu
23.	Habakik Primary	Bangale
24.	Hakoka Primary	Gale Dyertu
25.	Handaraku Primary	Tana Delta
26.	Sabukia Primary	Tana North
27.	Haroresa Primary	Tana River
28.	Hirimani Primary	Tana North
29.	Hosingo Primary	Tana North
30.	Huruma Primary	Tana North
31.	Imani Primary	Tana Delta
32.	Jajavo Primary	Tana North
33.	Kamaguru Primary	Bangale
34.	Kaniki Primary	Tana North
35.	Kaniki Primary	Tana North
36.	Katsangani Primary	Tana Delta
37.	Kiarukungu Primary	Tana River
38.	Korati Primary	Bangale
39.	Koticha Primary	Gale Dyertu
40.	Kuriti Primary	Bangale
41.	Lazima Primary	Tana Delta
42.	Majiweni Primary	Tana Delta
43.	Malkamasa Primary	Bangale
44.	Mapunga Primary	Tana Delta
45.	Maramtu Primary	Bangale
46.	Marembo Primary	Tana Delta
47.	Matagala Primary	Tana North
48.	Matangeni Primary	Tana Delta
49.	Mbalambala Primary	Bangale
50.	Mnazini Primary	Tana Delta
51.	Mulanjo Primary	Bangale
52.	Mumbuji Primary	Tana Delta
53.	Mwina Primary	Tana Delta
54.	Nanighi Primary	Tana North
55.	Nduru Primary	Tana Delta
56.	Odole Primary	Tana Delta
57.	Onwardei Primary	Tana Delta
58.	Riketa Primary	Tana Delta
59.	Ruko Primary	Bangale
60.	Sabukia Primary	Tana North
61.	Sera Primary	Tana Delta
62.	Shauri Moyo Primary	Tana Delta
63.	Sombo Primary	Bangale
64.	Subo Primary	Tana North
65.	Titila Primary	Galledyertu
66.	Waldena Primary	Tana River
67.	Walesorea Primary	TANA North
68.	Wayu School	Gale Dyertu
69.	Wayuboro Primary	Gale Dyertu
70.	Wekoye Primary	Tana North
71.	Ziwani Primary	Tana Delta

10.11 List of secondary schools in need of connection and repair of Solar PV system

Table 92: List of secondary schools in need of connection and repair of Solar PV system

Name of Institution	Sub County	Availability of power supply	Main source of power
Masabubu Secondary School	Tana River	No	Connect to electricity
Oda Secondary School	Tana Delta	No	Connect to electricity
Hurara Secondary School	Tana Delta	No	Connect to electricity
Kipao Secondary School	Tana Delta	No	Connect to electricity
Hashaka Secondary School	Tana Delta	No	Connect to electricity
Dalu Secondary School	Tana Delta	No	Connect to electricity
Kipini Girls Secondary School	Tana Delta	No	Connect to electricity
Madogo Secondary School	Bangale	No	Connect to electricity
Kora Secondary School	Bangale	Yes	Solar PV - Faulty
Mororo Mixed Day Secondary School	Bangale	Yes	Solar PV - Faulty
Bangale Mixed Day & Boarding Secondary School	Bangale	Yes	Solar PV - Faulty
Singwaya Secondary School	Tana North	Yes	Solar PV - Faulty
Fayya Girls Secondary School	Tana North	Yes	Solar PV - Faulty
Charidende Secondary School	Tana North	Yes	Solar PV - Faulty
Hirimani Secondary School	Tana North	Yes	Solar PV - Faulty
Huruma Secondary School	Tana North	Yes	Solar PV - Faulty
Nanighi Tana Secondary School	Tana North	Yes	Solar PV - Faulty

10.12 List of VTCs in need of connection and upgrade to three-phase

Table 93: List of VTCs in need of connection and upgrade to three-phase

Name of VTC	Sub-County	Type of connection	Proposed solution
Kipini VTC (Kipini west)	Tana Delta	Singe phase	Upgrade to 3-phase
Tarasaa VTC (Garsen South)	Tana Delta	Single phase	Upgrade to 3-phase
Odha VTC (Garsen South)	Tana Delta	Single phase	Upgrade to 3-phase
Garsen VTC (Garsen South)	Tana Delta	Single phase	Upgrade to 3-phase
Madogo VTC (Madogo)	Tana North	Single phase	Upgrade to 3-phase
Hurara VTC (Madogo)	Tana Delta	No connection	Connect to solar PV
Wenje VTC (Madogo)	Tana River	No connection	Connect to solar PV

10.13 List of 3 Level 4 facilities in need of grid supply upgrade and water heating system

Table 94: List of 3 Level 4 facilities in need of grid supply upgrade and water heating system

No.	Name of facility	Sub-County	Type of connection	Proposed solution
1.	Bura Sub-County Hospital	Tana North	2-phase	Upgrade to 3-phase and provide water heating system
2.	Hola District Hospital	Tana River	3-phase	Provide Water Heating System
3.	Ngao District Hospital	Tana Delta	3-phase	Provide Water Heating System

10.14 List of 3 Level 3 facilities in need of power backup and water heating system

Table 95: List of 3 Level 3 facilities in need of power backup and water heating system

No.	Name of facility	Sub-County	Type of connection	Proposed solution
1.	Madogo Health Centre	Tana North	3-phase	Power backup and water heating system
2.	Garsen Health Centre	Tana Delta	3-phase	Power backup and water heating system
3.	Kipini Health Centre	Tana Delta	3-phase	Power backup and water heating system

10.15 List of 10 Level 2 facilities with connection but in need of backup and water heating system

Table 96: List of 10 Level 2 facilities with connection but in need of backup and water heating system

No.	Name of health facility	Sub County	Proposed solution
1.	Roka	Bura	Solar backup and water heating system
2.	Pumwani Dispensary	Galole	Solar backup and water heating system
3.	Oda Dispensary	Garsen	Solar backup and water heating system
4.	Idsowe Dispensary	Garsen	Solar backup and water heating system
5.	Makere Dispensary	Galole	Solar backup and water heating system
6.	GK Prisons Dispensary (Tana River)	Galole	Solar backup and water heating system
7.	Majengo Dispensary (Tana River)	Galole	Solar backup and water heating system
8.	Chewani Dispensary	Galole	Solar backup and water heating system
9.	Wenje Dispensary	Galole	Solar backup and water heating system
10.	Maziwa Dispensary	Garsen	Solar backup and water heating system

10.16 List of 37 Level 2 facilities in need of connection and water heating system

Table 97: List of 37 level 2 facilities in need of connection and water heating system

No.	Name of health facility	Sub county	Proposed solution
1.	Kone Dispensary	Garsen	Connect to electricity and provide water heating system
2.	Mandingo Dispensary	Garsen	Connect to electricity and provide water heating system
3.	Bilbil Dispensary (Tana North)	Bura	Connect to electricity and provide water heating system
4.	Sabukia Dispensary (Tana North)	Bura	Connect to electricity and provide water heating system
5.	Mororo Dispensary	Bura	Connect to electricity and provide water heating system
6.	Lenda Dispensary	Galole	Connect to electricity and provide water heating system
7.	Tana River County Beyond Zero Clinic	Galole	Connect to electricity and provide water heating system
8.	Kitere Minhaj Dispensary	Garsen	Connect to electricity and provide water heating system
9.	Buwa	Bura	Connect to electricity and provide water heating system
10.	Wayu Boru	Galole	Connect to electricity and provide water heating system
11.	Meti Dispensary	Bura	Connect to electricity and provide water heating system
12.	Haroresa	Galole	Connect to electricity and provide water heating system
13.	Bura Nomadic	Galole	Connect to electricity and provide water heating system
14.	Boka	Galole	Connect to electricity and provide water heating system
15.	Kilelengwani Dispensary	Garsen	Connect to electricity and provide water heating system
16.	Kinyadu Dispensary	Garsen	Connect to electricity and provide water heating system
17.	Shirikisho Medical Dispensary	Garsen	Connect to electricity and provide water heating system
18.	Mlanjo Dispensary	Bura	Connect to electricity and provide water heating system
19.	Kulesa Dispensary	Garsen	Connect to electricity and provide water heating system
20.	Assa Dispensary	Garsen	Connect to electricity and provide water heating system
21.	Mnazini Dispensary	Garsen	Connect to electricity and provide water heating system
22.	Galili Dispensary	Garsen	Connect to electricity and provide water heating system
23.	Kau Dispensary	Garsen	Connect to electricity and provide water heating system
24.	Kipao Dispensary	Garsen	Connect to electricity and provide water heating system
25.	Ozi Dispensary	Garsen	Connect to electricity and provide water heating system
26.	Semikaro Dispensary	Garsen	Connect to electricity and provide water heating system
27.	Sombo Dispensary	Bura	Connect to electricity and provide water heating system
28.	Sera Dispensary	Garsen	Connect to electricity and provide water heating system
29.	Mbalambala Dispensary	Bura	Connect to electricity and provide water heating system
30.	Charidende Dispensary (CDF)	Bura	Connect to electricity and provide water heating system
31.	Chifiri Dispensary (LATIF)	Galole	Connect to electricity and provide water heating system
32.	Nanighi Dispensary (Tana River)	Bura	Connect to electricity and provide water heating system
33.	Chewele Dispensary	Bura	Connect to electricity and provide water heating system
34.	Bangali Dispensary	Bura	Connect to electricity and provide water heating system
35.	Wayu Dispensary	Galole	Connect to electricity and provide water heating system
36.	Waldena Dispensary	Galole	Connect to electricity and provide water heating system
37.	Mwina Dispensary	Garsen	Connect to electricity and provide water heating system

10.17 List of all water and small earth dams supplying water consumption – disaggregated as per the sponsoring entity

Table 98:List of all water and small earth dams supplying water consumption – disaggregated as per the sponsoring entity

No.	Name	Sponsoring/ Implementing Agency
County Government		
1.	Rigley	County Government
2.	Doke	County Government
3.	Water Pan	County Government
4.	Chirfa ya Juu	County Government
5.	Konekaliti Dam	County Government of Tana River
6.	Walidena Dam	County Government of Tana River
7.	Idi Dam	County Government
8.	Dujume Water Pan	County Government
9.	Habakik	County Development Programme
10.	Titila Muka	County Government
11.	Lakole 1 Water Pan	County Government of Tana River
12.	Harra Bulagabharani Water Pan	County Government of Tana River
13.	Lakole1 Water Pan	County Government of Tana River
14.	Oda Water Pan	County Government of Tana River
15.	Odo Ganda Water Pan	CGTR
National Government		
1.	Damage Water Pan	National Irrigation Board (NIB)
2.	Dayate Mega Water Pan	National Drought Management Authority (NDMA)
3.	Kiari Kungu	National Irrigation Authority (NIA)
4.	Dayat Water Pan	NDMA
5.	Water Reservoir	NIB
6.	Tayate Dam	NIA
7.	Amares	National Youth Service (NYS)
8.	Chardende Water Pan	County Development Fund (CDF)
9.	Koinobori	National Government
10.	Wange	National Government
11.	Kurumen	National Government/National Government Constituencies Development Fund (NG-CDF)
12.	Mangeri Water Pan	National Government
13.	Water Pan	Coast Water Service Board (CWSB)
14.	Amares Water Pan	NYS
15.	Water Pan	CWSB
16.	Giriwa Water Pan	NYS
17.	Twin dam 2	National Government
18.	Koti	National Government
19.	Water Pan	CDF in 2013
20.	Tawfiq Water Pan	CDF
21.	Gafuru Dam	National Water Harvesting and Storage Authority
22.	Marere Dam	National Water Harvesting and Storage Authority
23.	Tawfiq Water Pan	CDF
24.	Boji Earth Pan	CWSB
25.	Boji Earth Pan	CWSB

No.	Name	Sponsoring/ Implementing Agency
26.	Dfp	Ministry of Agriculture and Livestock Development
27.	ASSA Water Pan	NYS 1989
28.	Water Pan Assa	NDMA
29.	Chirfa Juu Water Pan	NDMA
30.	Mkomani Earth Dam	National Government through Small-Scale Irrigation and Value Addition Project (SIVAP)
31.	Mitiboma Water Pan	National Government
32.	Dargakora Haroresa Pan	National Government
33.	Haroresa Dam	National Government
34.	Areri Water Pan	Coast Development Authority
35.	Assa Water Pan	NYS since 1989
36.	Water Pan	NYS
37.	Gerarsa Water Pan (the second)	NDMA
38.	Gerarsa (Ndogo) Water Pan	NDMA
39.	Harambee Dam	National Government
40.	Sera Water Pan	National Government
41.	Baldos ki Rer Abdi Rowa	CWSB
42.	Burki Water Pan	National Government
43.	Sabukiye Water Pan	National Government
44.	Kesi Water Pan	NIB
45.	Odoganda Water Pan in Assa (Garsen West Ward)	Water Sector Trust Fund (WSTF)
46.	Takee Dam	National Government
47.	Oddoganda Dam	WSTF
48.	Lakole 2 Water Point	National Government/ World Bank
49.	Chuma Mrefu Water Pan	National Government
50.	Kuno Aro Dam	National Government, Equalisation Fund
51.	Matagala Water Pan	CWSB
52.	Bula Sukele Water Pan	National Government
53.	Bisahargesa Water Pan	National Government
54.	Daba Water Pan	National Government
55.	Hor Chompo Water Pan	National Government
56.	Bulto Abarufa Water Pan	NDMA
Development partners		
1.	Kiarkungu	Kiarkungu Water Reservoir
2.	Tana Water Pan	
3.	Libile Buldoz	World Bank
4.	Labile Buldoz	Road contractor
5.	Water Pan	Agri Germany
6.	Water Pan	Agro Germany
7.	Water Pan	Agro Germany
8.	Tula Water Pan	Catholic Diocese of Garissa
9.	Baleneka Dam	Baleneka Community Group
10.	Kitchen Garden	PGI
11.	Korre	CWSB
12.	Baleneka Dam	Baleneka Community Group
13.	Water Pan	
14.	Amares Water Pan	
15.	Water Pan	Community/National Government/CDF

No.	Name	Sponsoring/ Implementing Agency
16.	Baleneka Dam	Baleneka Community Group
17.	Dorga	Community
18.	Boji Earth Pan	CWSB
19.	Onjila 1	Islamic Relief
20.	Dfp Water Pan	Timuntim
21.	Water Pan	European Union (EU)
22.	Danabale Dam	KCSAP
23.	Ziwa Dianje	Natural
24.	Gerarsa Water Pan	
25.	Baridi Water Pan	
26.	Kalkacha Dam	Catholic Relief Services (C.R.S)
27.	Onjila Water Pan	Islamic Relief
28.	Tilting Water Dam	Community
29.	Haboye Water Pan	Community
30.	Makere ya Gwano Water Project	Kenya Climate Smart
31.	Baldos Silig	Kenya Red Cross
32.	Gerarsa water pan	Liban (a donor)
33.	Didaade Water Pan	World Bank
34.	Gerasa Water Pan	Liban (a donor)
35.	Water Pan	Charity Magiri Manene
36.	Lakole 2 Water Pan	World Bank
38.	Water Pan, Odo Ganda	Team and Team
39.	Hamese Water Pan	Community
40.	Bangale Dam	World Bank
41.	Koti Nyogora Water Pan	Don't know
42.	Halo Water Pan	Don't know
43.	Mji wa Pili Garsen Borehole 1	Team and Team
44.	Daneste 2	Well wisher
45.	Wayu Boro Magiri Dam	CRS Garissa Diocese
46.	Hor Osmani, Wayu Boro Dam 2	
47.	Dam	Community
48.	County Government	Siligle Basin Hargeisa
49.	Water Pan at Ege Kumbi Village	Natural
50.	Hor Shungi	Initially developed by a private Entity but renovated by County Government of Tana River
51.	HOR Wardey	Name not provided
52.	Hor Jarso	Private entity

10.18 ECDEs in need of clean cooking solutions

Table 99:ECDEs in need of clean cooking solutions

No.	Sub-County	ECDE Centre	School Attached	Proposed solution
1.	Tana Delta	Assa	Assa Primary	Improved Institutional stove & modern kitchen
2.	Tana Delta	Onjilla	Assa Primary	Improved Institutional stove & modern kitchen
3.	Tana Delta	Danisa	Danisa Primary	Improved Institutional stove & modern kitchen
4.	Tana Delta	Dumi	Danisa Primary	Improved Institutional stove & modern kitchen
5.	Tana Delta	Furaha	Danisa Primary	Improved Institutional stove & modern kitchen
6.	Tana Delta	Bilisa	Bilisa Primary	Improved Institutional stove & modern kitchen
7.	Tana Delta	Korlabe	Bilisa Primary	Improved Institutional stove & modern kitchen
8.	Tana Delta	Imani	Imani Primary	Improved Institutional stove & modern kitchen
9.	Tana Delta	Didaade	Didaade Primary	Improved Institutional stove & modern kitchen
10.	Tana Delta	Ramadha	Dadaade Primary	Improved Institutional stove & modern kitchen
11.	Tana Delta	Iqra	Didaade Primary	Improved Institutional stove & modern kitchen
12.	Tana Delta	Maua	Maua Primary	Improved Institutional stove & modern kitchen
13.	Tana Delta	Tulu	Maua Primary	Improved Institutional stove & modern kitchen
14.	Tana Delta	Bora Imani	Maua Primary	Improved Institutional stove & modern kitchen
15.	Tana Delta	Onkolde	Onkolde Primary	Improved Institutional stove & modern kitchen
16.	Tana Delta	R/Mwewe	R/Mwewe Primary	Improved Institutional stove & modern kitchen
17.	Tana Delta	Gamba	Gamba Primary	Improved Institutional stove & modern kitchen
18.	Tana Delta	Peponi	Gamba Primary	Improved Institutional stove & modern kitchen
19.	Tana Delta	Lango	Gamba Primary	Improved Institutional stove & modern kitchen
20.	Tana Delta	Odoganda	Odoganda Primary	Improved Institutional stove & modern kitchen
21.	Tana Delta	Kibususera	Kibususera Primary	Improved Institutional stove & modern kitchen
22.	Tana Delta	Ngumu	Ngumu Primary	Improved Institutional stove & modern kitchen
23.	Tana Delta	Maziwa	Maziwa Primary	Improved Institutional stove & modern kitchen
24.	Tana Delta	Manna	Maziwa Primary	Improved Institutional stove & modern kitchen
25.	Tana Delta	Garsen	Garsen Primary	Improved Institutional stove & modern kitchen
26.	Tana Delta	Konkona	Garsen Primary	Improved Institutional stove & modern kitchen
27.	Tana Delta	Vuria	Garsen Primary	Improved Institutional stove & modern kitchen
28.	Tana Delta	Little Angels	Garsen Primary	Improved Institutional stove & modern kitchen
29.	Tana Delta	Dalu	Dalu Primary	Improved Institutional stove & modern kitchen
30.	Tana Delta	Abaganda	Abaganda Primary	Improved Institutional stove & modern kitchen
31.	Tana Delta	Idsowe	Idsowe Primary	Improved Institutional stove & modern kitchen
32.	Tana Delta	Goodluck	Idsowe Primary	Improved Institutional stove & modern kitchen
33.	Tana Delta	Sheli	Sheli Primary	Improved Institutional stove & modern kitchen
34.	Tana Delta	Gadeni	Gadeni Primary	Improved Institutional stove & modern kitchen
35.	Tana Delta	Galma	Galma Primary	Improved Institutional stove & modern kitchen
36.	Tana Delta	Marembo	Marembo Primary	Improved Institutional stove & modern kitchen
37.	Tana Delta	Minjila	Minjila Primary	Improved Institutional stove & modern kitchen
38.	Tana Delta	Minjila Agr	Minjila Primary	Improved Institutional stove & modern kitchen
39.	Tana Delta	Kulesa	Kulesa Primary	Improved Institutional stove & modern kitchen
40.	Tana Delta	Kiembeni	Kulesa Primary	Improved Institutional stove & modern kitchen
41.	Tana Delta	Bisadi Kone	Bisadi Kone Primary	Improved Institutional stove & modern kitchen
42.	Tana Delta	Iddi	Iddi Primary	Improved Institutional stove & modern kitchen
43.	Tana Delta	Bula Rahma	Bula Rahma Primary	Improved Institutional stove & modern kitchen
44.	Tana Delta	Golbanti	Golbanti Primary	Improved Institutional stove & modern kitchen
45.	Tana Delta	Hurara	Hurara Primary	Improved Institutional stove & modern kitchen
46.	Tana Delta	Galili	Galili Primary	Improved Institutional stove & modern kitchen

No.	Sub-County	ECDE Centre	School Attached	Proposed solution
47.	Tana Delta	Gomesa	Galili Primary	Improved Institutional stove & modern kitchen
48.	Tana Delta	Uhuru Kenyata	Uhuru Kenya Primary	Improved Institutional stove & modern kitchen
49.	Tana Delta	Dibe	Dibe Primary	Improved Institutional stove & modern kitchen
50.	Tana Delta	Tana Kurole	Tana Kurole Primary	Improved Institutional stove & modern kitchen
51.	Tana Delta	Handaraku	Handaraku Primary	Improved Institutional stove & modern kitchen
52.	Tana Delta	Lailoni	Handaraku Primary	Improved Institutional stove & modern kitchen
53.	Tana Delta	Semikaro	Semikaro Primary	Improved Institutional stove & modern kitchen
54.	Tana Delta	Nduru	Nduru Primary	Improved Institutional stove & modern kitchen
55.	Tana Delta	Mataarba	Nduru Primary	Improved Institutional stove & modern kitchen
56.	Tana Delta	Tara	Nduru Primary	Improved Institutional stove & modern kitchen
57.	Tana Delta	Najah	Najah Primary	Improved Institutional stove & modern kitchen
58.	Tana Delta	Furaha	Furaha Primary	Improved Institutional stove & modern kitchen
59.	Tana Delta	Kikoroto	Furaha Primary	Improved Institutional stove & modern kitchen
60.	Tana Delta	Mademo	Furaha Primary	Improved Institutional stove & modern kitchen
61.	Tana Delta	Gubani	Furaha Primary	Improved Institutional stove & modern kitchen
62.	Tana Delta	Chamwanamuma	Chamwanamuma Primary	Improved Institutional stove & modern kitchen
63.	Tana Delta	Milimani	Tarasaa Primary	Improved Institutional stove & modern kitchen
64.	Tana Delta	Tarasaa	Tarasaa Primary	Improved Institutional stove & modern kitchen
65.	Tana Delta	Manyatta	Tarasaa Primary	Improved Institutional stove & modern kitchen
66.	Tana Delta	Onwardei	Onwardei Primary	Improved Institutional stove & modern kitchen
67.	Tana Delta	Bura Anaan	Onwardei Primary	Improved Institutional stove & modern kitchen
68.	Tana Delta	Arap Moi	Arap Moi Primary	Improved Institutional stove & modern kitchen
69.	Tana Delta	Kibokoni	Kibokoni Primary	Improved Institutional stove & modern kitchen
70.	Tana Delta	Bura Kofira	Bura Kofira Primary	Improved Institutional stove & modern kitchen
71.	Tana Delta	Maderte	Bura Kofira Primary	Improved Institutional stove & modern kitchen
72.	Tana Delta	Ongonyo	Ongonyo Primary	Improved Institutional stove & modern kitchen
73.	Tana Delta	Odole	Odole Primary	Improved Institutional stove & modern kitchen
74.	Tana Delta	Samicha	Odole Primary	Improved Institutional stove & modern kitchen
75.	Tana Delta	Shirikisho	Shirikisho Primary	Improved Institutional stove & modern kitchen
76.	Tana Delta	Marafa	Shirikisho Primary	Improved Institutional stove & modern kitchen
77.	Tana Delta	Bora Moyo	Shirikisho Primary	Improved Institutional stove & modern kitchen
78.	Tana Delta	Darga	Shirikisho Primary	Improved Institutional stove & modern kitchen
79.	Tana Delta	Kipao	Kipao Primary	Improved Institutional stove & modern kitchen
80.	Tana Delta	Darartu	Kipao Primary	Improved Institutional stove & modern kitchen
81.	Tana Delta	Mooti-Mooti	Kipao Primary	Improved Institutional stove & modern kitchen
82.	Tana Delta	Haroru	Kipao Primary	Improved Institutional stove & modern kitchen
83.	Tana Delta	Miticharaka	Miticharaka Primary	Improved Institutional stove & modern kitchen
84.	Tana Delta	Baraka	Miticharaka Primary	Improved Institutional stove & modern kitchen
85.	Tana Delta	Katsangani	Katsangani Primary	Improved Institutional stove & modern kitchen
86.	Tana Delta	Mto-Tana	Katsangani Primary	Improved Institutional stove & modern kitchen
87.	Tana Delta	Mto-Kilifi	Katsangani Primary	Improved Institutional stove & modern kitchen
88.	Tana Delta	Mkwajuni	Katsangani Primary	Improved Institutional stove & modern kitchen
89.	Tana Delta	Kikomo	Kikomo Primary	Improved Institutional stove & modern kitchen
90.	Tana Delta	Riketa	Riketa Primary	Improved Institutional stove & modern kitchen
91.	Tana Delta	Matangeni	Matangeni Primary	Improved Institutional stove & modern kitchen
92.	Tana Delta	Kizuliani	Matangeni Primary	Improved Institutional stove & modern kitchen
93.	Tana Delta	Bula Mnazi	Matangeni Primary	Improved Institutional stove & modern kitchen
94.	Tana Delta	Kilelengwani	Kilelengwani Primary	Improved Institutional stove & modern kitchen
95.	Tana Delta	Kilunguni	Kilelengwani Primary	Improved Institutional stove & modern kitchen

No.	Sub-County	ECDE Centre	School Attached	Proposed solution
96.	Tana Delta	Tizama Lako	Kilelengwani Primary	Improved Institutional stove & modern kitchen
97.	Tana Delta	Kau	Kau Primary	Improved Institutional stove & modern kitchen
98.	Tana Delta	Ziwani	Ziwani Primary	Improved Institutional stove & modern kitchen
99.	Tana Delta	Mvikoni	Ziwani Primary	Improved Institutional stove & modern kitchen
100.	Tana Delta	Kaloleni	Ziwani Primary	Improved Institutional stove & modern kitchen
101.	Tana Delta	Canaan Bora	Canaan Bora Primary	Improved Institutional stove & modern kitchen
102.	Tana Delta	Grace Pefa	Canaan Bora Primary	Improved Institutional stove & modern kitchen
103.	Tana Delta	Mapunga	Mapunga Primary	Improved Institutional stove & modern kitchen
104.	Tana Delta	Tumaini	Mapunga Primary	Improved Institutional stove & modern kitchen
105.	Tana Delta	Neema	Mapunga Primary	Improved Institutional stove & modern kitchen
106.	Tana Delta	Kipini	Kipini Primary	Improved Institutional stove & modern kitchen
107.	Tana Delta	Shauri Moyo	Shauri Moyo Primary	Improved Institutional stove & modern kitchen
108.	Tana Delta	Ozi	Ozi Primary	Improved Institutional stove & modern kitchen
109.	Tana Delta	Mpeketoni	Ozi Primary	Improved Institutional stove & modern kitchen
110.	Tana Delta	Majiweni	Majiweni	Improved Institutional stove & modern kitchen
111.	Tana Delta	Millenia	Majiweni Primary	Improved Institutional stove & modern kitchen
112.	Tana Delta	Mchelelo	Mchelelo Primary	Improved Institutional stove & modern kitchen
113.	Tana Delta	Gatundu	Gatundu Primary	Improved Institutional stove & modern kitchen
114.	Tana Delta	Baomo	Baomo Primary	Improved Institutional stove & modern kitchen
115.	Tana Delta	Kitere	Kitere Primary	Improved Institutional stove & modern kitchen
116.	Tana Delta	Choa	Kitere Primary	Improved Institutional stove & modern kitchen
117.	Tana Delta	Kinyadu	Kinyadu Primary	Improved Institutional stove & modern kitchen
118.	Tana Delta	Peponi	Peponi Primary	Improved Institutional stove & modern kitchen
119.	Tana Delta	Mumbuji	Mumbuji Primary	Improved Institutional stove & modern kitchen
120.	Tana Delta	Bahati	Bahati Primary	Improved Institutional stove & modern kitchen
121.	Tana Delta	Mnazini	Mnazini Primary	Improved Institutional stove & modern kitchen
122.	Tana Delta	Mwina	Mwina Primary	Improved Institutional stove & modern kitchen
123.	Tana Delta	Lazima	Lazima Primary	Improved Institutional stove & modern kitchen
124.	Tana Delta	Bubesa	Bubesa Primary	Improved Institutional stove & modern kitchen
125.	Tana River	Rafiki	Rafiki Primary	Improved Institutional stove & modern kitchen
126.	Tana River	Imani	Rafiki Primary	Improved Institutional stove & modern kitchen
127.	Tana River	Sorani	Rafiki Primary	Improved Institutional stove & modern kitchen
128.	Tana River	Harmony	Rafiki Primary	Improved Institutional stove & modern kitchen
129.	Tana River	B/Salama	Rafiki Primary	Improved Institutional stove & modern kitchen
130.	Tana River	Kalaule	Rafiki Primary	Improved Institutional stove & modern kitchen
131.	Tana River	Hola	Hola Primary	Improved Institutional stove & modern kitchen
132.	Tana River	Noor Muslim	Hola Primary	Improved Institutional stove & modern kitchen
133.	Tana River	Hola Methodist	Hola Primary	Improved Institutional stove & modern kitchen
134.	Tana River	Bright Future	Hola Primary	Improved Institutional stove & modern kitchen
135.	Tana River	Bismillahi	Laza Primary	Improved Institutional stove & modern kitchen
136.	Tana River	G.K Prison	Laza Primary	Improved Institutional stove & modern kitchen
137.	Tana River	M/Ngwena	Laza Primary	Improved Institutional stove & modern kitchen
138.	Tana River	High Vision	Laza Primary	Improved Institutional stove & modern kitchen
139.	Tana River	Parent Hope	Laza Primary	Improved Institutional stove & modern kitchen
140.	Tana River	Mikiduni	Mikinduni Primary	Improved Institutional stove & modern kitchen
141.	Tana River	Neema	Mikinduni Primary	Improved Institutional stove & modern kitchen
142.	Tana River	Emaus	Mikinduni Primary	Improved Institutional stove & modern kitchen
143.	Tana River	Kone	Kone Primary	Improved Institutional stove & modern kitchen
144.	Tana River	Tunu	Kone Primary	Improved Institutional stove & modern kitchen

No.	Sub-County	ECDE Centre	School Attached	Proposed solution
145.	Tana River	Watta	Kone Primary	Improved Institutional stove & modern kitchen
146.	Tana River	Kiarikungu	Kiarikungu Primary	Improved Institutional stove & modern kitchen
147.	Tana River	Daba	Daba Primary	Improved Institutional stove & modern kitchen
148.	Tana River	Daba Aic	Daba Primary	Improved Institutional stove & modern kitchen
149.	Tana River	Kitole	Daba Primary	Improved Institutional stove & modern kitchen
150.	Tana River	Malka Dende	Daba Primary	Improved Institutional stove & modern kitchen
151.	Tana River	Waldena	Waldena Primary	Improved Institutional stove & modern kitchen
152.	Tana River	Kone Kaliti	Waldena Primary	Improved Institutional stove & modern kitchen
153.	Tana River	Haboye	Waldena Primary	Improved Institutional stove & modern kitchen
154.	Tana River	Kotole	Waldena Primary	Improved Institutional stove & modern kitchen
155.	Tana River	Doke	Waldena Primary	Improved Institutional stove & modern kitchen
156.	Tana River	Koticha	Koticha Primary	Improved Institutional stove & modern kitchen
157.	Tana River	Milima	Koticha Primary	Improved Institutional stove & modern kitchen
158.	Tana River	Kalkacha	Kalkacha Primary	Improved Institutional stove & modern kitchen
159.	Tana River	Odowan	Kalkacha Primary	Improved Institutional stove & modern kitchen
160.	Tana River	Dayate	Kalkacha Primary	Improved Institutional stove & modern kitchen
161.	Tana River	Nys	Kalkacha Primary	Improved Institutional stove & modern kitchen
162.	Tana River	Maderte	Kalkacha Primary	Improved Institutional stove & modern kitchen
163.	Tana River	Kalalani	Kalalani Primary	Improved Institutional stove & modern kitchen
164.	Tana River	Dida Ade	Kalalani Primary	Improved Institutional stove & modern kitchen
165.	Tana River	Titila	Titila Primary	Improved Institutional stove & modern kitchen
166.	Tana River	Anabu	Titila Primary	Improved Institutional stove & modern kitchen
167.	Tana River	Ongola	Titila Primary	Improved Institutional stove & modern kitchen
168.	Tana River	Chanani	Chanani Primary	Improved Institutional stove & modern kitchen
169.	Tana River	Hola Lisa	Hola Lisa Primary	Improved Institutional stove & modern kitchen
170.	Tana River	Wayu Boru	Wayu Boru Primary	Improved Institutional stove & modern kitchen
171.	Tana River	Maua	Wayu Boru Primary	Improved Institutional stove & modern kitchen
172.	Tana River	Ghofisa	Wayu Boru Primary	Improved Institutional stove & modern kitchen
173.	Tana River	Matagala	Wayu Primary	Improved Institutional stove & modern kitchen
174.	Tana River	Gururi	Gururia Primary	Improved Institutional stove & modern kitchen
175.	Tana River	Matagala	Wayu Ghofisa Primary	Improved Institutional stove & modern kitchen
176.	Tana River	Lenda	Lenda Primary	Improved Institutional stove & modern kitchen
177.	Tana River	Bulto Mulitu	Bulto Mulitu Primary	Improved Institutional stove & modern kitchen
178.	Tana River	Bulto Abarufa	Bulto Mulitu Primary	Improved Institutional stove & modern kitchen
179.	Tana River	Chewani	Chewani Primary	Improved Institutional stove & modern kitchen
180.	Tana River	Kumbi	Kumbi Primary	Improved Institutional stove & modern kitchen
181.	Tana River	Bahati	Bahati Primary	Improved Institutional stove & modern kitchen
182.	Tana River	Umoja	Umoja Primary	Improved Institutional stove & modern kitchen
183.	Tana River	Rebai	Bahati Primary	Improved Institutional stove & modern kitchen
184.	Tana River	Ghalamani	Ghalamani Primary	Improved Institutional stove & modern kitchen
185.	Tana River	Chifiri	Chifiri Primary	Improved Institutional stove & modern kitchen
186.	Tana River	Gambo	Gambo Primary	Improved Institutional stove & modern kitchen
187.	Tana River	Hakoka	Hakoka Primary	Improved Institutional stove & modern kitchen
188.	Tana River	Kesi	Kesi Primary	Improved Institutional stove & modern kitchen
189.	Tana River	Lakole	Lakole Primary	Improved Institutional stove & modern kitchen
190.	Tana River	Wachakone	Wachakone Primary	Improved Institutional stove & modern kitchen
191.	Tana River	Jarha	Wachakone Primary	Improved Institutional stove & modern kitchen
192.	Tana River	Makere	Makere Primary	Improved Institutional stove & modern kitchen

No.	Sub-County	ECDE Centre	School Attached	Proposed solution
193.	Tana River	Daku	Daku Primary	Improved Institutional stove & modern kitchen
194.	Tana River	Bohoni	Bohoni Primary	Improved Institutional stove & modern kitchen
195.	Tana River	Laini	Laini Primary	Improved Institutional stove & modern kitchen
196.	Tana River	Nyagwani	Nyagwani Primary	Improved Institutional stove & modern kitchen
197.	Tana River	Rhoko	Rhoko Primary	Improved Institutional stove & modern kitchen
198.	Tana River	Ovo	Ovo Primary	Improved Institutional stove & modern kitchen
199.	Tana River	Imani	Ovo Primary	Improved Institutional stove & modern kitchen
200.	Tana River	Handampia	Handampia Primary	Improved Institutional stove & modern kitchen
201.	Tana River	Gafuru	Gafuru Primary	Improved Institutional stove & modern kitchen
202.	Tana River	Harambee	Gafuru Primary	Improved Institutional stove & modern kitchen
203.	Tana River	Bondeni	Bondeni Primary	Improved Institutional stove & modern kitchen
204.	Tana River	Kelokelo	Bondeni Primary	Improved Institutional stove & modern kitchen
205.	Tana River	Maweni	Maweni Primary	Improved Institutional stove & modern kitchen
206.	Tana River	Fanjua	Fanjua Primary	Improved Institutional stove & modern kitchen
207.	Tana River	Majengo	Majengo Primary	Improved Institutional stove & modern kitchen
208.	Tana River	Boji	Majengo Primary	Improved Institutional stove & modern kitchen
209.	Tana River	Jaridodi	Jaridodi Primary	Improved Institutional stove & modern kitchen
210.	Tana River	Masalani	Masalani Primary	Improved Institutional stove & modern kitchen
211.	Tana River	Gubani	Gubani Primary	Improved Institutional stove & modern kitchen
212.	Tana River	Duwayo	Duwayo Primary	Improved Institutional stove & modern kitchen
213.	Tana River	Bububu	Bububu Primary	Improved Institutional stove & modern kitchen
214.	Tana River	Maroni	Maroni Primary	Improved Institutional stove & modern kitchen
215.	Tana River	Hara	Hara Primary	Improved Institutional stove & modern kitchen
216.	Tana River	Baksano	Baksano Primary	Improved Institutional stove & modern kitchen
217.	Tana River	Vukoni	Vukoni Primary	Improved Institutional stove & modern kitchen
218.	Tana River	Wenje	Wenje Primary	Improved Institutional stove & modern kitchen
219.	Tana River	Mkomani	Mkomani Primary	Improved Institutional stove & modern kitchen
220.	Tana River	Vukoni	Vukoni Primary	Improved Institutional stove & modern kitchen
221.	Tana River	Wenje	Wenje Primary	Improved Institutional stove & modern kitchen
222.	Tana River	Kipendi	Wenje Primary	Improved Institutional stove & modern kitchen
223.	Tana North	Bawama	Bawama Primary	Improved Institutional stove & modern kitchen
224.	Tana North	Meti	Meti Primary	Improved Institutional stove & modern kitchen
225.	Tana North	Gale	Meti Primary	Improved Institutional stove & modern kitchen
226.	Tana North	Makini	Makini Primary	Improved Institutional stove & modern kitchen
227.	Tana North	Hirimani	Hirimani Primary	Improved Institutional stove & modern kitchen
228.	Tana North	Damaja	Damaja Primary	Improved Institutional stove & modern kitchen
229.	Tana North	Dukanotu	Dukanotu Primary	Improved Institutional stove & modern kitchen
230.	Tana North	Subo	Subo Primary	Improved Institutional stove & modern kitchen
231.	Tana North	Al-Maghan	Subo Primary	Improved Institutional stove & modern kitchen
232.	Tana North	Kidhori	Subo Primary	Improved Institutional stove & modern kitchen
233.	Tana North	Fahari	Fahari Primary	Improved Institutional stove & modern kitchen
234.	Tana North	Walesorea	Walesorea Primary	Improved Institutional stove & modern kitchen
235.	Tana North	Mitobini	Mitobini Primary	Improved Institutional stove & modern kitchen
236.	Tana North	Kibhileni	Mitobini Primary	Improved Institutional stove & modern kitchen
237.	Tana North	Huruma	Huruma Primary	Improved Institutional stove & modern kitchen
238.	Tana North	Mataarba	Huruma Primary	Improved Institutional stove & modern kitchen
239.	Tana North	Sabukia	Sabukia Primary	Improved Institutional stove & modern kitchen
240.	Tana North	Titila"A"	Sabukia Primary	Improved Institutional stove & modern kitchen
241.	Tana North	Bilbil Kuku	Bilbil Primary	Improved Institutional stove & modern kitchen

No.	Sub-County	ECDE Centre	School Attached	Proposed solution
242.	Tana North	Bilbil Gheriba	Bilbil Primary	Improved Institutional stove & modern kitchen
243.	Tana North	Matagala	Matagala Primary	Improved Institutional stove & modern kitchen
244.	Tana North	Hosingo	Hosingo Primary	Improved Institutional stove & modern kitchen
245.	Tana North	Amani (Bura)	Amani Primary	Improved Institutional stove & modern kitchen
246.	Tana North	Darime	Darime Primary	Improved Institutional stove & modern kitchen
247.	Tana North	Bularig	Bularig Primary	Improved Institutional stove & modern kitchen
248.	Tana North	Singwaya	Singwaya Primary	Improved Institutional stove & modern kitchen
249.	Tana North	Chewele	Chewele Primary	Improved Institutional stove & modern kitchen
250.	Tana North	Langoni	Chewele Primary	Improved Institutional stove & modern kitchen
251.	Tana North	Baleni	Chewele Primary	Improved Institutional stove & modern kitchen
252.	Tana North	Tune	Tune Primary	Improved Institutional stove & modern kitchen
253.	Tana North	Magura	Magura Primary	Improved Institutional stove & modern kitchen
254.	Tana North	Nanighi	Nanighi Primary	Improved Institutional stove & modern kitchen
255.	Tana North	Jara	Nanighi Primary	Improved Institutional stove & modern kitchen
256.	Tana North	Kakate	Nanighi Primary	Improved Institutional stove & modern kitchen
257.	Tana North	Wekoyo	Wekoyo Primary	Improved Institutional stove & modern kitchen
258.	Tana North	Bulasukule	Bulasukule Primary	Improved Institutional stove & modern kitchen
259.	Tana North	Shikaadabu	Shikaadabu Primary	Improved Institutional stove & modern kitchen
260.	Tana North	Ghamano	Ghamano Primary	Improved Institutional stove & modern kitchen
261.	Tana North	Damaka	Ghamano Primary	Improved Institutional stove & modern kitchen
262.	Tana North	Godia	Godia Primary	Improved Institutional stove & modern kitchen
263.	Tana North	Bisaadi	Godia Primary	Improved Institutional stove & modern kitchen
264.	Tana North	Jajavo	Jajavo Primary	Improved Institutional stove & modern kitchen
265.	Tana North	Wadesa	Wadesa Primary	Improved Institutional stove & modern kitchen
266.	Tana North	Titila"B"	Sabukia Primary	Improved Institutional stove & modern kitchen
267.	Tana North	Walestokocha	Hosingo Primary	Improved Institutional stove & modern kitchen
268.	Tana North	Ziwani Vango	Ziwani Vango Primary	Improved Institutional stove & modern kitchen
269.	Tana North	Boji (Madogo)	Boji (Madogo) Primary	Improved Institutional stove & modern kitchen
270.	Tana North	Mbalambala	Mbalambala Primary	Improved Institutional stove & modern kitchen
271.	Tana North	Pamba	Mbalambala Primary	Improved Institutional stove & modern kitchen
272.	Tana North	Mansugda	Mbalambala Primary	Improved Institutional stove & modern kitchen
273.	Tana North	Habakik	Habakik Primary	Improved Institutional stove & modern kitchen
274.	Tana North	Mulanjo	Mulanjo Primary	Improved Institutional stove & modern kitchen
275.	Tana North	Adhama	Mulanjo Primary	Improved Institutional stove & modern kitchen
276.	Tana North	Fafbare	Mulanjo Primary	Improved Institutional stove & modern kitchen
277.	Tana North	Bara	Mulanjo Primary	Improved Institutional stove & modern kitchen
278.	Tana North	Sala	Sala Primary	Improved Institutional stove & modern kitchen
279.	Tana North	Mororo	Mororo Primary	Improved Institutional stove & modern kitchen
280.	Tana North	E-Lnino	Mororo Primary	Improved Institutional stove & modern kitchen
281.	Tana North	Samira	Mororo Primary	Improved Institutional stove & modern kitchen
282.	Tana North	Upperhill	Mororo Primary	Improved Institutional stove & modern kitchen
283.	Tana North	Bulabaraka	Mororo Primary	Improved Institutional stove & modern kitchen
284.	Tana North	Malkamansa	Malkamansa Primary	Improved Institutional stove & modern kitchen
285.	Tana North	Korati	Korati Primary	Improved Institutional stove & modern kitchen
286.	Tana North	Hatata	Hatata Primary	Improved Institutional stove & modern kitchen
287.	Tana North	K/Delight	Hatata Primary	Improved Institutional stove & modern kitchen
288.	Tana North	Ziwani	Hatata Primary	Improved Institutional stove & modern kitchen
289.	Tana North	Maramtu	Maramtu Primary	Improved Institutional stove & modern kitchen
290.	Tana North	Amani (Maramtu)	Maramtu Primary	Improved Institutional stove & modern kitchen

No.	Sub-County	ECDE Centre	School Attached	Proposed solution
291.	Tana North	Bakuyu	Maramtu Primary	Improved Institutional stove & modern kitchen
292.	Tana North	Amares	Amares Primary	Improved Institutional stove & modern kitchen
293.	Tana North	Anole	Anole Primary	Improved Institutional stove & modern kitchen
294.	Tana North	Kono Ramadhan	Kono Ramadhan Primary	Improved Institutional stove & modern kitchen
295.	Tana North	Matarsesa	Kono Ramadhan Primary	Improved Institutional stove & modern kitchen
296.	Tana North	Lagbadana	Kono Ramafadha Primary	Improved Institutional stove & modern kitchen
297.	Tana North	Adele	Adele Primary	Improved Institutional stove & modern kitchen
298.	Tana North	Ruko	Ruko Primary	Improved Institutional stove & modern kitchen
299.	Tana North	Buwa	Ruko Primary	Improved Institutional stove & modern kitchen
300.	Tana North	Kabba	Ruko Primary	Improved Institutional stove & modern kitchen
301.	Tana North	Taleo	Sala Primary	Improved Institutional stove & modern kitchen
302.	Tana North	Dhidha	Sala Primary	Improved Institutional stove & modern kitchen
303.	Tana North	Buradima	Korati Primary	Improved Institutional stove & modern kitchen
304.	Tana North	Sombo	Sombo Primary	Improved Institutional stove & modern kitchen
305.	Tana North	El-Rara	El-Rara Primary	Improved Institutional stove & modern kitchen
306.	Tana North	Kamaguru	Kamaguru Primary	Improved Institutional stove & modern kitchen
307.	Tana North	Boka	Boka Primary	Improved Institutional stove & modern kitchen
308.	Tana North	Baleneka	Baleneka Primary	Improved Institutional stove & modern kitchen
309.	Tana North	Bangal	Bangal Primary	Improved Institutional stove & modern kitchen
310.	Tana North	Yakrit	Bangal Primary	Improved Institutional stove & modern kitchen
311.	Tana North	Kaniki	Bangal Primary	Improved Institutional stove & modern kitchen
312.	Tana North	Guruko	Bangal Primary	Improved Institutional stove & modern kitchen
313.	Tana North	Mitiboma	Bangal Primary	Improved Institutional stove & modern kitchen
314.	Tana North	Bisargesa	Bisargesa Primary	Improved Institutional stove & modern kitchen
315.	Tana North	Kuriti	Kuriti Primary	Improved Institutional stove & modern kitchen
316.	Tana North	Bultobanta	Bultobanta Primary	Improved Institutional stove & modern kitchen
317.	Tana North	Lebile	Bultobanta Primary	Improved Institutional stove & modern kitchen
318.	Tana North	Tula	Tula Primary	Improved Institutional stove & modern kitchen

10.19 List of 157 primary schools in need of improved institutional Bellerive stoves

Table 100: List of 157 primary schools in need of improved institutional Bellerive stoves

Name of school	Primary fuel	Primary stove
Chanani Day	Firewood	Stone Jiko
Chewani	Firewood	
Wachakone	Firewood	Kenya Ceramic Jiko
Gururi School	Firewood	Traditional 3 Stones
Gubani Primary	Firewood	Nil
Fanjua Primary	Firewood	Local Jiko
Kiarukungu Primary	Firewood	Traditional 3 Stones
Wenje	Firewood	Jiko
Mkomani Primary	Firewood	Kenya Ceramic Jiko
Duwayo	Firewood	Kenya Ceramic Jiko
Bondeni	Firewood	Nil
Masalani	Firewood	Local Jiko
Rafiki	Firewood	Traditional 3 Stones
Lenda	Firewood	Jiko
Mikinduni	Firewood	Traditional 3 Stones
Koticha	Firewood	Traditional 3 Stones
Hakoka	Firewood	Kenya Ceramic
Jarirodi	Firewood	
Daba School	Firewood	Traditional 3 Stones
Bohoni	Firewood	Na
Haroresa	Firewood	Na
Vukoni Primary	Firewood	Jiko
Kone	Firewood	Traditional 3 Stones
Majengo Primary	Firewood	Kenya Ceramic Jiko
Maroni	Firewood	Fire Place
Nyangwani	Firewood	Nil
Hara	Firewood	Kenya Ceramic Jiko
Rhoka	Charcoal	Kenya Ceramic Jiko
Ovo	Firewood	N/A
Maweni	Firewood	Nil
Tewayu School	Firewood	Traditional 3 Stones
Handampia	Firewood	Temporary Jiko
Baksano	Firewood	Kenya Ceramic Jiko
Wayuboro School	Firewood	Traditional 3 Stones
Bububu	Firewood	
Bulto Mulito	Charcoal	Kenya Ceramic Jiko
Waldena	Firewood	
Laini	Firewood	Kenya Ceramic Jiko
Chifiri	Firewood	Kenya Ceramic Jiko
Titila	Firewood	Kenya Ceramic Jiko
Bohoni	Firewood	Kenya Ceramic Jiko
Abaganda	Firewood	N/A
Arap Moi	Firewood	N/A
Assa	Firewood	N/A
Bahati	Firewood	N/A

Name of school	Primary fuel	Primary stove
Baomo	Firewood	N/A
Bilisa	Firewood	N/A
B/Kone	Firewood	N/A
Bubesa	Firewood	N/A
Bula Rahma	Firewood	N/A
Bura Kofira	Firewood	N/A
C/Muma	Firewood	N/A
Dalu	Firewood	N/A
Danisa	Firewood	N/A
Dibe	Firewood	No
Didaade	Firewood	Nil
Furaha	Firewood	Nil
Gadeni	Firewood	N/A
Galili	Firewood	N/A
Galma	Firewood	Nil
Gamba	Firewood	Nil
Garsen	Firewood	Nil
Gatundu	Firewood	Nil
Golbanti	Firewood	Nil
Handaraku	Firewood	Nil
Hayole	Firewood	N/A
Hurara	Firewood	Nil
Idsowe	Firewood	Na
Imani	Firewood	N/A
Katsangani	Charcoal	Ceramic Jiko
Kau	Firewood	N/A
Kibokoni	Firewood	N/A
Kibusu	Firewood	Nil
Kikomo	Firewood	N/A
Kilelengwani	Firewood	N/A
Kinyadu	Firewood	N/A
Kipao	Firewood	N/A
Kipini	Charcoal	Kenya Ceramic Jiko
Kitere	Firewood	Nil
Konkona	Firewood	None
Kulesa	Firewood	Nil
Lailoni	Firewood	Nil
Lazima	Firewood	Nil
Maderte	Charcoal	N/A
Majiweni	Firewood	Nil
Mapunga	Firewood	Nil
Marembo	Firewood	Kenya Ceramic Jiko
Matangeni	Charcoal	Kenya Ceramic Jiko
Maua	Firewood	Nil
Maziwa	Firewood	Nil
Mchelelo	Firewood	Nil
Minjila	Firewood	Nil
Miticharaka	Firewood	N/A
Mnazini	Firewood	N/A

Name of school	Primary fuel	Primary stove
Mumbuji	Firewood	N/A
Najaah	Firewood	N/A
Nduru	Firewood	N/A
Ngumu	Firewood	N/A
Odoganda	Firewood	N/A
Odole	Firewood	N/A
Ongonyo	Firewood	N/A
Onkolde	Firewood	Nil
Onwardei	Firewood	Nil
Ozi	Firewood	N/A
Peponi	Charcoal	N/A
R/Mwewe	Firewood	N/A
Riketa	Firewood	N/A
Semikaro	Firewood	N/A
Shauri Moyo	Firewood	N/A
Shelli	Firewood	Nil
Shirikisho	Firewood	N/A
Tana Kurole	Firewood	Nil
Tarasaa	Firewood	N/A
Tulu	Firewood	N/A
Uhuru Kenyatta	Firewood	N/A
Ushindi	Firewood	N/A
Mto Kilifi	Firewood	N/A
Ziwani	Firewood	N/A
Shikaadabu	Firewood	Traditional 3 Stones
Mitobini	Firewood	Traditional 3 Stones
Fahari	Firewood	Kenya Ceramic Jiko
Makini	Firewood	Traditional 3 Stones
Darime	Firewood	Traditional 3 Stones
Jajavo	Firewood	Ceramic Jiko
Singwaya	Firewood	Traditional 3 Stones
Chewele	Firewood	Traditional 3 Stones
Bularig	Firewood	
Wekoye	Firewood	Kenya Ceramic Jiko
Subo	Firewood	Traditional 3 Stones
Hosingo	Firewood	Traditional 3 Stones
Dukanotu	Firewood	Traditional 3 Stones
Walesorea	Firewood	Ceramic Jiko
Kaniki	Firewood	N/A
Hirimani	Firewood	Traditional 3 Stones
Bularig	Charcoal	Kenya Ceramic Jiko
Bilbil	Firewood	Traditional 3 Stones
Tune	Firewood	Kenya Ceramic Jiko
Ziwani -Vango Primary	Firewood	N/A
Bultobanta Primary	Firewood	NA
Sombo Primary	Firewood	N/A
Ruko Primary	Firewood	NA
Habakik Primary	Firewood	N/A
Boka Primary	Firewood	None
Bisargesa Primary	Firewood	Ceramic Jiko

Name of school	Primary fuel	Primary stove
Yaqrit Primary	Firewood	None
Hatata Primary	Firewood	None
Maramtu Primary	Firewood	N/A
Baleneka Primary	Firewood	Na
Adele Primary	Firewood	None
Tula Primary	Firewood	Nill
Lagbadana Primary	Firewood	Nil
Konoramadha Primary	Firewood	Nill
Kuriti Primary	Firewood	Kenya Ceramic Jiko
Sala Primary	Firewood	N/A
Bangali	Firewood	Ordinary Jiko
Amares	Firewood	
Kamaguru	Firewood	None

10.20 List of 161 primary schools in need of modern kitchens

Table 101: List of 161 primary schools in need of modern kitchens

Name of school	Primary fuel	Primary stove	Kitchen type
Chanani Day	Firewood	Stone Jiko	Temporary
Chewani	Firewood		
Wachakone	Fire Wood	Kenya Ceramic Jiko	Temporary
Gururi School	Firewood	Traditional 3 Stones	Temporary
Gubani Primary	Firewood	Nil	Temporary
Fanjua Primary	Firewood	Local Jiko	Temporary
Bahati	Firewood	Modern Jiko	Temporary
Kiarukungu Primary	Firewood	Traditional 3 Stones	Temporary
Wenje	Firewood	Jiko	Dilapidated
Mkomani Primary	Firewood	Kenya Ceramic Jiko	Temporary
Duwayo	Firewood	Kenya Ceramic Jiko	Temporary
Laza Primary	Firewood	Improved	Temporary
Bondeni	Firewood	Nil	Temporary
Masalani	Firewood	Local Jiko	Temporary
Rafiki	Firewood	Traditional 3 Stones	Temporary
Lenda	Firewood	Jiko	Temporary
Mikinduni	Firewood	Traditional 3 Stones	Temporary
Kumbi	Firewood	Modern Jiko	Temporary
Koticha	Firewood	Traditional 3 Stones	Temporary
Hakoka	Firewood	Kenya Ceramic	Temporary
Jarirodi	Firewood		
Daba School	Firewood	Traditional 3 Stones	Temporary
Bohoni	Firewood	Na	Na
Haroresa	Firewood	Na	Temporary
Vukoni Primary	Firewood	Jiko	
Kone	Firewood	Traditional 3 Stones	Temporary
Majengo Primary	Firewood	Kenya Ceramic Jiko	Temporary
Maroni	Firewood	Fire Place	Temporary
Nyangwani	Firewood	Nil	Temporary
Hara	Firewood	Kenya Ceramic Jiko	Temporary
Rhoka	Charcoal	Fuel	Temporary
Ovo	Firewood	N/A	Temporary
Maweni	Firewood	Nil	Temporary
Tewayu School	Firewood	Traditional 3 Stones	Temporary
Handampia	Firewood	Temporary Jiko	Temporary
Baksano	Firewood	Kenya Ceramic Jiko	Temporary
Wayuboro Schoool	Firewood	Traditional 3 Stones	Temporary
Bububu	Firewood		Temporary
Bulto Mulito	Charcoal	Kenya Ceramic Jiko	Temporary
Waldena	Firewood		Temporary
Laini	Firewood	Kenya Ceramic Jiko	Temporary
Chifiri	Firewood	Kenya Ceramic Jiko	Temporary
Titila	Firewood	Kenya Ceramic Jiko	Temporary
Bohoni	Firewood	Kenya Ceramic Jiko	Temporary
Abaganda	Firewood	N/A	Temporary
Arap Moi	Firewood	N/A	Temporary

Name of school	Primary fuel	Primary stove	Kitchen type
Assa	Firewood	N/A	Temporary
Bahati	Firewood	N/A	Temporary
Baomo	Firewood	N/A	Temporary
Bilisa	Firewood	N/A	Temporary
B/Kone	Firewood	N/A	Temporary
Bubesa	Firewood	N/A	Temporary
Bula Rahma	Firewood	N/A	Temporary
Bura Kofira	Firewood	N/A	Temporary
C/Muma	Firewood	N/A	Temporary
Dalu	Firewood	N/A	Temporary
Danisa	Firewood	N/A	Temporary
Dibe	Firewood	No	Temporary
Didaade	Firewood	Nil	Nil
Furaha	Firewood	Nil	Nil
Galili	Firewood	N/A	Temporary
Galma	Firewood	Nil	Nil
Gamba	Firewood	Nil	Nil
Garsen	Firewood	Nil	Nil
Gatundu	Firewood	Nil	Temporary
Golbanti	Firewood	Nil	Nil
Handaraku	Firewood	Nil	Nil
Hayole	Firewood	N/A	Temporary
Hurara	Firewood	Nil	Nil
Idsowe	Firewood	Na	Modern
Imani	Firewood	N/A	Temporary
Kau	Firewood	N/A	Temporary
Kibokoni	Firewood	N/A	Temporary
Kibusu	Firewood	Nil	Nil
Kikomo	Firewood	N/A	Temporary
Kilelengwani	Firewood	N/A	Temporary
Kinyadu	Firewood	N/A	Temporary
Kipao	Firewood	N/A	Temporary
Kipini	Charcoal	Kenya Ceramic Jiko	Temporary
Kitere	Firewood	Nil	Nil
Konkona	Firewood	None	Temporary
Kulesa	Firewood	Nil	Nil
Lailoni	Firewood	Nil	Nil
Lazima	Firewood	Nil	Nil
Maderte	Charcoal	N/A	Temporary
Majiweni	Firewood	Nil	Nil
Mapunga	Firewood	Nil	Nil
Marembo	Firewood	Kenya Ceramic Jiko	Firewood
Maua	Firewood	Nil	Nil
Maziwa	Firewood	Nil	Nil
Mchelelo	Firewood	Nil	Nil
Minjila	Firewood	Nil	Nil
Mnazini	Firewood	N/A	Temporary
Mumbuji	Firewood	N/A	Temporary
Mwina	Firewood	Improved Jiko	Temporary

Name of school	Primary fuel	Primary stove	Kitchen type
Najaah	Firewood	N/A	Temporary
Nduru	Firewood	N/A	Temporary
Ngumu	Firewood	N/A	Temporary
Odoganda	Firewood	N/A	Temporary
Odole	Firewood	N/A	Temporary
Ongonyo	Firewood	N/A	Temporary
Onkolde	Firewood	Nil	Temporary
Onwardei	Firewood	Nil	Temporary
Ozi	Firewood	N/A	Temporary
Peponi	Charcoal	N/A	Temporary
R/Mwewe	Firewood	N/A	Temporary
Riketa	Firewood	N/A	Temporary
Semikaro	Firewood	N/A	Temporary
Sera	Firewood	Improved Jiko	Temporary
Shelli	Firewood	Nil	Nil
Shirikisho	Firewood	N/A	Temporary
Tana Kurole	Firewood	Nil	Nil
Tarasaa	Firewood	N/A	Temporary
Tulu	Firewood	N/A	Temporary
Uhuru Kenyatta	Firewood	N/A	Temporary
Ushindi	Firewood	N/A	Temporary
Mto Kilifi	Firewood	N/A	Temporary
Ziwani	Firewood	N/A	Temporary
Shikaadabu	Firewood	Traditional 3 Stones	Temporary
Mitobini	Firewood	Traditional 3 Stones	Temporary
Makini	Firewood	Traditional 3 Stones	Temporary
Darime	Firewood	Traditional 3 Stones	Temporary
Jajavo	Firewood	Ceramic Jiko	Semi-Permanent
Singwaya	Firewood	Traditional 3 Stones	Temporary
Chewele	Firewood	Traditional 3 Stones	Temporary
Bularig	Firewood		
Wekoye	Firewood	Kenya Ceramic Jiko	Temporary
Subo	Firewood	Traditional 3 Stones	Temporary
Hosingo	Firewood	Traditional 3 Stones	Temporary
Dukanotu	Firewood	Traditional 3 Stones	Temporary
Sabukia	Firewood	Improved Jiko	Temporary
Kaniki	Firewood	N/A	Temporary
Hirimani	Firewood	Traditional 3 Stones	Temporary
Bularig	Charcoal	Kenya Ceramic Jiko	
Bilbil	Firewood	Traditional 3 Stones	Temporary
Tune	Firewood	Kenya Ceramic Jiko	Temporary
Ziwani -Vango Primary	Firewood	N/A	Temporary
Bultobanta Primary	Firewood	NA	Temporary
Sombo Primary	Firewood	N/A	Temporary
Ruko Primary	Firewood	NA	Temporary
Habakik Primary	Firewood	N/A	Temporary
Boka Primary	Firewood	None	Temporary
Bisargesa Primary	Firewood	Ceramic Jiko	Temporary
Korati Primary	Firewood	Boiler	Temporary
Yaqrit Primary	Firewood	None	Temporary

Name of school	Primary fuel	Primary stove	Kitchen type
Mbalambala Primary	Firewood	Boiler	Temporary
Hatata Primary	Firewood	None	Temporary
Maramtu Primary	Firewood	N/A	N/A
Baleneka Primary	Firewood	Na	None
Adele Primary	Firewood	None	Temporary
Tula Primary	Firewood	Nill	Temporary
Lagbadana Primary	Firewood	Nil	Temporary
Konoramadha Primary	Firewood	Nill	Temporary
Malkamasa Primary	Firewood	Boiler	Temporary
Anole Primary	Firewood	Boiler	Temporary
Kuriti Primary	Fire Wood	Kenya Ceramic Jiko	Semi Modern
Sala Primary	Firewood	N/A	Temporary
Bangali	Firewood	Ordinary Jiko	Temporary
Amares	Firewood		Temporary
Koti Primary	Nil	Nil	Nil
Kamaguru	Firewood	None	Open Air

10.21 The 25 primary schools with capacity for production of human waste biogas

Table 102: The 25 primary schools with capacity for production of human waste biogas

Sub County	Ward	Name of school	Enrollment
Tana River	Galole South	Bondeni	604
Tana River	Galole South	Gubani	505
Tana River	Galole Central	Hola	1169
Tana River	Galole Central	Kone	648
Tana River	Galole Central	Laza	1075
Tana River	Galole South	Majengo	560
Tana River	Galole Central	Mikinduni	536
Tana River	Galole Central	Rafiki	1162
Bangale	Madogo	Adele	974
Bangale	Madogo	Bangali	1518
Bangale	Madogo	Boji	751
Bangale	Madogo	Hatata	626
Bangale	Madogo	Mororo	1865
Tana North	Bura	Bula Sukele	510
Tana North	Bura	Huruma	542
Tana North	Bura	Magura	614
Tana Delta	Garsen South	Arap Moi	535
Tana Delta	Garsen South	Furaha	762
Tana Delta	Garsen Central	Garsen	1038
Tana Delta	Garsen South	Handaraku	520
Tana Delta	Garsen South	Hurara	1132
Tana Delta	Garsen South	Kipao	765
Tana Delta	Garsen Central	Maua	698
Tana Delta	Garsen Central	Minjila	637
Tana Delta	Garsen South	Odole	519

10.22 Five Secondary schools with capacity for production of human waste biogas

Table 103:Secondary schools with capacity for production of human waste biogas

Sub County	Ward	Name of school	Enrollment
Tana River	Galole Central	Maumau Girls'	597
Tana River	Galole South	Ndura	751
Tana North	Bura	Hirimani	541
Tana North	Bura	Huruma	669
Tana Delta	Garsen Coast	Kipini	520

10.23 The county health facility with capacity for production of human waste biogas

Table 104:The county health facility with capacity for production of human waste biogas

Sub County	Ward	Name of school	Enrollment
Tana River	Galole Central	Hola Referral Hospital	200

Practical ACTION

REPUBLIC OF KENYA

MINISTRY OF ENERGY AND PETROLEUM

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