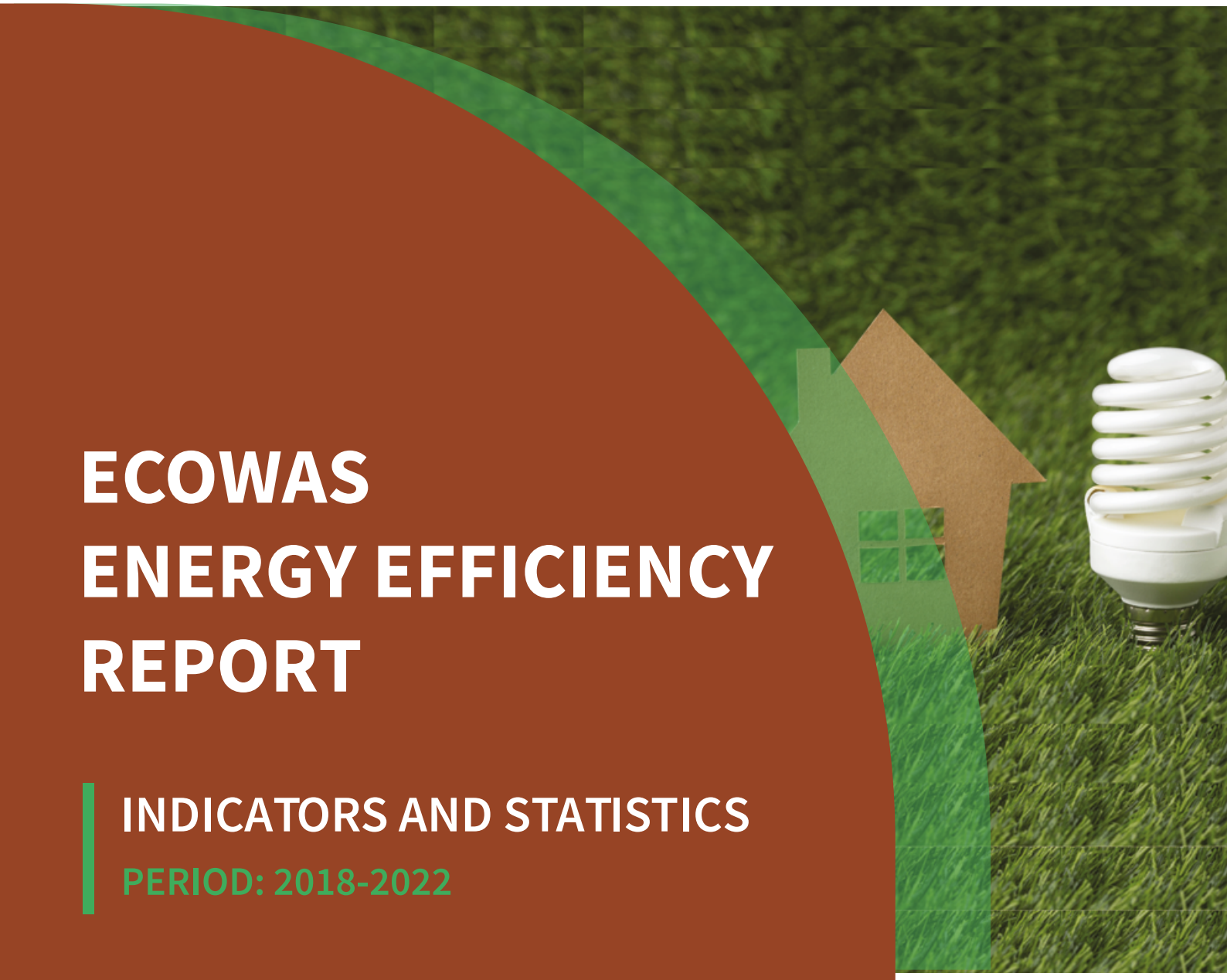
African Union
AFRICAN ENERGY COMMISSION



ECOWAS ENERGY EFFICIENCY REPORT

INDICATORS AND STATISTICS

PERIOD: 2018-2022

www.ecreee.org

Published by :
ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE)
Jardim Gulbenkian St. ADS Building, 3rd Foor C.P 288
Achada Santo António, Praia - Cabo Verde
email : info@ecreee.org
Tel : +238 2604630

Authors:
Hodonou Alexandre Binazon – ECREEE

Reviewed by
Jafaru Abdulrahman – PO IT ECREEE, Mawufemo Modjinou - PPO Energy Efficiency-ECREEE, Madi Kabore – Project Coordinator ECREEE, Jihane Bakounoure - Energy Efficiency Expert ECREEE, Nougbodohoué Samson Bel-Aude - Head of the Statistics Division AFREC, Abdoulaye Oueddo- AFREC, Gbaty Gbandey- AFREC, Salome Maheya- AFREC

Maps
The maps are for informational purposes only and do not constitute recognition of international boundaries or regions; ECREEE makes no claims concerning the validity, accuracy or completeness of the maps nor assumes any liability resulting from the use of the information therein.

Place and date of Publication
Praia, Cabo Verde, January 2025

IMPRINT
ECOWAS Energy Efficiency Report Indicators and Statistics
Period: 2018-2022.

DISCLAIMER

ACKNOWLEDGEMENTS
ECREEE extends its sincere appreciation to the national institutions and designated representatives from ECOWAS Member States for their valuable contributions to the data collection process.
We also acknowledge the technical and financial support provided by the Federal Ministry for Economic Cooperation and Development (BMZ) through GIZ, as well as the support from AFREC in facilitating data collection.

www.ecreee.org

ACRONYMS

AEME	Agency for the Economy and Energy Management
AFREC	African Energy Commission
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung
CEMG	Clean Energy Mini-Grids
DHS	Demographic and Health Surveys
ECOWAS	Economic Community of West African States
ECOWREX	ECOWAS Observatory for Renewable Energy and Energy Efficiency
ECREEE	ECOWAS Centre for Renewable Energy and Energy Efficiency
EE	Energy Efficiency
EEEP	ECOWAS Energy Efficiency Policy
EI	Energy Intensity
EREP	ECOWAS Renewable Energy Policy
ESEF	ECOWAS Sustainable Energy Forum
EUR	EURO
GDP	Gross Domestic Product
GIZ	Gesellschaft für Internationale Zusammenarbeit
GOGLA	Global Off-Grid Lighting Association
GW/ GWh	Gigawatt / Gigawatt hour
HH	Household
IEA	International Energy Agency
IRENA	International Renewable Energy Agency
ktoe	Kilotonnes of Oil Equivalent
LED	Light Emitting Diode
LPG	Liquefied Petroleum Gas
MEPS	Minimum Energy Performance Standards
MICS	Multiple Indicator Cluster Surveys
MIS	Malaria Indicator Survey
MJ	Megajoule
MW/ MWh	Megawatt / Megawatt hour
NEEAPs	National Energy Efficiency Action Plans
NREAPs	National Renewable Energy Action Plans
ProCEM	Promotion of a Climate-friendly Electricity Market in the ECOWAS Region
RE	Renewable Energy
S&L	Standards and Labeling

ACRONYMS

SDG	Sustainable Development Goals
SEforALL	Sustainable Energy for ALL
SHS	Solar Home Systems
SME	Small and Medium Enterprises
TFEC	Total Final Energy Consumption
toe	Tonne of Oil Equivalent
USD	United States Dollar

ECREEE FOREWORD

Energy demand has steadily increased over the years, primarily driven by population growth, rapid urbanization, and improved living standards. This surge has placed significant pressure on energy resources, underscoring the urgent need for efficiency measures which have collectively intensified pressure on energy resources. Recognizing this challenge, ECREEE has undertaken a detailed assessment of the energy efficiency landscape across the ECOWAS region from 2018 to 2022, within the framework of its regional initiative, ECOWAS Observatory of Renewable Energy and Energy Efficiency (ECOWREX).

The report provides a comprehensive analysis of energy consumption trends, efficiency measures, and policy advancements in the ECOWAS region, emphasizing the link between energy use and economic growth. It identifies the residential sector as a critical area for efficiency improvements, given its substantial energy consumption. Furthermore, the report delves into energy intensity and electricity losses, providing invaluable insights into the overall efficiency of our energy system

While notable progress has been made in promoting energy efficiency in the ECOWAS member states, several challenges remain, including financial constraints, inadequate policy and regulatory frameworks and the need for enhanced capacity building and advocacy. Addressing these barriers requires a coordinated effort among governments department and agencies, the private sector, and regional and international partners. Strengthening collaboration and knowledge among ECOWAS Member States is essential for scaling successful energy efficiency practices across the region.

This report serves as a critical roadmap for policymakers, stakeholders, and development partners in achieving the ambitious goals of ECOWAS Vision 2050 and the United Nations Sustainable Development Goals (SDGs).

It reaffirms ECREEE's unwavering commitment to advancing energy efficiency policies, fostering innovation, and steering West Africa toward a sustainable and inclusive energy future.

Jean Francis Sempore
ECREEE Executive Director

AFREC FOREWORD

One of the mandates of the African Energy Commission (AFREC), specialized agency of African Union, is the production of quality, updated and harmonized statistics for the planning, monitoring and evaluation of energy projects and programs in Africa. To this end, the AFREC has set up the African Energy Information System (AEIS) since 2012. The AEIS is currently the only continental tool that helps decision-making in the energy sector. With the adoption of Agenda 2063 and Agenda 2030, energy challenges are becoming increasingly greater.

To this end, AFREC decided in 2020 to revitalize the African Energy Information System, which makes it possible to add more variables to the database and to improve data collection tools at the level of African Union Member States.

Thus, the African Union Commission has developed four new questionnaires for updating the AEIS, which are: the Energy Balance Questionnaire, the Energy Efficiency Questionnaire, the Energy Prices and Taxes Questionnaire and the Power Plant Capacity questionnaire. To ensure that AFREC national focal points have a good knowledge of the new data collection tools, AFREC has undertaken since 2020, a vast capacity building campaign for the attention of AFREC National Focal Points in Africa. Thus, since 2020, AFREC has published three publications each year on the AEIS, namely: Key Energy Statistics, Africa Energy Balance, Africa Energy Database

AFREC also collaborates with the Regional Economic Communities in the collection of energy data and in the production of Energy Statistics in Africa. This is how AFREC has just started a collaboration with ECREEE, with the aim of collecting data based on the AFREC Energy Efficiency Questionnaire and also strengthening the capacities of ECOWAS States. To this end, AFREC and ECREEE collaborated to collect data on the AFREC Energy Efficiency Questionnaire for ECOWAS Member States. At the end of the data collection, AFREC and ECREEE produced this report which presents an analysis of the energy efficiency situation in ECOWAS from 2021 to 2022.

I hope you enjoy reading it and I remain convinced that you will get very relevant information on the ECOWAS energy sector and especially on energy efficiency. AFREC and ECREEE remain open to your criticisms and suggestions for improving future editions.

Rashid Ali Abdallah
Executive Director AFREC

DEFINITIONS

- **Clean Cooking Energy and technology:**

Refers to cooking solutions that utilize clean fuels and technologies, thereby reducing exposure to harmful smoke and pollutants. Clean cooking solutions include the use of electricity, liquefied petroleum gas (LPG), natural gas, biogas, alcohol fuels, and solar cookers.

- **Efficiency Electricity Generation :**

This measures the ratio of useful electricity output to the total energy input in electricity generation. Higher efficiency implies more electricity is produced from the same amount of energy input, reducing fuel consumption and associated emissions.

- **Electricity Transmission and distribution losses:**

These are losses of electrical energy that occur during the transmission and distribution of electricity from power plants to end-users. They can result from technical factors, such as resistance in wires, and non-technical factors, like theft or metering inaccuracies.

- **Primary Energy Intensity:**

Ratio between Total Energy Supply and GDP is measured in MJ per 2015 USD constant. Energy intensity (EI) indicates how much energy is used to produce one unit of economic output. A lower ratio indicates that less energy is used to produce one unit of economic output. EI is an imperfect indicator, as changes are affected by other factors other than energy efficiency, particularly changes in the structure of economic activity.

- **Energy Intensity in the Agricultural Sector:**

The amount of Final energy consumed per unit of economic output in the agricultural sector. It measures the energy efficiency of agricultural activities and is typically expressed as energy consumption (MJ) per unit of agricultural value added in GDP (USD).D).

- **Energy Intensity in Industry Sector:**

The amount of Final energy consumed per unit of economic output in the industry sector. It measures the energy efficiency of industry activities and is typically expressed as energy consumption (MJ) per unit of agricultural value added in GDP (USD

- **Energy Intensity in Residential Sector:**

The Final energy consumption in the residential sector per unit of household. It indicates the energy efficiency of energy use in households, typically considering factors such as energy consumed for lighting, heating, cooking, and appliances.

DEFINITIONS

- **Energy Intensity in Services and Trades Sector:**

The amount of Final energy consumed per unit of economic output in the Services and Trades sector. It measures the energy efficiency of Services and Trades activities and is typically expressed as energy consumption (MJ) per unit of agricultural value added in GDP (USD).SD

- **Total Final Energy Consumption (TFEC):**

The total amount of energy consumed by end-users, including households, industry, agriculture, services, and transport. TFEC excludes the energy used in energy transformation processes (e.g., electricity generation, refining) and losses during distribution. It represents the final stage of energy use and is typically expressed in energy units such as terajoules (TJ), gigawatt-hours (GWh), or tons of oil equivalent (toe). TFEC can also be broken down by energy source (e.g., electricity, natural gas, oil products) or by sector to provide a detailed analysis of energy demand.

- **Total Final Energy Consumption in the Agriculture sector:**

The total energy consumed by agricultural activities such as irrigation, machinery operation, greenhouse heating, and crop drying. This includes energy used directly in farming operations and agro-processing activities.

- **Total Final Energy Consumption in Industry sector:**

The total amount of energy consumed by the industrial sector for manufacturing, processing, and related activities. This includes energy used in factories, production plants, and industrial facilities but excludes energy used for energy transformation processes.

- **Total Final Energy Consumption in Residential sector:**

The total energy consumed by households for domestic activities such as lighting, heating, cooling, cooking, and the use of electrical appliances. It represents direct energy use within residential buildings.

- **Total Final Energy Consumption in Services and Trades sector:**

The total energy consumed by the commercial, trade, and public services sectors, including energy used in office buildings, retail stores, schools, hospitals, and other service-oriented facilities.

- **Total Final Energy Consumption in Transport sector:**

The total amount of energy consumed for transportation purposes across all modes, including road, rail, air, and maritime. This includes energy used for passenger and freight transport by vehicles, airplanes, ships, and trains.

DEFINITIONS

- **Total Final Energy Consumption in Residential from Biomass and waste :**

The total amount of energy consumed by households derived from biomasss (e.g., firewood, charcoal, biogas) and waste (e.g., agricultural residues). This includes energy used for cooking, heating, and other domestic activities.

- **Total Final Energy Consumption in Residential from Coal**

The total amount of energy consumed by households derived from coal or coal products. This is typically used for heating, cooking, or other household needs.

- **Total Final Energy Consumption in Residential from Fossil fuel:**

The total energy consumed by households derived from fossil fuel sources, including coal, oil, and natural gas. It accounts for energy used for activities such as cooking, heating, and powering appliances.

- **Total Final Energy Consumption in Residential from Natural Gas:**

The total amount of energy consumed by households sourced from natural gas. This energy is primarily used for cooking, space heating, and water heating.

- **Total Final Energy Consumption in Residential from Oil:**

The total energy consumed by households derived from oil and oil products, such as kerosene or LPG (liquefied petroleum gas). It is commonly used for cooking, heating, and lighting in some regions.

- **Total Final Energy Consumption per capita**

This indicator represents the average amount of energy consumed per person in a specific region or country. It is calculated by dividing the Total Final Energy Consumption (TFEC) by the total population of the region or country during the same period.

- **Total Energy Supply:**

This represents the amount of energy available in the national territory during the reference period.

- **Electricity Consumption in Residential sector (ECRS):**

The total amount of electricity consumed by households for purposes such as lighting, cooling, heating, and powering appliances, and other use.

ACKNOWLEDGEMENTS

ECREEE would like to thank the Focal institutions and designated individuals in the ECOWAS countries who contributed data and information to this report. These include Pascal Sourougnon DEGBEGNON (Benin - Head of Studies and Planning Department - Ministère de l'Energie, de l'Eau et des Mines); Largum MADOUGOU (Benin - Coordinator P2EGeDBE - Ministère de l'Energie, de l'Eau et des Mines); Todeman ASSAN (Benin - Director General of Energy Planning and Rural Electrification - Ministry de l'Energie, de l'Eau et des Mines); Bakary LINGANI (Burkina Faso - Director of Conventional Energies - Ministère de l'Energie, des Mines et des Carrières); Windpouiré Rebecca ZABSONRE (Burkina Faso - Head of Energy Management Service - Ministère de l'Energie, des Mines et des Carrières); Mario Joao MARQUES DE OLIVEIRA (Cape Verde - Technician - Ministério da Indústria, Comércio e Energia); Angui Sylvain KOBENAN (Cote d'Ivoire - Deputy Director of Hydraulic and Wind Energy - Direction Générale de l'Energie); Francois KOKOLA (Cote d'Ivoire - Head of the Evaluation, Economic Monitoring, and Statistics Service - Direction Générale de l'Energie); Tijan JALLOW (Gambia - Senior Planner - Ministry of Petroleum & Energy); Emmanuel CORREA (Gambia - Senior Energy Officer - Ministry of Petroleum & Energy); Laura ZORDEH (Ghana - Assistant Manager - Ghana Energy Commission); Kofi Agyekum ANSONG-DWAMENA (Ghana - Statistician - Energy Commission of Ghana); Mendes DIVALDINO (Guinea Bissau - Technician/Deputy Head of Statistics - Ministério da Energia); Noé Saba N´BUNDÉ (Guinea Bissau - Public-Private Relations Advisor - Ministério da Energia); Bourhane BANGOURA (Guinea Conakry - Head of Energy Information Systems Section - Ministère de l'Energie de l'Hydraulique et des Hydrocarbures); Alpha Ibrahima DIALLO (Guinea Conakry - Energy Engineer (DESS) in charge of studies, focal point for data collection PANER, PANEE, Se4ALL - Ministère de l'Energie, de l'Hydraulique et des Hydrocarbures); Danwin F. HOFF (Liberia - Energy Data Officer - Ministry of Mines and Energy); Mentor Zahn KOTEE (Liberia - Assistant Director for Grid - Ministry of Mines and Energy); Seydou TANGARA (Mali - Head of Energy Economics and Efficiency Section - Direction Nationale de l'Energie); Mahamoud Traore (Mali - Head of Department for Promotion of Production and Technologies - Ministère de l'Energie et de l'Eau du Mali (ANADEB)); Ejura Gloria EZEKIEL (Nigeria - Assistant Chief Scientific Officer - Energy Commission of Nigeria); Teddy OMOREGBEE (Nigeria - Engineer - Federal Ministry of Power); Amadou Makhtar SARR (Senegal - In charge of Geographic Information Systems and Rural Electrification Data - Ministère de l'Energie du Pétrole et des Mines); Fatma SOW (Senegal - Head of the Energy Efficiency Office - Ministère de l'Energie du Pétrole et des Mines); Benjamin KAMARA (Sierra Leone - Chief Director of Energy/ECREEE Focal Point - Ministry of Energy); Shebora Onikeh KAMARA (Sierra Leone - Director of Policy, Research,

Planning, Monitoring, and Evaluation - Ministry of Energy); M'ba DJASSAH (Togo - Director of Planning - Direction Générale de l'Energie); Aboudou-Kafarou AKONDO (Togo - Engineer in charge of studies and project monitoring - Direction Générale de l'Energie (DGE)); Nassourou BELLO (Niger - ECREEE - UNDP Liptako Gourma Project Coordinator - ECREEE).

> *ECREEE also expresses gratitude to personnel from other ECOWAS Institutions/agencies and the Africa Energy Commission (AFREC), West African Economic and Monetary Union (WAEMU).*

These include Eya Sophie DESSI (ECOWAS Commission-Abuja - Entry Level Power Engineer - Direction de l'Energie, ECOWAS Commission); Samson Bel-Aube NOUGBODOHOUE (Algeria-AFREC - Head of Energy Information System and Statistics Division - AFREC); Salome MAHEYA (Algeria-AFREC - Senior Policy Officer Energy Statistics - AFREC); Oueddo ABDOULAYE (Algeria-AFREC - Senior Policy Officer Statistician - AFREC), Salif BAGAYOKO (Burkina Faso - WAEMU - Energy Officer - WAEMU Commission).

Finally, we express our profound appreciation to Federal Ministry for Economic Cooperation and Development (BMZ) through Gesellschaft für Internationale Zusammenarbeit (GIZ) for its technical and financial support.

EXECUTIVE SUMMARY

Over the past decade, the ECOWAS region has experienced a steady increase in Total Final Energy Consumption (TFEC), with an average annual growth rate of 3.85%, closely aligning with the region's economic growth rate of 3.21%. In 2022, the region's TFEC reached 129,871 ktoe, contributing 23.5% to Africa's overall TFEC. Nigeria, the economic and demographic powerhouse of ECOWAS, accounted for 56.2% of the total energy consumption. The top five countries—Nigeria, Côte d'Ivoire, Ghana, Burkina Faso, and Guinea—contributed over 80% of the total energy use in the region.

In 2022, the region's per capita energy consumption was 0.305 toe, slightly below the African continental average of 0.390 toe, reflecting a modest annual growth of 1.2% over the past decade. While Cape Verde reported the highest per capita consumption at 0.450 toe, disparities exist across the region.

Biomass, including waste, dominates the regional energy mix, accounting for 60% of total consumption, followed by petroleum products (33.1%), electricity (5.5%), natural gas (2.4%), and coal (0.3%). However, Cabo Verde has the lowest share of biomass and waste consumption (23%). Conversely, other countries—notably Burkina Faso, Togo, Niger, Sierra Leone, Liberia, and Guinea-Bissau—exhibit heavy reliance on biomass, which constitutes over 70% of their final energy consumption. Regarding petroleum products, their share in final energy consumption stands at approximately 30% in Benin, Côte d'Ivoire, The Gambia, Guinea, Mali, and Nigeria. This share rises to 61.8% in Cabo Verde and 45.4% in Ghana. As for electricity's share in final energy consumption, the highest rates are observed in Senegal (24%), Ghana (17.1%), and Cabo Verde (15.4%).

The residential sector is the leading energy consumer, representing 55% of Total Final Energy Consumption in 2022 in the region. This reliance is particularly evident in countries like Niger and Liberia, where residential energy consumption is highest (greater than 70%). Biomass and waste are the primary sources of energy for cooking, making up 77% of domestic energy consumption, while fossil fuels like LPG and kerosene are primarily used for cooking (84%) and water heating (11%).

The region faces significant challenges in the adoption of clean cooking technologies. Ten out of the fifteen ECOWAS countries reported modern cooking energy access rates below 10% in 2022, with Cabo Verde having the highest rate at 81%. This disparity highlights the urgent need for enhanced efforts to promote clean cooking technologies such as the adoption of improved cookstoves, LPG, and biomasss to meet household energy demands and reduce health and environmental impacts.

Between 2018 and 2022 the efficiency of electricity production from fossil fuels in the ECOWAS region achieved substantial improvements. The efficiency in electricity production from natural gas increased from 37.8% to 45.6%, while the efficiency from crude oil production rose from 40.3% to 55%. Similarly, electricity production from refined petroleum products and coal registered efficiency gains, further advancing the region's overall energy efficiency. Despite these advancements in the power sector, energy intensities in the residential and industrial sectors has declined at a pace below the required annual improvement rate of 3.4% needed to achieve SDG 7.3. Meanwhile, energy efficiency progress in the agriculture and services sectors has remained stagnant, highlighting the need for targeted interventions to accelerate improvements across all sectors.

In 2022, the weighted average technical electricity loss in the ECOWAS region is estimated at 9.1%, based on data from 15 companies representing 73% of users across 25 utilities. Liberia's LEC (15%) and Guinea-Bissau's EAGB (13.5%) report the highest technical losses, while Nigeria's IKEJA (3.6%) and Côte d'Ivoire's CIE (4.4%) have the lowest rates.

Total electricity losses, which include both technical and non-technical losses, were 21.3% for 21 companies covering 88% of users. Non-technical losses (NTLs) remain a major issue, particularly in Nigeria and Guinea-Bissau, where seven out of nine Nigerian utilities report non-technical losses exceeding 30%. The highest rates are observed in KAEDCO (65.8%), YEDC (61.9%), and JOS (56.0%).

Several ECOWAS energy efficiency policy targets set for 2020 and 2030 remain partially achieved or lagging:

Phase-out of inefficient lighting: Target of 100% by 2020, but only about 70% of inefficient lamps were phased out by 2022.

Reduction of electricity losses: Target of below 10% by 2020; recorded losses remained at 21.3% in 2022.

Universal access to clean cooking: Target set for 2030; recorded access in 2022 was only 23.2%.

Equipment standards and labeling: Regionally adopted in 2020, but transposition into national laws by Member States remains low.

Building energy efficiency codes: Regionally adopted in 2020, but implementation at the Member State level remains limited.

Financing mechanisms: A regional fund was planned for 2020. Funds have been mobilized for projects under the ECOWAS Special Intervention Fund (ESIF). However, a dedicated regional fund—the ECOWAS Renewable Energy and Energy Efficiency Facility (EREEEF)—is being established to support ECREEE-backed projects. This fund will be administered by the ECOWAS Bank for Investment and Development (EBID).

The ECOWAS region has made progress in certain areas, such as electricity production efficiency and a modest reduction in energy intensity in the residential and industrial sectors. However, significant challenges remain, particularly in improving energy access and efficiency, adopting clean cooking technologies, and addressing electricity losses. To secure sustainable energy futures and meet global targets, the region must intensify efforts in infrastructure development, energy efficiency improvements, and the promotion of clean and modern energy solutions for all sectors.

Contents

Contents

List of Tables

List of Figures

INTRODUCTION

The unwavering commitment of ECOWAS to advancing the objectives of the Sustainable Energy for All (SEforALL) initiative has been evident. This commitment was clearly demonstrated in October 2012 when they entrusted the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) with the mandate to lead the renewable energy and energy efficiency initiatives within the region. Subsequently, in July 2013, ECOWAS Heads of State adopted the ECOWAS Renewable Energy Policy (EREP) and the ECOWAS Energy Efficiency Policy (EEEP), thereby paving the way for achieving major regional objectives.

Following the adoption of these regional sustainable energy policies, ECREEE has supported ECOWAS member states in developing their National Renewable Energy Action Plans (NREAPs), National Energy Efficiency Action Plans (NEEAPs), and SEforALL National Agendas. The national targets of each member state, as outlined in these action plans, are closely aligned with the regional goals defined by the EREP and EEEP.

The 2023-2027 Strategic Plan of ECREEE, approved during the March 2023 meeting of ECOWAS Ministers in charge of Energy, draws its foundations from the ECOWAS Vision 2050 and the 4x4 ECOWAS management objectives (2022-2026). This strategic plan is structured around three regional programs (Renewable Energy, Energy Efficiency, and Cross-Cutting Programs) and three major regional initiatives namely :

- **ECOWAS Observatory for Renewable Energy and Energy Efficiency (ECOWREX),**
- **Annual Report on Progress in Renewable Energy (RE) and Energy Efficiency (EE) in West Africa, and**
- **ECOWAS Sustainable Energy Forum (ESEF).**

ECREEE aims to provide reliable information on sustainable energy within the ECOWAS region through the ECOWREX and Annual Report initiatives, to better inform policymaking and decision-making processes. These initiatives enable the regular publication of annual progress reports. However, while statistics on renewable energy are relatively more accessible, those related to energy efficiency remain scarce, highlighting the challenges member states face in collecting such data and the need to improve energy efficiency data collection.

To commmence addressing this data scarcity challenge, ECREEE organized a regional workshop on energy efficiency initiatives and sustainable energy data collection in Cotonou on June 24-28, 2024 to strengthen the capacity and skills of ECREEE's Data Collection Focal Points in collecting energy efficiency data, particularly through the use of AFREC's energy efficiency questionnaire, which has been validated by all African countries. Additionally, the workshop marked the launch of data collection on energy efficiency indicators in the residential sector, which was conducted from July 1 to October 31, 2024.

This report on energy efficiency in ECOWAS countries, covering the period from 2018 to 2022, is based on data collected from ECOWAS member states. It explores key aspects including: It explores key aspects including:

- **Total final energy consumption in households by type of use,**
- **Energy intensity by standardized sector,**
- **Electricity transmission and distribution loss rates and performance,**
- **The efficiency of electricity generation, as well as**
- **The use of clean cooking energy and technologies.**

Additionally, the report examines, on one hand, energy efficiency policies, initiatives, and regulations, and on the other hand, assesses the regional energy efficiency objectives.

BACKGROUND

The ECOWAS Energy Efficiency Policy (EEEP) was established to address the critical need for improved energy efficiency across the region, aligning with the global framework of the United Nations Sustainable Development Goals (SDGs), particularly, SDG 7, which aims to ensure access to affordable, reliable, sustainable, and modern energy for all by 2030.

This goal emphasizes the importance of improving energy efficiency, which is critical for energy planning and the advancement of sustainable energy. Meaning that energy efficiency is a cornerstone of sustainable energy planning, as it reduces energy waste, lowers co sts, and mitigates environmental impacts.

The main objectives of the EEEP are outlined as follows:

i. Phase out inefficient incandescent lamps by 2020.

ii. Reduce electricity distribution losses from 15–40% to below 10% by 2020.

iii. Achieve universal access to safe, clean, affordable, and efficient cooking solutions by 2030.

iv. Develop and adopt region-wide standards and labels for major energy equipment by 2020.

v. Establish energy efficiency standards for buildings (e.g., building codes).

vi. Create financing instruments for sustainable energy projects, including a regional fund for long-term implementation.

Evidently, energy efficiency data is a fundamental pillar for effective monitoring of this policy and assessing whether the strategy to achieve its objectives is on track. Reliable and timely data enables the tracking of progress, identify gaps, and make informed adjustments to the interventions. Without robust energy efficiency indicators and data, evaluating the effectiveness

of implemented energy efficiency actions and ensuring alignment with long-term energy efficiency goals of the policy becomes challenging.

At the global level, data also plays a pivotal role in monitoring progress toward sustainable energy goals. Reports such as "Tracking SDG7: The Energy Progress Report 2023[1]"and "SDG7: Data and Projections"[2] offer comprehensive evaluations of global advancements in this domain based on global energy efficiency data. International forums like the Sustainable Energy for All Forum have convened to address progress and challenges related to SDG 7[3]. These initiatives underscore the crucial role of energy statistics in guiding policies and investments, particularly in energy efficiency, to promote a sustainable energy future.

At continental level, the African Energy Commission (AFREC) has been instrumental in advancing energy efficiency statistics and data across the continent. AFREC collects data and publishes comprehensive energy statistics and policy documents, including the :

- **Key Energy Statistics in Africa,**
- **'Energy efficiency in the residential sector',**
- **'Energy balance and energy database'.**
- **Energy Efficiency Potential in Africa by 2040**

[1]https://www.irena.org/Publications/2023/Jun/Tracking-SDG7-2023
[2]https://www.iea.org/reports/sdg7-data-and-projections
[3]https://www.seforall.org/forum

These publications are disseminated to all 55 African Union Member States, serving as foundational resources for energy policy development and project design. To further enhance data collection and analysis, AFREC in collaboration with regional economic communities has developed standardized questionnaires on energy balances and efficiency. These tools were validated and adopted by African countries, ensuring a harmonized approach to energy data gathering. Additionally, AFREC conducts capacity-building initiatives to strengthen the capabilities of member states in collecting and managing energy data effectively.

In the West African region, the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) by its mandate, also plays a pivotal role in bolstering member states' capacities in sustainable energy data collection. ECREEE has developed various data collection tools and actively gathers information on sustainable energy within the region. A notable initiative of ECREEE is the ECOWAS Observatory for Renewable Energy and Energy Efficiency (ECOWREX), which is a web-based platform designed to present the results and progress of the energy sector in the region based on high quality data and address the challenges of poor-quality data and lack of information in the sustainable energy sector across the ECOWAS region.

- **Monitor developments and progress in the energy sector in the region,**
- **Ensuring access to high-quality data on energy in general and sustainable energy in particular,**
- **Addressing the challenges associated with poor data availability and lack of information on sustainable energy in West Africa.**

To strengthen the capacity of the region, ECREEE, through these concerted efforts with AFREC lays a robust foundation for informed energy planning and policy-making, thereby facilitating the transition towards sustainable energy systems in West Africa and Africa as a whole.

After more than a decade of data collection efforts on sustainable energy led by the ECREEE, it has become evident that ECOWAS member states now have better access to information sustainable energy, more on renewable energy compared to energy

efficiency. This highlights a significant gap in the availability of standard energy efficiency indicators and data. Even though the United Nations, the International Energy Agency[4] (IEA), among others, are also making effort to close this capacity gap on energy efficiency data and statistics.

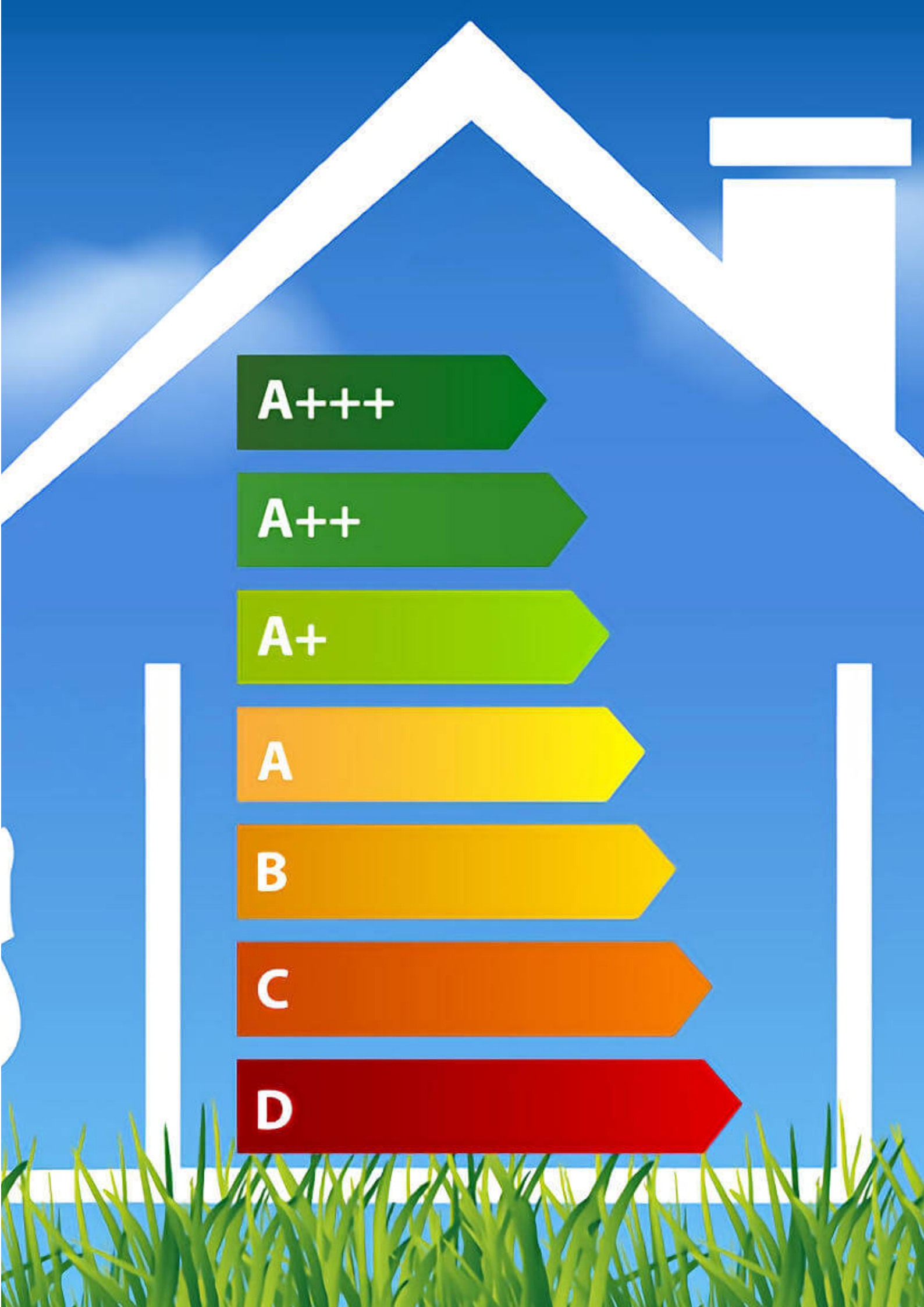
Ainsi, malgré l'adoption généralisée des
But the fact remains that, despite the development and continent-wide adoption of energy efficiency data collection tools, these mechanisms have not yielded the necessary data, resulting in a substantial void in the existence of energy efficiency indicators, particularly in Sub-Saharan Africa and within the ECOWAS region.

In response to this challenge, and in alignment with its 2023-2027 strategic plan, which emphasizes the critical importance of data availability on sustainable energy and, specifically, energy efficiency, ECREEE, in collaboration with AFREC, initiated a new phase of data collection campaign to estimate standard energy efficiency indicators across West Africa.

It should be noted that energy efficiency indicators in the residential sector are based on national energy balances and various sectoral and household surveys.

> *Furthermore, this report provides the advantage of offering high-quality data on sustainable energy in West Africa's residential sector, addressing the previous lack of energy efficiency indicators for this sector in the ECOWAS region.*

[4] https://iea.blob.core.windows.net/assets/cc7b1552-b390-414f-8cad-cb5f3c8919f8/Indicateurs_2019_Principe_Web.pdf


A+++
A++
A+
A
B
C
D

1

Methodological Approach

This section presents the approach that is used in data collection and validation and analysis.

1.1. Data Collection and Validation Approach:

Data collection from ECOWAS Member States was conducted by ECREEE's and AFREC's Energy Efficiency Focal Points, as well as by the energy balance focal points from various Member States.

The energy efficiency data collection campaign for the residential sector (2018-2022 period) was jointly carried out by ECREEE's and AFREC's energy data focal points. The collected data was validated by ECREEE and AFREC following specific verification protocols.

1.2 Data Categorization and Analysis Approach:

The categorization of indicators presented in this report is based on data derived from energy balances and household energy profiles. The consolidation of collected data across countries enabled the estimation of regional aggregates and analysis of key indicators listed as follows:

No	Indicators
1	Clean Cooking Energy and technology access Rate (CCET)
2	Efficiency Electricity Generation Rate from fossil fuel (EEG) Rate
3	Electricity Consumption in Residential sector (ECRS)
4	Electricity Transmission and distribution losses Rate (ETDL) Rate
5	Energy Intensity in Agricultural Sector (EIAS)
6	Energy Intensity in Industry Sector (EIIS)
7	Energy Intensity in Residential Sector (EIRS)
8	Energy Intensity in Services and Trades Sector (EISS)
9	Total Final Energy Consumption

No	Indicators
10	Total Final Energy Consumption in Agriculture sector
	Total Final Energy Consumption in Industry sector (TFECI)
11	Final Energy Consumption in Residential sector (TFECR)
12	Final Energy Consumption in Services and Trades sector (TFECS)
13	Final Energy Consumption in Transport sector (TFECT)
14	Final Energy Consumption in Residential from Biomass and waste (TFECRbz)
15	Final Energy Consumption in Residential from Coal (TFECRco)
16	Final Energy Consumption in Residential from Fossil fuel (TFECRco)
17	Final Energy Consumption in Residential from Natural Gas (TFECRng)
18	Final Energy Consumption in Residential from Oil (TFECRoil)
19	Total Final Energy Consumption per capita (TFECc)
20	Primary Energy Intensity (PEI)
21	Total Energy Supply
22	Compound Annual Growth Rate (CAGR)


A
B
C
D
E
Energy
Efficiency
MC
MR
%
OFF
M−
M+
CE
AC
ON/C

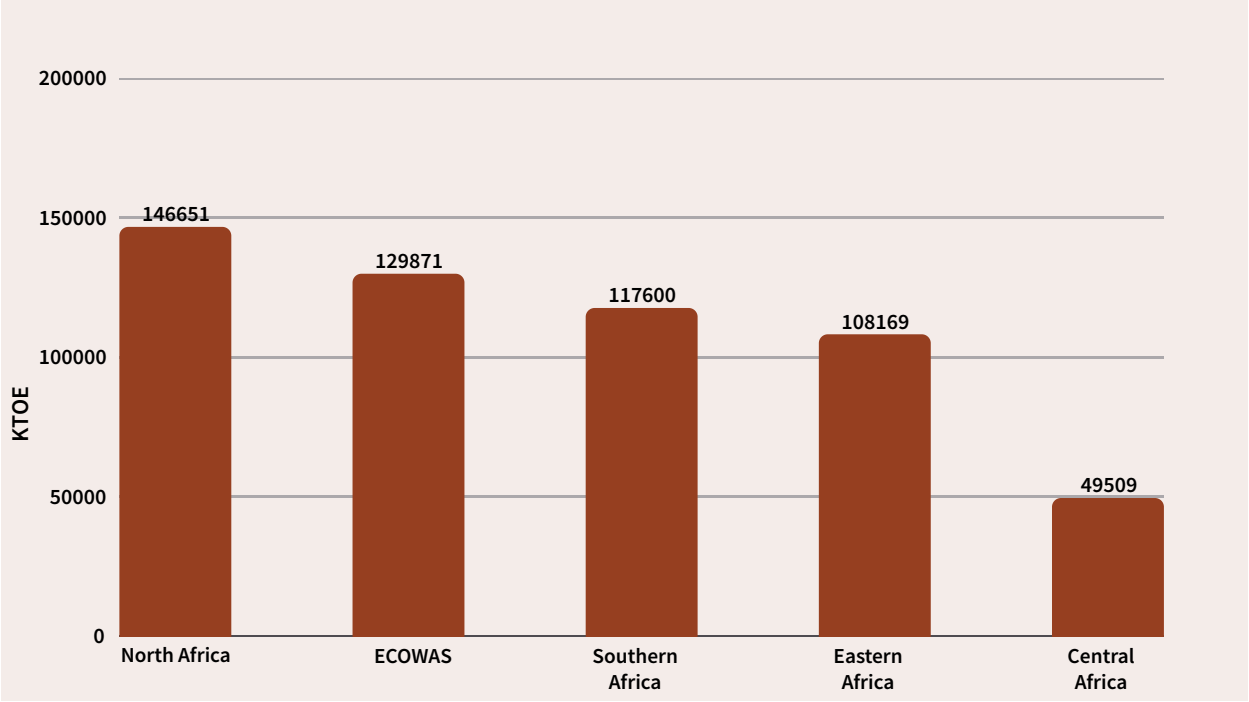
2 Analysis of Progress and Results

2.1. Total Final Energy Consumption in ECOWAS Region

2.1.1. Total Final Energy Consumption by Region in Africa

In 2022, the Total Final Energy Consumption (TFEC) in the ECOWAS region reached 129,871 kilotons of oil equivalent (ktoe). At the African continental level, ECOWAS ranks second, just behind North Africa, which recorded a TFEC of 146,651 ktoe. It is followed by Southern Africa with 117,600 ktoe, Eastern Africa with 108,169 ktoe, and Central Africa with 49,509 ktoe. The ECOWAS region's Total Final Energy Consumption thus accounts for 23.5% of the total Total Final Energy Consumption across the African continent.

Figure 1: Total Final Energy Consumption by Region in Africa in 2022



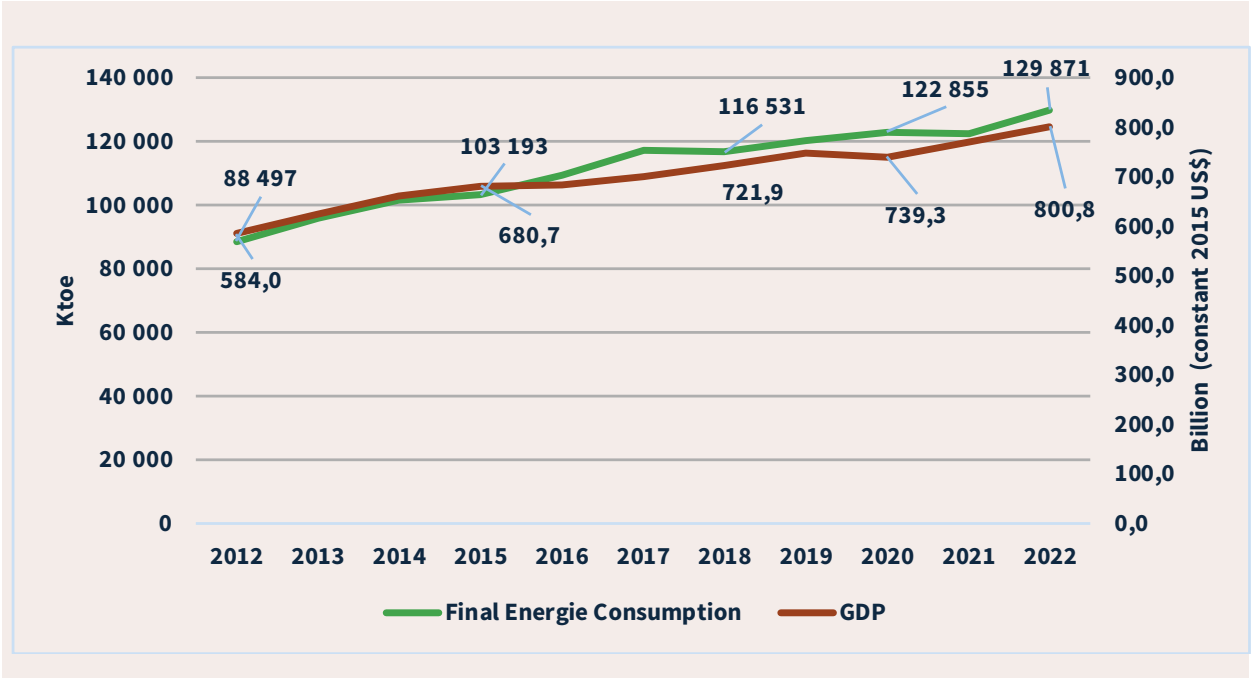
Sources: Energy balance data from ECOWAS Member States for 2022, submitted to ECREEE/AFREC and the AFREC data platform. TFEC (Total Final Energy Consumption) data for other regions is sourced from the AFREC platform.

2.1.2. Finale Energy Consumption and Economy Growth in the region

Over the past decade (2012-2022), the Total Final Energy Consumption in the ECOWAS region has witnessed a significant increase, rising from **88,497 ktoe** to **129,871 ktoe**, representing an average annual growth rate of **3.85%**. This growth slightly outpaces the region's average annual economic growth rate, which stood at **3.21%** over the same period. Specifically, the region's Gross Domestic Product (GDP) increased from **584 billion USD** to **800.1 billion USD** (constant 2015 USD).

> *This trend highlights a close correlation between the rise in energy consumption and the region's economic growth, underscoring the pivotal role of energy in supporting the economic development of ECOWAS member states.*

Figure 2: Total Final Energy Consumption and GDP of the ECOWAS Region Between 2012 and 2022



Sources: 2012 to 2021 from ECOWAS Energy information system and 2022 from ECOWAS Countries Energy Balances submitted to ECREEE/AFREC

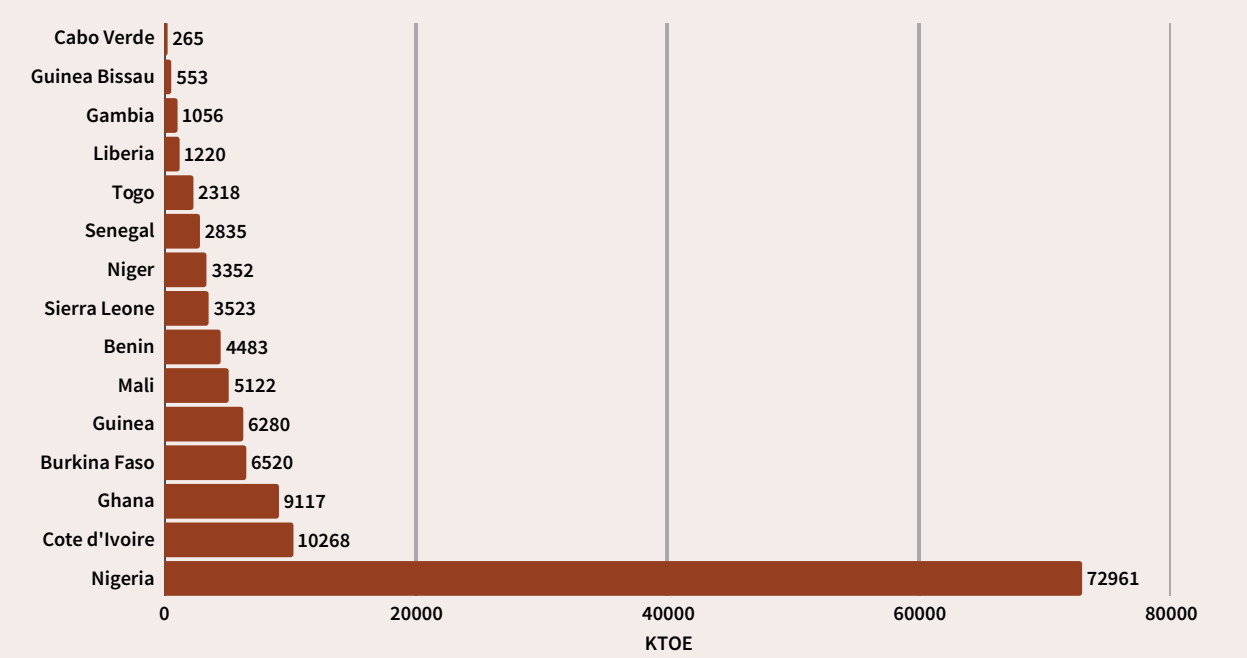
2.1.3. Final Energy Consumption by country in the region

In 2022, Nigeria overwhelmingly dominated the Total Final Energy Consumption in the ECOWAS region, accounting for 66.8% of the region's GDP. This economic dominance was mirrored in energy consumption, with Nigeria representing 56.2% (72,961 ktoe) of the region's total final energy consumption.

It is followed by Côte d'Ivoire, which holds 7.9% (10,268 ktoe), Ghana with 7% (9,117 ktoe), Burkina Faso with 5% (6,520 ktoe), and Guinea with 4% (5,122 Kktoe).

> *Together, these five countries account for more than 80% of the region's total final energy consumption, reflecting their significant economic and demographic influence within ECOWAS.*

Figure 3: Total Final Energy Consumption by country in ECOWAS Region in 2022



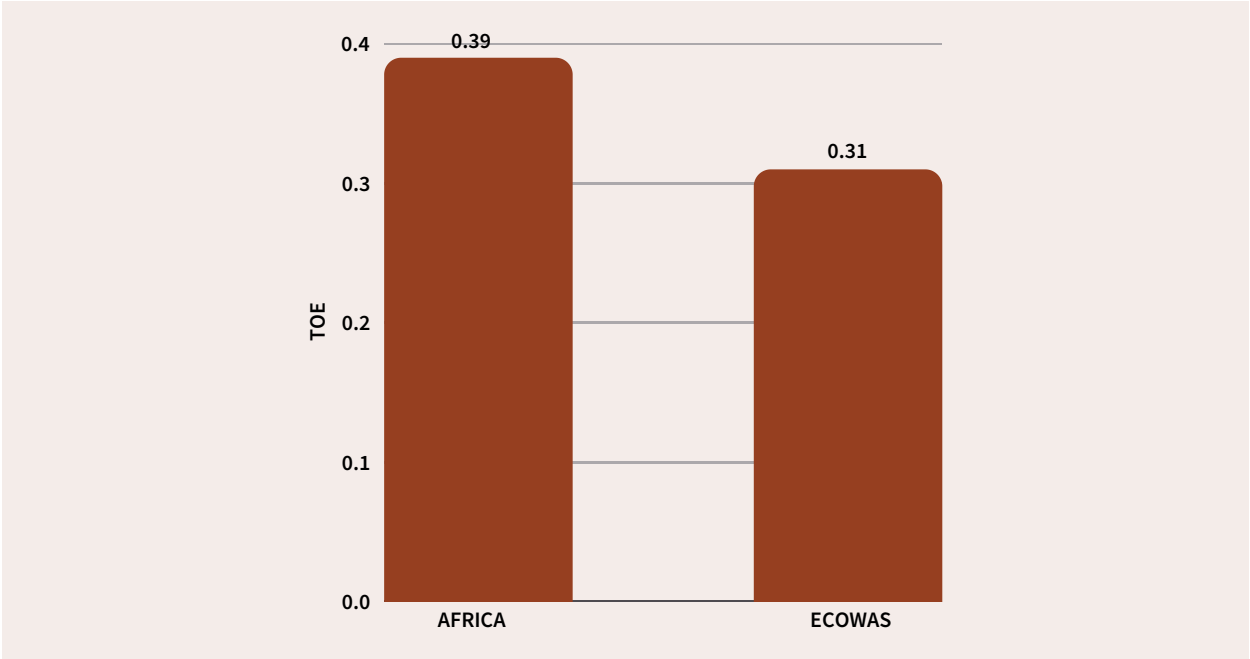
Sources: 2022 ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC

2.1.4. Total Final Energy Consumption per capita in the region

2.1.4. Total Final Energy Consumption per capita in the region
In 2022, the Total Final Energy Consumption per capita in the ECOWAS region was 0.305 tons of oil equivalent (toe), compared to 0.390 toe at the continental African level.

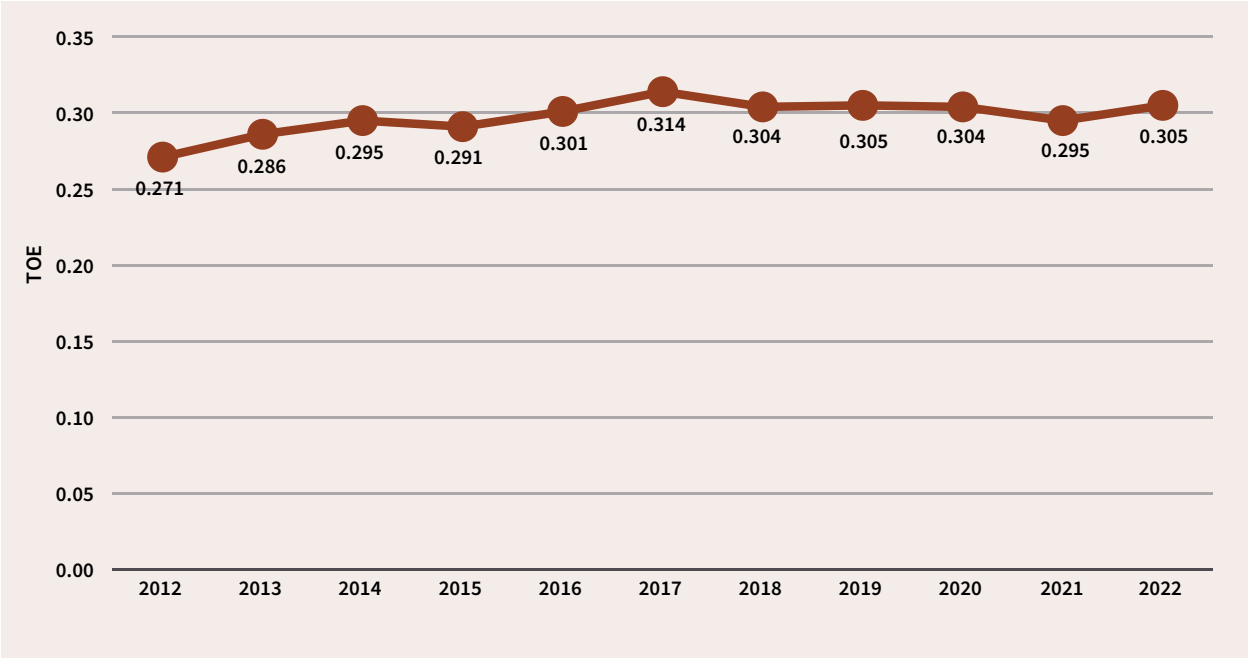
> *Over the past decade, the Total Final Energy Consumption per capita in the region increased from 0.271 toe in 2012 to 0.305 toe in 2022, representing an average annual growth rate of 1.2%. The peak during this period was reached in 2017, with a consumption of 0.314 toe per capita.*

Figure 4: Total Final Energy Consumption per capita in ECOWAS Region in 2022



Sources: 2022 ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC, and AFREC data platform

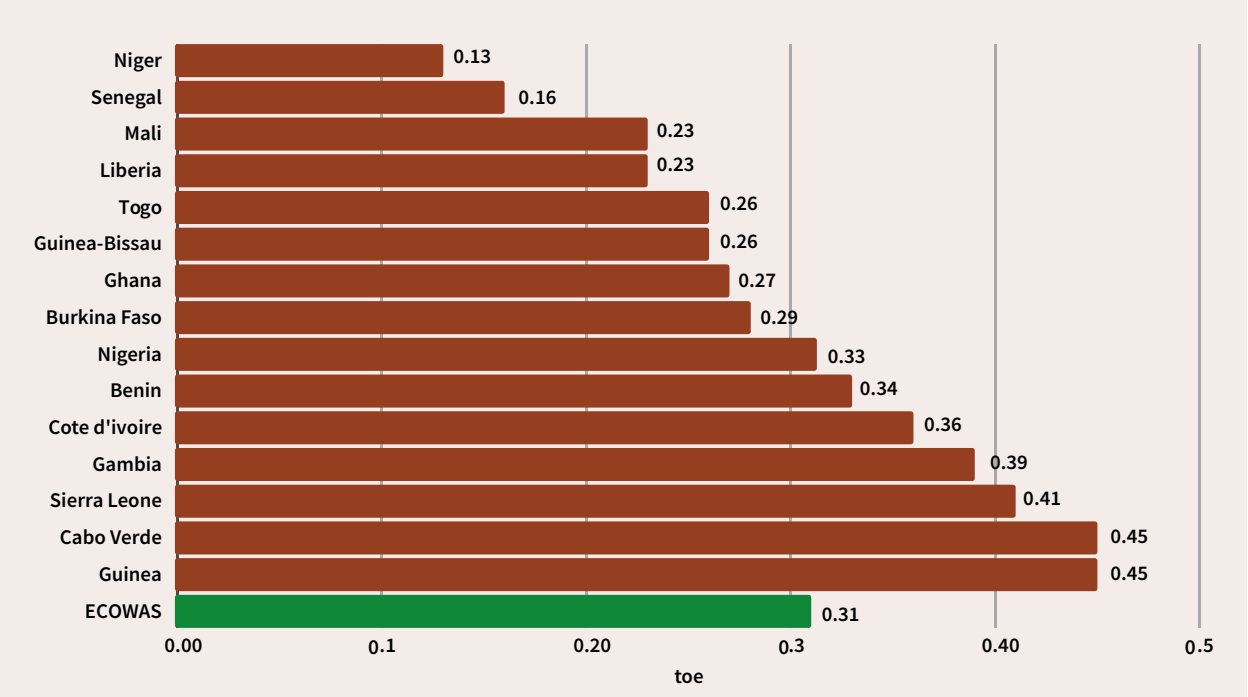
Figure 5: Total Final Energy Consumption per capita in ECOWAS Region Between 2012 and 2022



Sources: 2012 to 2021 from ECOWAS Energy information system and 2022 from ECOWAS Countries Energy Balances submitted to ECREEE/AFREC

> *Total Final Energy Consumption per capita varies considerably from one country to another within the ECOWAS region. Cape Verde and Guinea lead the ranking, with a Total Final Energy Consumption per capita of 0.450 tons of oil equivalent (toe). They are followed by Sierra Leone (0.410 toe), Gambia (0.390 toe), and Côte d'Ivoire (0.360 toe).*

Figure 6: Total Final Energy Consumption per capita by Country Between 2012 and 2022



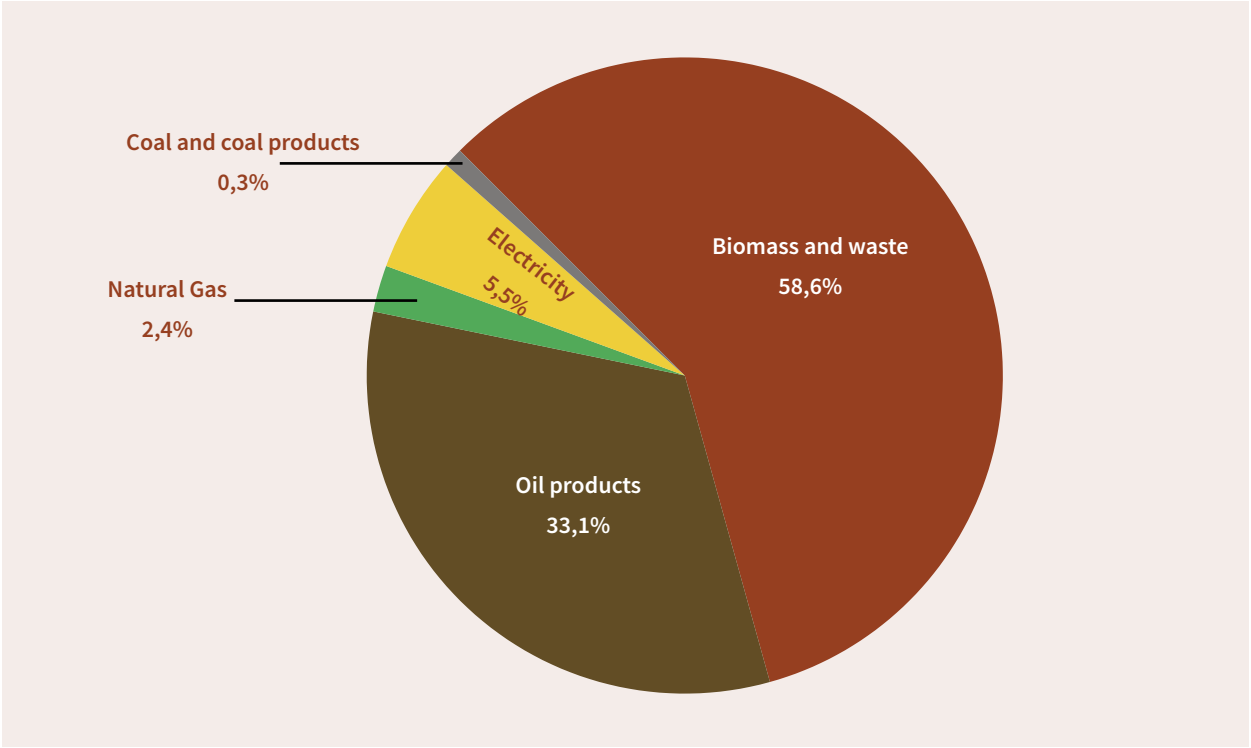
Sources: 2022 ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC

2.1.5. Total Final Energy Consumption by Energy Sources

The various energy sources for final consumption in the ECOWAS region in 2022 include biomasss and waste, oil, electricity, natural gas, and coal.

> *Among these sources, biomasss and waste dominate, accounting for approximately three-fifths of the region's total final energy consumption. They are followed by oil production (33.1%), electricity (5.5%), natural gas (2.4%), and coal and coal products (0.3%).*

Figure 7: Share Total Final Energy Consumption by energy sources in ECOWAS region in 2022



Sources: 2022 ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC

In line with regional trends, biomass including waste dominates the regional energy mix, accounting for 58.6% of total consumption, followed by petroleum products (33.1%), electricity (5.5%), natural gas (2.4%), and coal (0.3%). However, Cabo Verde reports the lowest share of biomass and waste consumption (23%). Conversely, other countries notably Burkina Faso, Togo, Niger, Sierra Leone, Liberia, and Guinea-Bissau exhibit heavy reliance on biomass, which constitutes over 70% of their final energy consumption.

For petroleum products, their share in final energy consumption stands at approximately 30% in Benin, Côte d'Ivoire, The Gambia, Guinea, Mali, and Nigeria. This share rises to 61.8% in Cabo Verde and 45.4% in Ghana. Regarding electricity's share in final energy consumption, the highest rates are recorded in Senegal (24%), Ghana (17.1%), and Cabo Verde (15.4%).

Finally, it is noteworthy that coal represents over 10% of Senegal's total final energy consumption, underscoring its contribution to the national energy mix.

Table 1: Total Final Energy Consumption by energy sources by Country in the region in 2022

Country	Biomass and waste (%)	Coal and Coal Product (%)	Electricity (%)	Natural Gas (%)	Oil Product (%)
Benin	59.2	2.1	2.9		35.7
Burkina Faso	71.3		4.3		24.4
Cabo Verde	22.9		15.4		61.8
Cote d'Ivoire	60.6		8.2	0.3	30.9
Gambia	60.9		1.6		37.5
Ghana	35.3		17.1	2.1	45.4
Guinea	64.0	0.2	3.9		31.9
Guinea Bissau	87.0		2.5		10.5
Liberia	81.4		3.6		15.0
Mali	61.7		9.2		29.1
Niger	75.6		3.6		20.8
Nigeria	57.8		3.4	4.0	34.8
Senegal	30.5	11.6	24.4		33.6
Sierra Leone	81.0		0.5		18.5
Togo	71.6		7.5		20.9

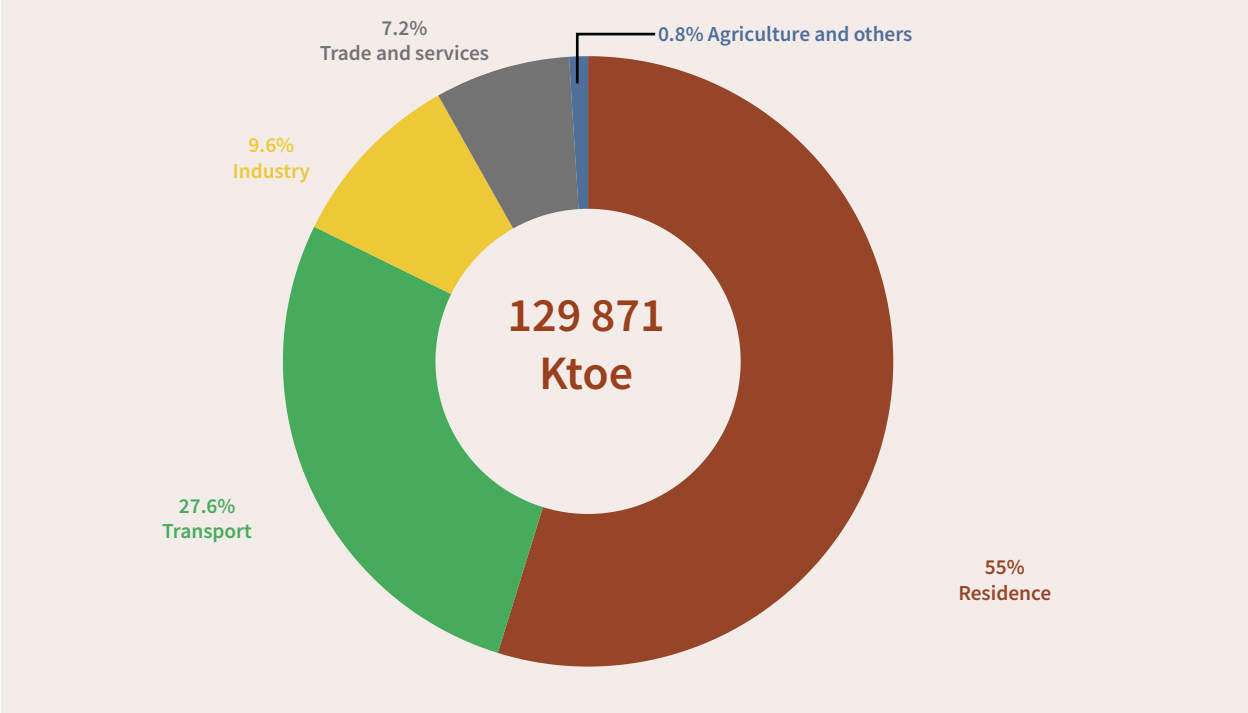
Sources: 2022 ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC

2.2. Total Final Energy Consumption by sector of use in 2022

In 2022, the residential sector accounted for the largest share of final energy consumption, representing 55%, highlighting the dominance of this sector within the region's energy landscape.

The transport sector follows as the second-largest, with a significant share of 27.6% of total final consumption. This is followed by the industrial sector, which contributes 10% to final energy consumption, then the commercial and service sectors at 7.2%. Lastly, the agricultural and other sectors combined account for 0.8% of final energy consumption.

Figure 8: Total Final Energy Consumption by sector of use in ECOWAS region in 2022



Sources: 2022 ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC

As observed at the regional level, several countries report a significant share of the residential sector in their total energy consumption. For instance, Gambia (51.1%), Nigeria (54.1%), Guinea (55.2%), Guinea-Bissau (57.2%), Mali (59.9%), Sierra Leone (65.3%), and Togo (67.7%) show a share of the residential sector exceeding 50%. Conversely, some countries like Niger (71.9%) and Liberia (73.5%) stand out with even higher proportions, surpassing 70%. Notably, Cabo Verde exhibits the lowest share of residential energy consumption, at 26.9%, followed by Ghana (38.8%), Benin (43.9%), and Senegal (44.5%).

In the industrial sector, Senegal leads with the highest share of Total Final Energy Consumption at 32%, followed by Ghana (19.2%) and Cabo Verde (16.9%).

For the transport sector, Cabo Verde leads with 39.8%, followed by Ghana (36.8%) and Nigeria (30.7%).

> *In the services sector, Guinea-Bissau tops the list with 27.7%, followed by Benin (18.0%) and Sierra Leone (16.1%).*

Table 2: Total Final Energy Consumption by sector of use by country in the region in 2022

Country	Share of Industry (%)	Share of Transport (%)	Share of residential (%)	Share of Services & trade (%)	Share of Agriculture And Others (%)
Benin	4.5	33.1	43.9	18.0	0.5
Burkina Faso	6.0	18.0	60.1	14.9	1.0
Cabo Verde	16.9	39.8	26.9	14.3	2.1

Table 2: Total Final Energy Consumption by sector of use by country in the region in 2022

Country	Share of Industry (%)	Share of Transport (%)	Share of residential (%)	Share of Services & trade (%)	Share of Agriculture And Others (%)
Benin	4.5	33.1	43.9	18.0	0.5
Burkina Faso	6.0	18.0	60.1	14.9	1.0
Cabo Verde	16.9	39.8	26.9	14.3	2.1
Cote d'Ivoire	4.2	23.4	62.4	9.4	0.6
Gambia	7.9	29.6	51.1	11.3	0.1
Ghana	19.4	36.8	38.8	4.1	1.0
Guinea	9.8	22.8	55.2	11.3	1.0
Guinea Bissau	1.5	8.6	57.2	27.7	4.9
Liberia	11.3	9.7	73.5	5.0	0.6
Mali	4.9	26.5	59.9	7.2	1.5
Niger	3.6	15.1	71.9	9.3	0.1
Nigeria	9.7	30.7	54.1	4.9	0.6
Senegal	32.0	13.8	44.5	2.9	6.7
Sierra Leone	9.3	9.1	65.3	16.1	0.2
Togo	3.9	17.6	67.7	10.8	0.0

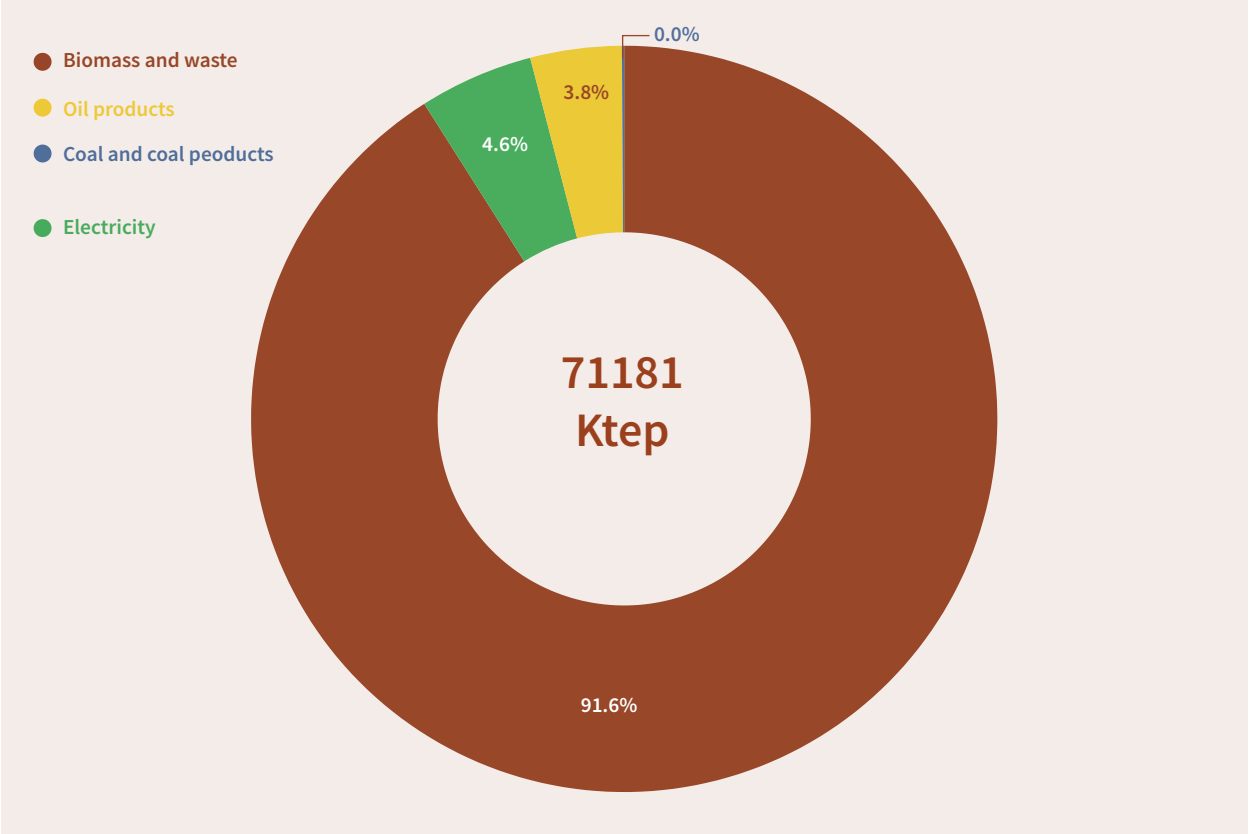
Sources: 2022 ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC

2.2.1. Total Final Energy Consumption in the Residential Sector by Energy Sources

In the ECOWAS region, Total Final Energy Consumption in residential sector in 2022, estimated at 71,181 ktoe, is predominantly derived from biomasss and waste. These sources account for 91.6% of total Total Final Energy Consumption in residential sector, compared to 4.6% from electricity and 3.8% from petroleum products such as LPG and kerosene.

> *This heavy reliance on biomasss highlights the region's dependence on traditional energy sources, particularly in rural areas where access to modern energy alternatives remains limited.*

Figure 9: Total Final Energy Consumption in the Residential Sector by Supply Sources in 2022



Sources: Estimated from 2022 ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC[5], Energy Efficiency questionnaire filled by each country and Energy data from household characteristics in National Survey released by National Institute of Statistics[7]

[5] Bilans Energétiques | AFREC
[7] The DHS Program - Data

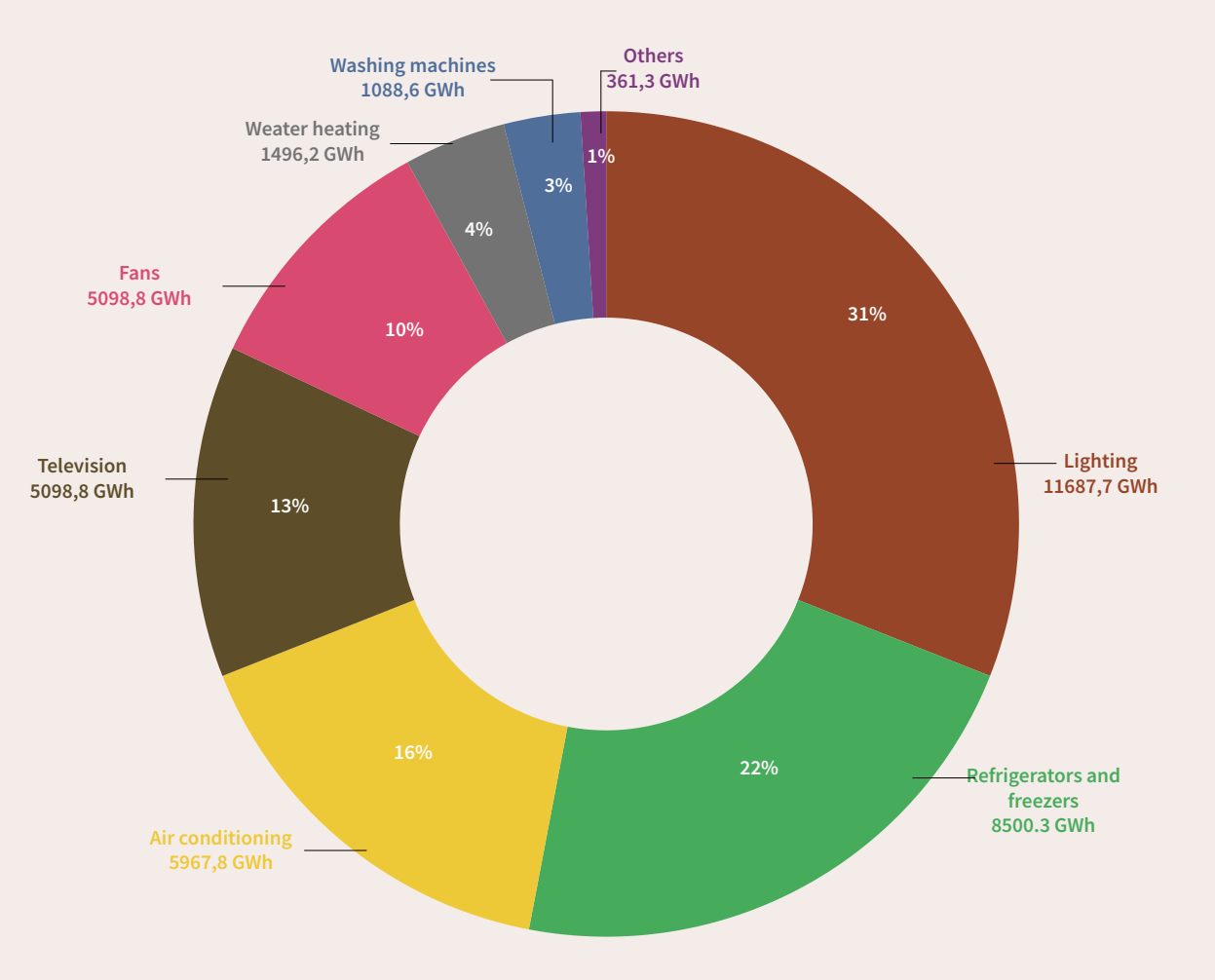
2.2.2. Electricity Consumption in Residential by End Use in 2022

Final electricity consumption in the residential sector across the ECOWAS region was estimated at 38,089 GWh in 2022. Within this sector, electricity is utilized for various essential applications, including lighting, washing machines, water heating, fans, televisions, air conditioning, refrigerators/freezers, and other household appliances.

In the region, 92% of residential electricity consumption is concentrated on four main uses: lighting (31%), refrigerators/freezers (22%), air conditioning (16%), televisions (13%), and fans (10%). Consequently, prioritizing the adoption of energy-efficient appliances—particularly lighting systems, refrigerators/freezers, air conditioners, and televisions—could substantially enhance the efficient utilization of electricity in the residential sector.

> *Following the example of Ghana in 2022, ECOWAS Member States should implement stringent regulations on Energy Efficiency Standards and Labelling for the importation of these types of appliances. Such measures would enable better control of residential electricity consumption while fostering energy sustainability across the region.*

Figure 10: Final Electricity Consumption in Residential by End Use



Sources: Estimated from [2022] ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC[7], Energy Efficiency questionnaire filled by each country and Energy data from household characteristics in National Survey released by National Institute of Statistics[8]

2.2.3. Electricity Consumption in Residential by End Use in 2022 By Country in the Region

In Benin, Burkina Faso, and Togo, approximately 90% of residential electricity consumption is attributed to lighting, fans, and televisions. The respective shares are 58.2%, 20.3%, and 11.2% for Benin; 52.4%, 19.1%, and 15.6% for Burkina Faso; and 56.6%, 16.1%, and 16.6% for Togo.

In Côte d'Ivoire and The Gambia, 90% of residential electricity consumption is also concentrated on lighting, fans, televisions, and refrigerators/freezers. The respective contributions are 40.2%,

[7]Bilans Energétiques | AFREC
[8]The DHS Program - Data

22.0%, 18.8%, and 9.8% for Côte d'Ivoire, and 44.8%, 8.0%, 12.2%, and 19.3% for The Gambia. Senegal and Ghana report the lowest shares of lighting in residential electricity consumption compared to the regional average, with respective shares of 6.2% and 16.7%. In Ghana, domestic electricity consumption is primarily dominated by air conditioning (38.1%) and refrigerators/freezers (24.2%). Conversely, in Senegal, televisions (47.7%), refrigerators/freezers (26.1%), and fans (17.0%) represent the main uses.

In Nigeria, residential electricity consumption patterns closely resemble those of Ghana. The respective shares are 29.3% for lighting, 26.3% for refrigerators/freezers, 12.4% for air conditioning, and 11.7% for televisions.

Finally, in Niger, Sierra Leone, and Liberia, the shares of lighting in residential electricity consumption are the highest in the region, amounting to 73.1%, 65.9%, and 64.3%, respectively.

Table 3: Final Electricity Consumption in Residential by End Use in ECOWAS country in 2022

Electricity Consumption in Residential sector by End Use in 2022 By Country (%)										
Country	**Lighting (%)**	**Refrigerators and freezers (%)**	**Air conditio-ning (%)**	**Television (%)**	**Fans (%)**	**Electrical water heating (%)**	**Washing ma-chines (%)**	**Cooking (%)**	**Water pumping (%)**	**Other (%)**
Benin	58.3	1.5	8.8	11.2	20.3	0.0	0.0	0.0	0.0	0.0
Burkina Faso	52.4	4.1	5.8	15.6	19.1	0.0	0.0	0.0	0.1	2.9
Cabo Verde	7.1	43.2	6.1	10.2	7.3	3.6	1.5	0.1	0.0	20.8
Cote d'Ivoire	40.2	9.8	6.2	18.8	22.0	0.0	0.0	0.0	0.0	2.9
Gambia	44.8	19.3	1.0	12.2	8.0	7.6	1.6	2.8	2.8	0.0
Ghana	16.7	24.2	38.1	4.6	6.9	8.4	1.2	0.0	0.0	0.0
Guinea	35.0	40.1	16.1	2.3	2.2	0.5	3.7	0.0	0.1	0.0
Guinea Bissau	20.8	21.1	22.2	6.4	5.6	12.2	10.3	0.4	1.0	0.0
Liberia	64.7	2.9	3.6	8.8	19.9	0.0	0.0	0.0	0.0	0.0
Mali	57.3	11.9	19.3	9.6	1.9	0.0	0.0	0.0	0.0	0.0
Niger	73.1	3.3	1.9	10.2	11.4	0.0	0.0	0.0	0.0	0.0
Nigeria	29.3	26.3	12.4	11.7	8.9	5.1	5.3	0.2	0.9	0.0
Senegal	6.2	26.1	2.2	47.7	17.0	0.0	0.6	0.0	0.2	0.0
Sierra Leone	65.9	9.4	0.9	6.9	12.5	2.7	1.5	0.1	0.1	0.0
Togo	56.6	7.6	2.7	16.9	16.1	0.0	0.0	0.0	0.1	0.0

Sources: Estimated from 2022 ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC , Energy Efficiency questionnaire filled by each country and Energy data from household characteristics in National Survey released by National Institute of Statistics

2.2.4. Biomass Energy Consumption in Residential by End Use In 2022

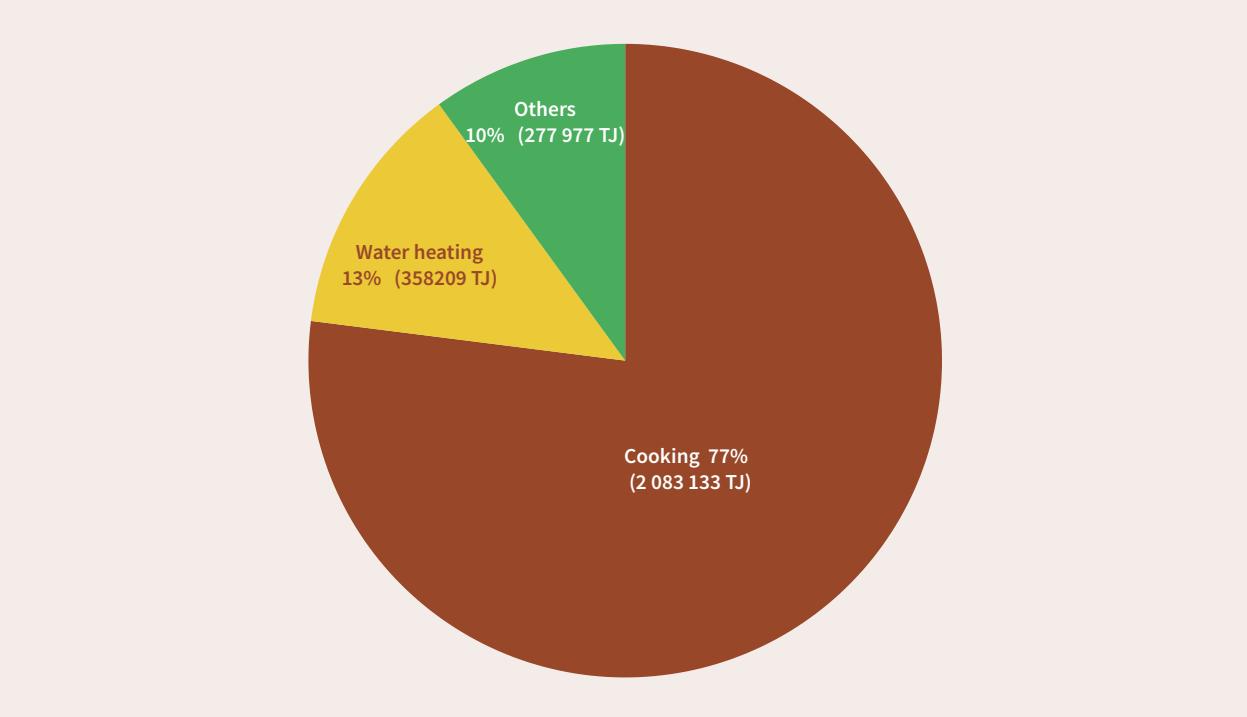
In the ECOWAS region, domestic final consumption of biomasss and waste is predominantly allocated to cooking, accounting for 77% of total usage. Additionally, 13% of this consumption is dedicated to water heating, while the remaining 10% is used for other miscellaneous purposes.

This distribution highlights the heavy reliance of households in the region on biomasss and waste to meet their essential cooking needs. It underscores the ongoing challenges related to access to modern energy solutions, such as high-efficiency cookstoves and alternative energy sources like electricity or gas.

> *Investing in cleaner and more efficient cooking technologies could not only reduce environmental impacts but also significantly improve living conditions and public health across the region.*

[8] Bilans Energétiques | AFREC
[9] The DHS Program - Data

Figure 11: Biomass Energy Consumption in Residential by End Use In 2022 in ECOWAS region



Sources: Estimated from 2022 ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC[10] , Energy Efficiency questionnaire filled by each country and Energy data from household characteristics in National Survey released by National Institute of Statistics[11]

2.2.5. Biomass Energy Consumption in Residential by End Use In 2022 By Country

In line with regional trends, biomass and waste account for over 70% of energy used for cooking across all ECOWAS member states, as indicated in Table 4 below.

[10] Bilans Energétiques | AFREC
[11] The DHS Program - Data

Table 4: Biomass Energy Consumption in Residential by End Use in 2022 in ECOWAS Country

Country	Cooking (%)	Water heating (%)	Other (%)
Benin	77.0	17.8	5.1
Burkina Faso	78.9	12.1	9.0
Cabo Verde	91.4	0.0	8.6
Cote d'Ivoire	91.0	7.9	1.2
Gambia	81.0	9.4	9.6
Ghana	76.3	23.7	0.0
Guinea	83.0	6.5	10.5
Guinea Bissau	88.1	3.9	7.9
Liberia	80.2	14.9	4.8
Mali	90.0	10.0	0.0
Niger	94.2	5.3	0.5
Nigeria	70.8	14.3	14.9
Senegal	77.9	22.1	0.0
Sierra Leone	81.0	9.5	9.5
Togo	80.7	18.5	0.8

Sources: Estimated from 2022 ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC[12] , Energy Efficiency questionnaire filled by each country and Energy data from household characteristics in National Survey released by National Institute of Statistics[13]

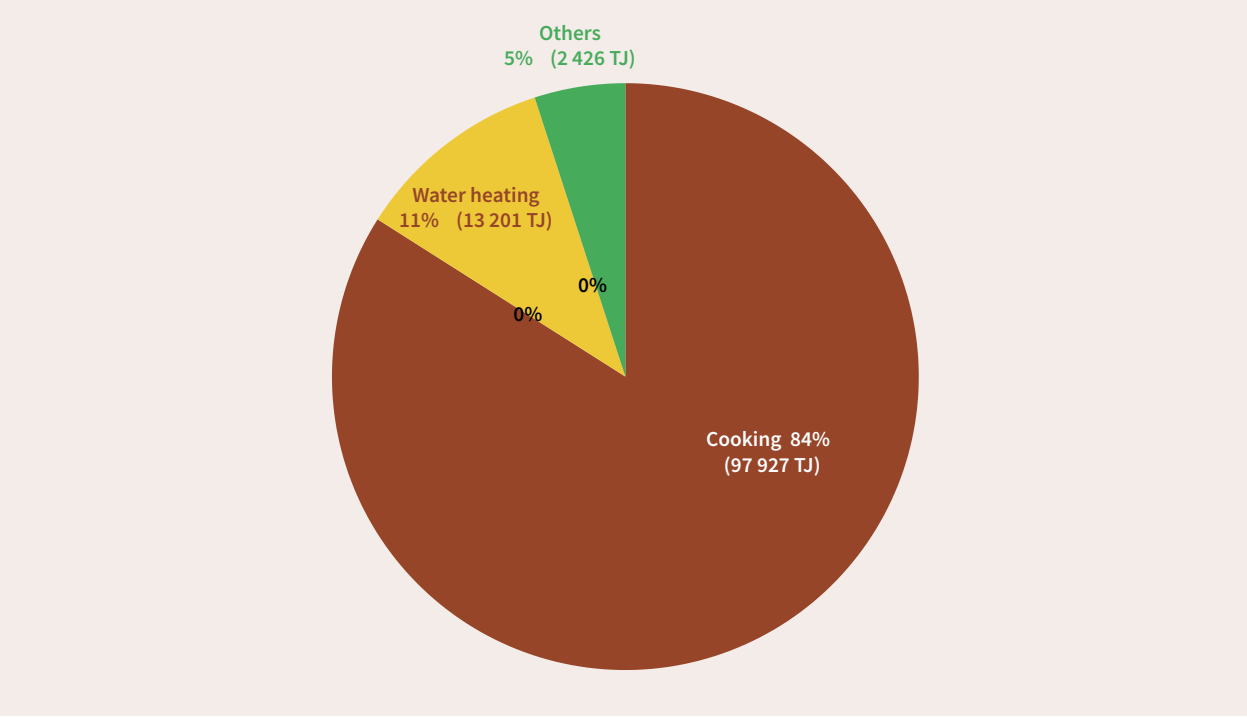
[12] Bilans Energétiques | AFREC
[13] The DHS Program - Data

2.2.6. Fossil fuel Energy Consumption in Residential by End Use in 2022

In 2022, the final consumption of fossil fuels, such as liquefied petroleum gas (LPG) and kerosene, in the residential sector of the ECOWAS region was allocated as follows: 84% for cooking, 11% for water heating, and 5% for other purposes.

> *This usage distribution is consistently observed across all ECOWAS member countries, as illustrated in Table 5 below.*

Figure 12: Fossil fuel Energy Consumption in Residential by End Use In 2022 in ECOWAS region



Sources: Estimated from 2022 ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC[14] , Energy Efficiency questionnaire filled by each country and Energy data from household characteristics in National Survey released by National Institute of Statistics[15]

[14] Bilans Energétiques | AFREC
[15] The DHS Program - Data

Table 5: Fossil fuel Energy Consumption in Residential by End Use in 2022 in ECOWAS Country

Country	Cooking (%)	Lighting (%)	Space heating (%)	Water heating (%)	Other Residential end uses and non-specified (%)
Benin	95.3	1.7	0.0	3.0	0.0
Burkina Faso	79.9	2.8	0.0	12.8	4.5
Cabo Verde	92.8	0.0	0.0	0.0	7.2
Cote d'Ivoire	94.5	0.5	0.0	5.0	0.0
Gambia	66.0	0.0	0.0	24.0	10.0
Ghana	91.2	0.0	0.0	8.8	0.0
Guinea	95.7	4.1	0.0	0.1	0.0
Guinea Bissau	86.5	0.0	0.0	3.8	9.6
Liberia	95.7	3.8	0.0	0.5	0.0
Mali	90.0	0.0	0.0	10.0	0.0
Niger	95.0	0.2	0.0	4.8	0.0
Nigeria	76.4	0.1	0.0	15.4	8.2
Senegal	89.0	2.1	0.0	8.8	0.0
Sierra Leone	67.1	0.0	0.0	22.9	10.0
Togo	98.0	0.0	0.0	2.0	0.0

Sources: Estimated from 2022 ECOWAS Countries Energy Balances data submitted to ECREEE/AFREC , Energy Efficiency questionnaire filled by each country and Energy data from household characteristics in National Survey released by National Institute of Statistics

[16] Bilans Energétiques | AFREC
[17] The DHS Program - Data


A
B
C
D
E
F
G

2.3. Energy Intensity in ECOWAS Region

2.3.1. Primary Energy Intensity in ECOWAS Region

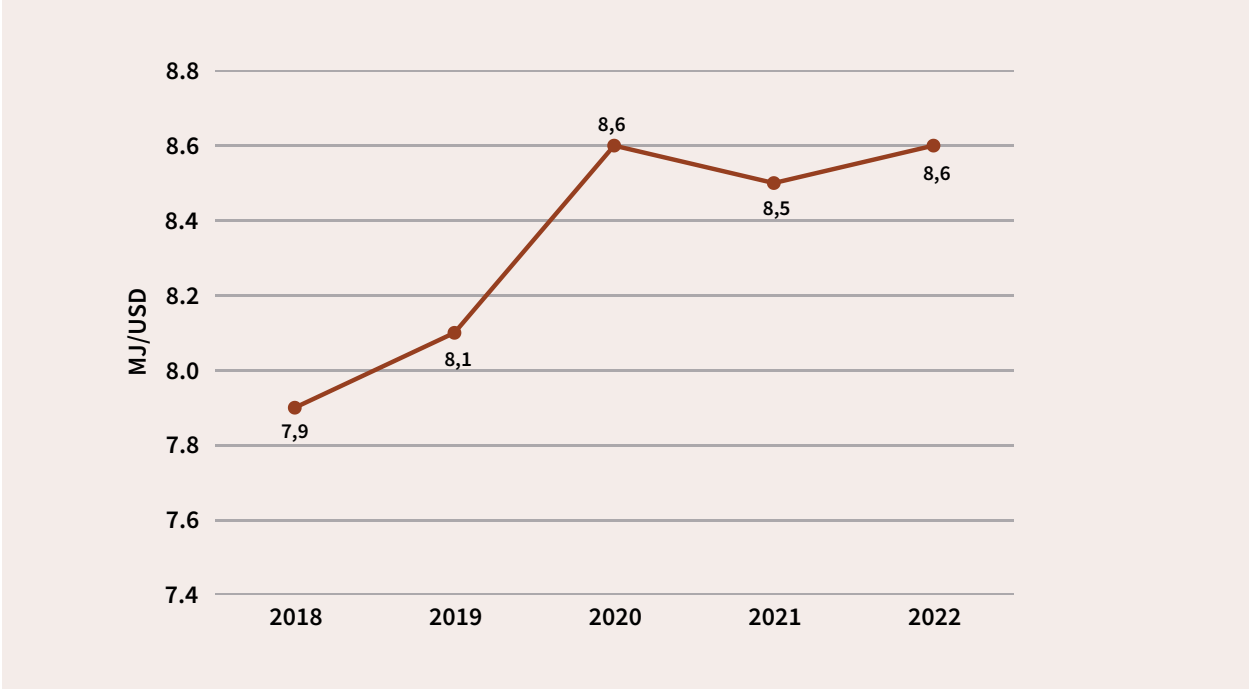
The global primary energy intensity improvement rate is defined as the percentage reduction in the ratio of total global energy supply to gross domestic product (GDP). This indicator serves as a critical benchmark for tracking progress in global energy efficiency.

AIn the ECOWAS region, energy intensity increased between 2018 and 2022, rising from 7.9 to 8.6 megajoules per US dollar of GDP (MJ/USD). This trend reflects a growing amount of energy required to generate one unit of economic output, indicating a decline in energy efficiency across national economies. Such an evolution runs counter to the annual improvement rate of 3.4% required to achieve Target 7.3 of the Sustainable Development Goals (SDGs), which aims to enhance global energy efficiency. This deterioration in energy performance highlights the need for urgent corrective measures to strengthen energy efficiency policies and investments throughout the region.

> *This trend highlights the urgent need to accelerate the implementation of the ECOWAS Energy Efficiency Policy (EEEP) by reinforcing minimum energy performance standards (MEPS), improving energy infrastructure, and fostering the adoption of modern, high-efficiency technologies.*

Additionally, targeted consumer awareness campaigns are essential to promote energy conservation and behavioral change. Aligning national policies with these regional frameworks is important for reducing electricity demand and improving energy security. Moreover, enhanced efficiency measures will play a pivotal role in supporting ECOWAS Member States in meeting their Nationally Determined Contributions (NDCs).

Figure 13: Energy intensity in ECOWAS region



Sources: Estimated from (i) Energy Supply Data of 2012 to 2021 from ECOWAS Energy information system[18] and 2022 from ECOWAS Countries Energy Balances submitted to ECREEE/AFREC, dans (ii) GDP Data Bank from World Bank platform[19]

2.3.2. Primary Energy Intensity by Country in the Region

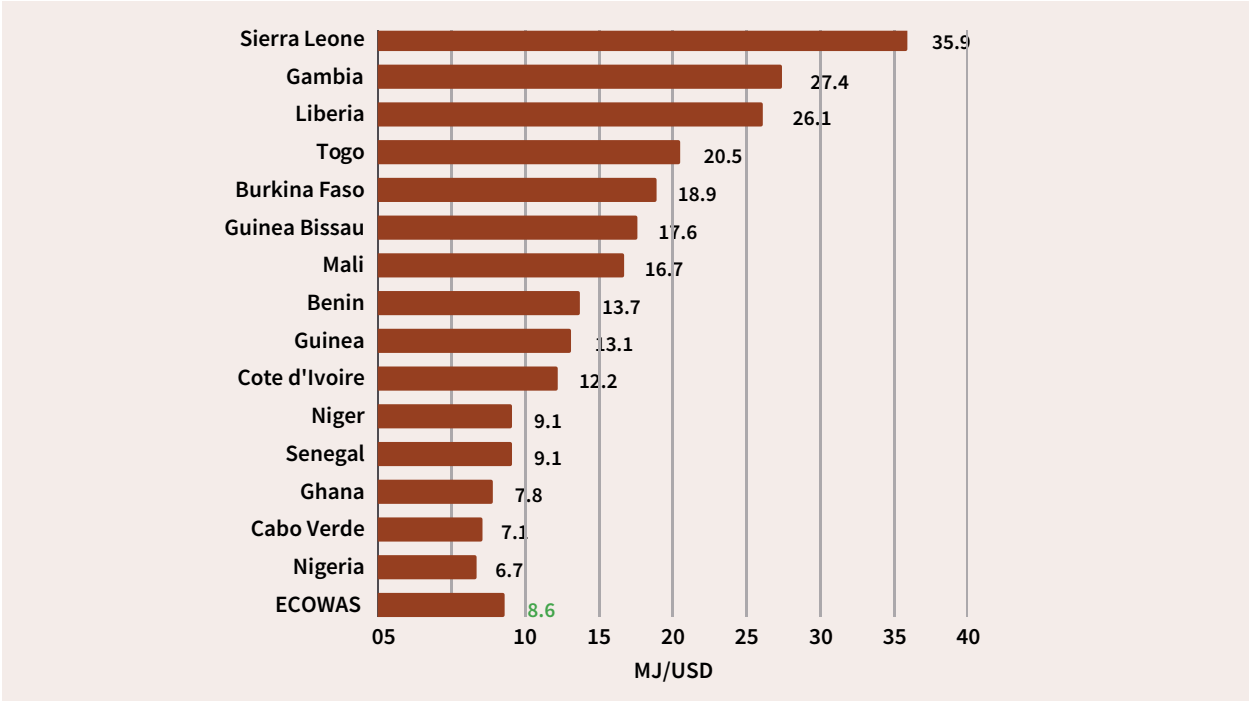
In 2022, energy intensity within the ECOWAS region varied significantly across countries, ranging from 6.7 MJ/USD in Nigeria to 35.9 MJ/USD in Sierra Leone.

Apart from Nigeria, countries such as Cabo Verde, Ghana, Senegal, and Niger recorded energy intensities below 10 MJ/USD, indicating better energy efficiency.

> *Conversely, nations like The Gambia (27.4 MJ/USD), Liberia (26.1 MJ/USD), and Togo (20.5 MJ/USD) exhibited high energy intensity levels (More than 20 MJ/USD), alongside Sierra Leone.*

[18] ECOWAS ENERGY INFORMATION SYSTEMw | WAEIS
[19] World Development Indicators | DataBan

Figure 14: Energy intensity in ECOWAS region per country



Sources: Estimated from (i) Energy Supply Data of 2012 to 2021 from ECOWAS Energy information system[20] and 2022 from ECOWAS Countries Energy Balances submitted to ECREEE/AFREC, dans (ii) GDP Data Bank from World Bank platform[21]

2.3.3. Energy Intensity by sector in the Region

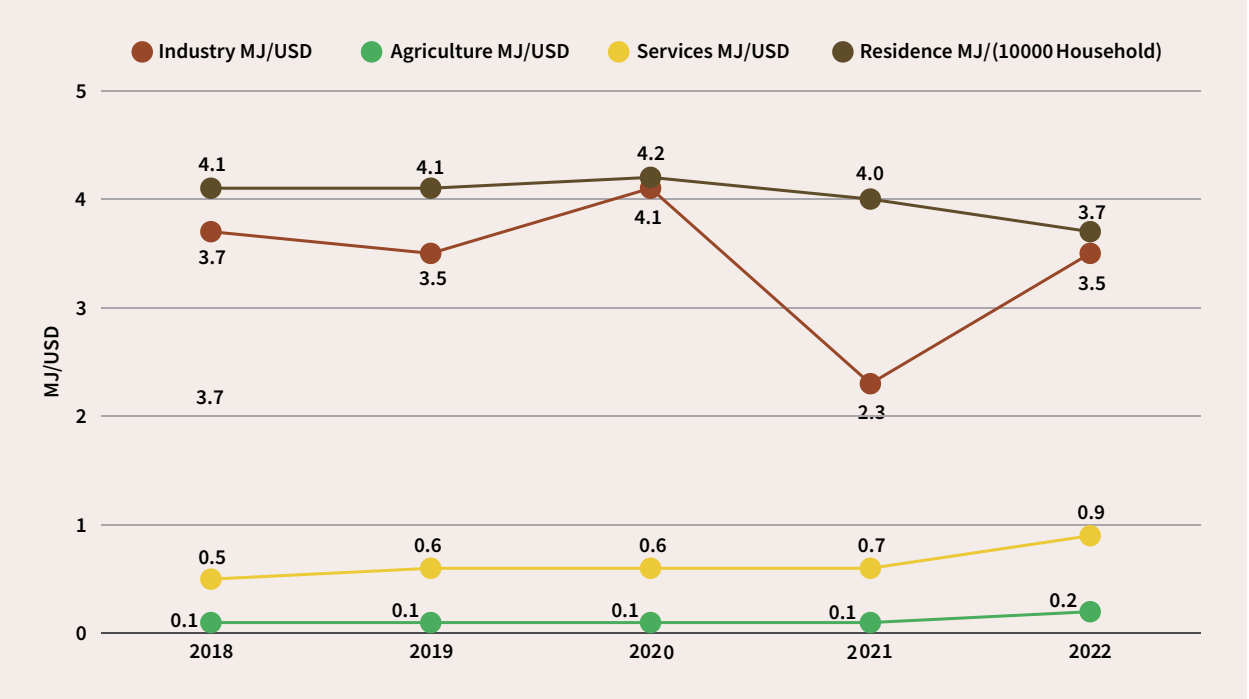
In the ECOWAS region, energy intensities in the residential and industrial sectors have shown a downward trend over the past five years (2018 to 2022), indicating relative improvement.

In the residential sector, energy intensity decreased from 4.1 to 3.7 units, reflecting an average annual decline of 1.9%. For the industrial sector, energy intensity dropped from 3.7 units in 2018 to 3.5 units in 2022, corresponding to an average annual reduction of 1.0%.

[20] ECOWAS ENERGY INFORMATION SYSTEM | WAEIS
[21] World Development Indicators | DataBank

> *Conversely, the energy intensities in the agriculture and services sectors have remained virtually unchanged throughout the period, indicating stagnation in energy efficiency improvements in these areas.*

Figure 15: Energy intensity in ECOWAS region per sector



Sources: Estimated from (i) Energy Consumption Data of 2018 to 2021 from ECOWAS Energy information system and 2022 from ECOWAS[22] Countries Energy Balances submitted to ECREEE/AFREC, dans (ii) Value Added Of GDP from Data Bank from World Bank platform[23]

The improvement of energy efficiency depends both on optimizing end-use energy efficiency and on changes in the efficiency of electricity supply.

[22] ECOWAS ENERGY INFORMATION SYSTEM | WAEIS
[23] World Development Indicators | DataBank

> *The improvement of energy efficiency depends both on optimizing end-use energy efficiency and on changes in the efficiency of electricity supply.*

2.4. Electricity Losses Rate in ECOWAS Region

The information on Electricity Losses was obtained from the study report "Technical assistance in the improvement of the operational performance of utilities, Publication 2023" by WAPP with support from GIZ, within the framework of the ProCEM2 assistance program.

The data was processed considering the following sources of information:

- **2020 Report: "Reduction of Technical and Non-Technical Electricity Losses in Distribution Companies in the ECOWAS Region," published in December 2021, prepared by INTEC.**
- **Information gathered from presentations at the Second Forum held in Liberia from February 20-23, 2024, on "Comprehensive and Sustainable System for Monitoring Losses and Other Performance Indicators."**
- **Information received from questionnaires specifically designed to collect data on the main processes of the companies and aspects outlined in the Terms of Reference. One of the questionnaires focused on gathering data related to the key performance indicators (KPIs) for the period 2020-2022, including data on total energy losses, technical losses, and non-technical losses.**

2.4.1. Technical Electricity Losses (TL)

In 2022, the weighted average of technical losses was estimated at 9.1%[24] in the ECOWAS region. This average can be considered representative of the regional context regarding electrical technical losses. The estimation accounts for the varying maturity levels of utilities in the process of detecting and reducing technical losses.

The companies LEC in Liberia and EAGB in Guinea-Bissau have the highest technical loss rates, at 15% and 13.5%, respectively. In contrast, IKEJA in Nigeria and CIE in Côte d'Ivoire report the lowest technical loss rates in the region, at 3.6% and 4.4%, respectively.

[24] Average based on data from 25 distribution companies in West Africa, presented in table 7 below.

Table 6: 2022 Electricity Technical Losses

Company	Country	Technical Losses 2022	Number Of Customers
IKEJA	Nigeria	3.60%	1 159 699
CIE	Cote d'Ivoire	4.4%	4 055 553
CEET	Togo	9.0%	689 380
SBEE	Benin	9.6%	767 073
ECG	Ghana	9.8%	4 979 141
ENUGU	Nigeria	10.0%	1 227 410
NAWEC	Gambia	10.9%	200 040
SONABEL	Burkina Faso	10.9%	983 285
NEDCO	Ghana	10.9%	1 212 483
EKEDC	Nigeria	11.2%	489 233
SENELEC	Senegal	11.6%	2 198 613
KANO	Nigeria	11.8%	672 009
IBADAN	Nigeria	12.0%	2 220 266
EAGB	Guinee Bissau	13.5%	132 026
LEC	Liberia	15.0%	199 441
Weighted average of Technical Losses in ECOWAS Region (2022)		**9.10%**	

Sources: Technical assistance in the improvement of the operational performance of utilities, GIZ ProCEM2-2024

2.4.2. Electricity Non-Technical Losses (NTL) and Total Losses (TL)

Across the ECOWAS region's electricity sector, the weighted average of combined technical and non-technical losses reaches 21.3%, calculated from a representative sample of 21 distribution utilities covering 88% of total customer connections among the region's 25 utilities.

The companies with the highest rates of non-technical electricity losses are found in Nigeria and Guinea-Bissau. In Nigeria, except for EKEDC and IKEJA, the seven other companies have non-technical loss rates above 30%, with companies such as KAEDCO, YEDC, and JOS having the highest rates, at 65.8%, 61.9%, and 56.0%, respectively

Table 7: 2022 Electricity Non-technical Losses and Total Losses

Company	Country	Total Losses 2022	Technical Losses 2022	Non Technical Losses 2022
SONABEL	Burkina Faso	11.1%	10.9%	0.2%
CIE	Ivory Coast	8.7%	4.4%	4.3%
SENELEC	Senegal	17.4%	11.6%	5.8%
CEET	Togo	16.1%	9.0%	7.1%
EDM-SA	Mali	17.7%	9.1%	8.5%
NAWEC	Gambia	22.7%	10.9%	11.8%
SBEE	Benin	22.2%	9.6%	12.6%
EKEDC	Nigeria	24.5%	11.2%	13.3%
IKEJA	Nigeria	19.6%	3.6%	16.0%
NEDCO	Ghana	28.4%	10.9%	17.5%
ECG	Ghana	28.4%	9.8%	18.6%
EDSA	Sierra Leone	39.0%	13.5%	25.5%
EDG	Guinea	41.0%	9.1%	31.9%

Company	Country	Total Losses 2022	Technical Losses 2022	Non Technical Losses 2022
PHED	Nigeria	43.3%	9.1%	34.2%
IBADAN	Nigeria	48.8%	12.0%	36.8%
LEC	Liberia	56.3%	15.0%	41.3%
ENUGU	Nigeria	51.4%	10.0%	41.4%
KANO	Nigeria	53.7%	11.8%	41.9%
EAGB	Guinea Bissau	59.0%	13.5%	45.5%
JOS	Nigeria	65.1%	9.1%	56.0%
YEDC	Nigeria	71.0%	9.1%	61.9%
KAEDCO	Nigeria	74.9%	9.1%	65.8%
Weighted average ECOWAS 2022			**21.3%**	

Source: Technical assistance in the improvement of the operational performance of utilities, GIZ ProCEM2-2024

Based on the distribution systems and the weighted average loss values calculated for 2022, it can be assumed that a reasonable target for achievable loss levels in the medium term would be approximately 20% (weighted average for the ECOWAS Region). Taking this target of 20% total losses (weighted average) into consideration, along with the weighted average of Technical Losses (TL) at 9.1%, and data from the period 2020-2022, the following table outlines the status of each company in relation to the reference total loss level of 20%.

> *In conclusion, the situation of Non-Technical Losses (NTLs) presents a complex challenge for most companies in the ECOWAS Region, which requires a multi-sectoral approach to address all the actions related to NTLs, extending beyond the management of energy distribution companies.*

Table 8: Average Electricity Losses 2020-2022

Company	Country	Total Losses: 2020-2022	average Technical Losses: 2020- 2022	average NTL: 2020-2022
CIE	Côte d'Ivoire	10,9%	5,1%	5,8%
SONABEL	Burkina Faso	11,4%	10,7%	0,7%
CEET	Togo	16,0%	9,0%	7,0%
IKEJA	Nigeria	17,6%	3,9%	13,7%
SENELEC	Senegal	18,7%	12,4%	6,3%
EDM-SA	Mali	19,0%	No data	No data
NAWEC	Gambia	20,7%	10,9%	9,8%
EKEDC	Nigeria	21,7%	11,8%	9,9%
SBEE	Benin	22,7%	9,6%	13,1%
NEDCO	Ghana	27,7%	10,3%	17,4%
ECG	Ghana	28,0%	9,8%	18,1%
EDSA	Sierra Leone	34,6%	14,2%	20,4%
PHED	Nigeria	38,2%	No data	No data
EAGB	Guinea Bissau	45,5%	14,2%	31,3%
KANO	Nigeria	51,0%	10,5%	40,6%
IBADAN	Nigeria	52,7%	13,0%	39,7%
ENUGU	Nigeria	53,2%	10,0%	43,2%
EDG	Guinea	53,7%	No data	No data
JEDPLC	Nigeria	57,5%	No data	No data
KAEDCO	Nigeria	59,3%	No data	No data
LEC	Liberia	60,6%	14,0%	46,6%
YEDC	Nigeria	66,8%	No data	No data
NIGELEC	Niger	No data	No data	No data
BEDC	Nigeria	No data	No data	No data
AEDC	Nigeria	No data	No data	No data

Sources: Technical assistance in the improvement of the operational performance of utilities, GIZ ProCEM2-2024

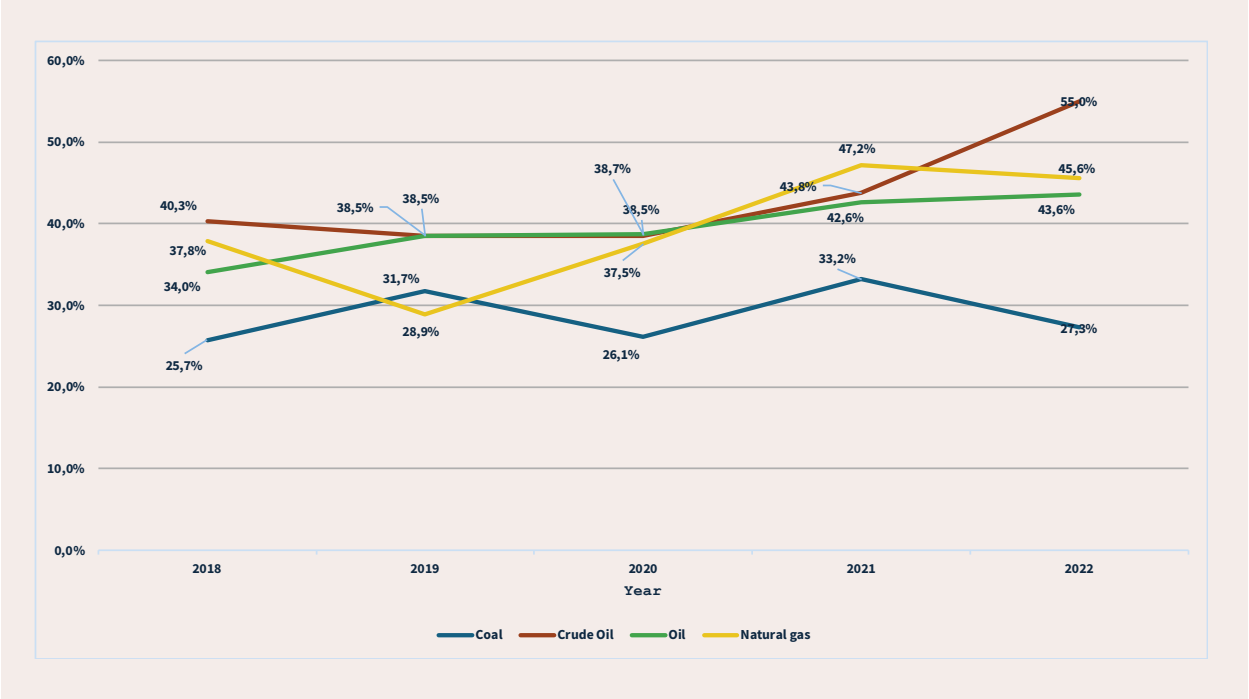
2.5 Efficiency Electricity generation in ECOWAS Region

Unlike electricity loss rates, the efficiency of electricity production from fossil fuels has recorded significant increases over the past five years (2018-2022) in the ECOWAS region. These improvements are observed across all types of fossil fuels, namely natural gas, coal, crude oil, and refined petroleum products

Specifically, the efficiency of electricity production from natural gas experienced notable growth, rising from 37.8% in 2018 to 45.6% in 2022, despite a temporary decline to 30% in 2019. This corresponds to an average annual improvement rate of 3.8%. Similarly, the efficiency of electricity production from crude oil increased significantly, from 40.3% to 55.0% between 2018 and 2022, with an average annual improvement rate of 6.4%.

> *Refined petroleum products and coal also saw progress, with average annual improvement rates in energy efficiency of 5.1% and 1.2%, respectively.*

Figure 16: Efficiency of electricity production from fossil fuels rate in ECOWAS region



Sources: Estimated from (i) Energy Production and Consumption Data of 2018 to 2021 from ECOWAS Energy information system[25] and 2022 from ECOWAS Countries Energy Balances submitted to ECREEE/AFREC

[25] ECOWAS ENERGY INFORMATION SYSTEM | WAEIS

2.6. Clean Cooking Energy and technology in ECOWAS Region

An essential aspect of energy efficiency lies in the adoption of clean cooking technologies. These solutions, which encompass the use of modern fuels and efficient cooking appliances, not only mitigate the environmental and health impacts associated with the combustion of traditional fuels such as wood, charcoal, and kerosene but also contribute to a more rational and efficient management of energy resources.

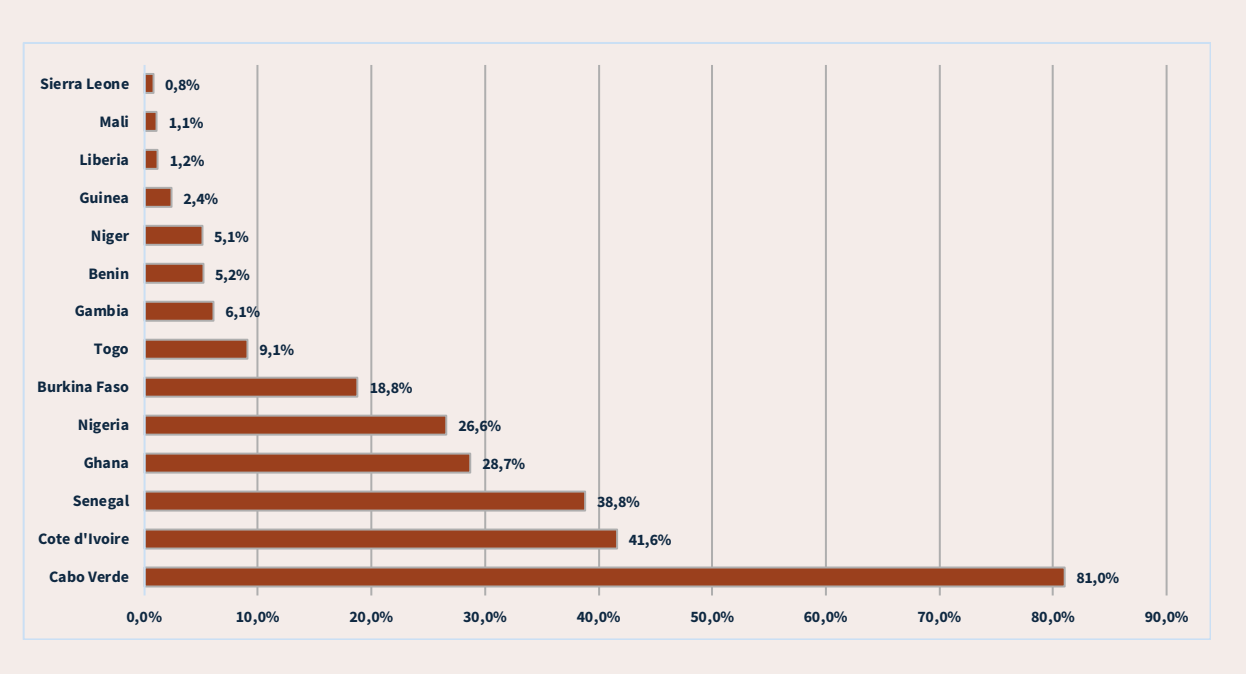
As part of the Sustainable Development Goals (SDGs), target 7.1 of SDG7 aims to ensure universal access to modern, reliable, and affordable energy services by 2030, including access to clean cooking technologies. In 2020, according to the Tracking SDG7: Energy Progress Report (2022), approximately 2.4 billion people worldwide still lacked access to clean cooking solutions. The numerical target is to achieve 100% access by 2030.

The adoption of clean cooking technologies remains a significant challenge in the ECOWAS region. In 2022, ten out of the fifteen countries in the region reported access rates to modern cooking energy and technologies below 10%.

> *Nigeria and Ghana exhibit similar adoption ratios of modern cooking energy and technologies, with respective rates of 26.6% and 28.7%. Similarly, Senegal and Côte d'Ivoire show comparable rates of 38.8% and 41.6%. Cabo Verde stands out with the highest rate in the region, reaching 81%.*

These findings highlight a concerning situation in the ECOWAS region, where access levels to clean cooking technologies fall significantly below the global average. Strengthening efforts to promote clean cooking solutions, such as improved cookstoves, modern liquid fuels (LPG), and biomasss, is crucial. These measures will not only address the energy needs of households but also help reduce greenhouse gas emissions and health risks associated with the use of polluting fuels.

Figure 17: Clean Cooking Energy and technology in ECOWAS Region until 2022



Sources: Energy data from household characteristics in National Survey released by National Institute of Statistics[26]

[26] The DHS Program - Data

2.7. Energy Efficiency Policy Law and Regulation in ECOWAS Region

Under the leadership of the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE), the ECOWAS region has established sustainable energy policies as follows:

- ECOWAS Renewable Energy Policy (EREP, 2013)
- ECOWAS Energy Efficiency Policy (EEEP, 2013)
- ECOWAS Bioenergy Policy (2017)
- ECOWAS Policy for Gender Mainstreaming in Energy Access (2017)
- ECOWAS Green Hydrogen Policy and Strategy Framework (2023)

> *In addition to these policies, standards and guidelines have been developed and adopted at the regional level, as presented in the table*

Table 9: Standards and guidelines adopted for the ECOWAS region

No	Name of standards	Reference	Status	Date
1	Technical specification for mains-voltage general lighting service lamps	ECOSTAND 053: 2016(F)	Adopted	13/05/2016
2	Technical specification for off-grid lighting products	ECOSTAND 054: 2016	Adopted	13/05/2016
3	Minimum Energy Performance Standards (MEPS)- Part 1-refrigerating appliances	ECOSTAND 071-1: 2017(E)	Adopted	20/06/2017
4	Minimum Energy Performance Standards (MEPS)- Part 2- air conditioners	ECOSTAND 071-2: 2017(E)	Adopted	20/06/2017
5	Minimum Energy Performance Standards (MEPS) for TV	ECOSTAND 084: 2020	Adopted	11/06/2021
6	Minimum Energy Performance Standards (MEPS) for comfort electric fans	ECOSTAND 081: 2020	Adopted	17/06/2021
7	Minimum Energy Performance Standards (MEPS) for electric storage water heaters	ECOSTAND 085: 2020	Adopted	17/06/2021
8	Directive for Minimum Energy Performance Standards (MEPS) and Labelling for Electrical Appliances and Equipment in the ECOWAS Member States		Adopted	2022

ECREEE facilitates the domestication of Regional Policies into National Action Plans by Member States, with current implementation status detailed below for the Energy Efficiency dimension.

Table 10: ECOWAS Countries with Energy Policy and Action Plan Until 2022

Country	Energy law, electrification code and energy policy	Sustainable Energy For All Action Plan (SE4All)	Energy Efficiency National Action Plan	Energy Efficiency Agency
Benin	YES	YES	YES	
Burkina Faso	YES	YES	YES	YES
Cabo Verde	YES	YES		
Cote d'Ivoire	YES	YES	YES	
Gambia, The	YES	YES		
Ghana	YES	YES	YES	YES
Guinea	YES	YES		
Guinea-Bissau			YES	
Liberia	YES	YES	YES	YES
Mali	YES	YES	YES	YES
Niger	YES	YES	YES	
Nigeria	YES	YES	YES	YES
Senegal	YES	YES	YES	YES
Sierra Leone	YES	YES	YES	
Togo	YES	YES	YES	YES
ECOWAS	YES	YES	YES	YES

In addition to regional initiatives, countries have also developed their own energy efficiency initiatives.

BENIN

In 2020, through Law No. 2020-05 enacted on April 1, 2020, establishing the Electricity Code of the Republic of Benin, the country outlined the key orientations of its energy policy as well as the general principles for the organization, operation, and development of the electricity sector. This policy aligns with Benin's international, regional, and national commitments, particularly concerning environmental protection and climate change mitigation.

The policy explicitly defines actions to be undertaken in the field of energy efficiency. The law stipulates that the implementation of the government's policy on energy management and efficiency is entrusted to a public, non-profit institution. Additionally, an administrative body established by the government is tasked with setting standards related to safety, environmental protection, performance, and energy efficiency. These standards apply to infrastructure, installations, buildings, equipment, products, and services regulated under the provisions of this law.

BURKINA FASO

Burkina Faso has developed the **Energy Sector Strategy 2019–2023**[27] . Pillar 2 of this plan emphasizes the promotion of energy efficiency. This includes fostering energy savings, optimizing the transportation, distribution, and consumption of energy, as well as promoting alternative technologies and energy sources to replace wood fuel.

CABO VERDE

The "Energy Transition 2023[28]" Program aims to promote access to clean and sustainable energy through three key intervention areas: (i) sustainable energy production and distribution, (ii) efficient energy consumption, and (iii) strengthening sector governance.

COTE D'IVOIRE

In November 2020, Côte d'Ivoire adopted Interministerial Decree No. 156 / MMPE/ MCLU/ MT/ MINEDDTE/ MCI of April 23, 2024, which establishes the conditions for mandatory and periodic energy audits for energy-consuming entities, the procedures for conducting such audits, and the qualifications required for energy auditors[29].

[27] https://faolex.fao.org/docs/pdf/bkf223810.pdf
[28] https://relop.org/wp-content/uploads/2023/11/Transicao-Energia-Relop2023-Rito-Evora.pdf
[29] https://anare.ci/download/arrete-interministeriel-n-156-mmpe-mclu-mt-mineddte-mci-du-23-avril-2024-portant-conditions-dassujettissements-des-organismes-consommateurs-denergie-a-laudit-energetique-obligatoire/

Additionally, Côte d'Ivoire has implemented several projects aimed at developing and promoting energy efficiency in public lighting. These initiatives focus on:

- Establishing a regulatory and institutional framework to promote energy management.
- Developing energy efficiency policies, standards, and guidelines for lighting applications.
- Identifying programs and targets to strengthen institutional and technical capacities among stakeholders.
- Disseminating information and raising awareness among consumers.
- Phasing out incandescent light bulbs and fostering the development of a market for efficient lighting solutions.

GHANA

In 2021, Ghana developed its national energy policy titled "National Energy Policy: Energy Sector, an Engine for Economic Growth and Sustainable Development", which places energy efficiency at its core.

In 2023, the country established energy efficiency guidelines called "Energy Efficiency Guidelines for Manufacturers, Importers and Retailers of Regulated Electrical Appliances[30]". The primary objective is to enhance consumer confidence in the electrical appliances available on the market, as well as their energy efficiency performance, thereby guiding purchasing decisions.

NIGERIA

In 2022, Nigeria adopted its National Energy Policy[32], with a strong emphasis on energy efficiency. The policy is structured around four key pillars, which are as follows:

- The nation shall adopt and promote energy efficiency and conversation best practices in the exploration and utilization of the nation's energy resources
- The nation shall mainstream energy efficiency and conversation best practices into all sectors of the economy
- The nation shall adopt appropriate energy pricing, metering, and billing mechanisms
- The nation shall integrate energy efficiency and conservation studies into the curricula of educational institutions
- The nation shall adopt, promote and enforce standardization of the energy appliance standards and code for energy efficiency and conservation technologies

[30] https://efficiency.energycom.gov.gh/files/energy-efficiency-guidelines.pdf
[31] https://energy.gov.ng/Energy_Policies_Plan/APPROVED_REVISED_NEP_2022.pdf

SENEGAL

Senegal has undertaken a revision of its energy policy, with particular emphasis on energy efficiency. The country focuses on the Agency for Energy Economy and Control (AEME), the key institution responsible for designing and implementing this policy. Senegal aims to strengthen AEME's technical expertise and institutional capacities to effectively achieve set objectives. The agency carries out multiple missions, including:

- Assessing sectoral potential for energy efficiency improvements
- Developing sector-specific strategies, action plans, and targeted programs

Furthermore, AEME is tasked with proposing energy management programs and contributes to the development of legislative and regulatory frameworks for energy efficiency in Senegal.


A
B
C
D
E
Energy
Efficiency
MC
MR
%
OFF
M−
M+
CE
AC
ON/C

2.8. Summary of Energy Efficiency Progress (2022 Status)

i. **Phasing Out Inefficient Lighting:**

- **Target:** 100% phase-out by 2020.
- **Achievement:** about 70% transition to efficient lighting.

ii. **Electricity Distribution Losses:**

- **Target:** Below 10% by 2020.
- **Regional Achievement:** 21.3% in 2022.

iii. **Clean Cooking Access:**

- **Target:** Universal access by 2030.
- **Regional Achievement:** 23.2% access in 2022.

iv. **Standards and Labels for Equipment:**

- **Target:** Region-wide adoption by 2020.
- **Regional Achievement:** low adoption.

v. **Financing Mechanisms:**

- **Target:** Established regional fund by 2020.
- **Regional Achievement:** Funds have been mobilized for projects through the ECOWAS Special Intervention Fund (ESIF) initiative. Additionally, a regional fund under the ECOWAS Renewable Energy and Energy Efficiency Facility (EREEEF) is currently being implemented to support projects endorsed by ECREEE. This fund will be administered by the ECOWAS Bank for Investment and Development (EBID).

3

Perspectives and Recommendations

To address the identified challenges and accelerate energy efficiency in the residential sector within the ECOWAS region, several concrete actions must be implemented.

1. **Electricity Distribution Losses: :** the following urgent measures are required to limit these inefficiencies:

- Modernize and maintain distribution infrastructure by investing in more robust networks and replacing outdated equipment.
- Deploy smart meters to better manage demand and reduce technical and commercial losses.
- Support the emergence of startups specializing in smart meter installations, helping to optimize electricity consumption and distribution.
- Assist electricity companies in reducing fraud by strengthening monitoring mechanisms and raising public awareness of the importance of paying for consumed electricity.

2. **Accelerating the Adoption of Clean Cooking Technologies:** Access to clean cooking technologies remains a significant challenge, with ten countries recording access rates below 10%. To reverse this trend, it is essential to:

- Encourage the emergence of local enterprises specializing in the production and distribution of improved cookstoves, bioethanol, and biogas by facilitating access to financing and manufacturing equipment.
- Strengthen the technical capacities of local artisans and SMEs through training programs on the production and installation of clean cooking technologies.
- Implement public awareness campaigns highlighting the health and economic benefits of modern cooking solutions while promoting their adoption through innovative business models such as lease-to-own schemes and consumer-friendly credit options.

3. **Standards and Labels for Equipment:** Households in the ECOWAS region consume an increasing share of electricity, yet the penetration of energy-efficient appliances remains insufficient. Immediate measures should include:

- Establishing and enforcing Minimum Energy Performance Standards (MEPS) for household appliances, including refrigerators, air conditioners, and light bulbs.
- Gradually phasing out energy-intensive appliances, such as incandescent bulbs and low-efficiency air conditioners, while facilitating the importation of high-performance models.
- Providing financial incentives (tax reductions, credit facilities) to encourage the purchase of energy-efficient appliances.
- Educating consumers on the impact of their energy choices through energy labeling initiatives and awareness campaigns on energy savings.

4. **Building Efficiency Standards:** Energy losses in residential buildings hinder the energy transition. To address this:

- Integrate energy efficiency standards into the construction of new housing, promoting the use of insulating materials and bioclimatic designs suited to the local climate.
- Develop a local market for sustainable and insulating construction materials, supporting entrepreneurs in producing eco-friendly bricks, reflective roofing, and thermal insulation solutions.
- Encourage the training of construction professionals in bioclimatic building techniques to generalize the adoption of energy-efficient housing designs.
- Facilitate access to financing for energy-efficient renovations, partnering with financial institutions to offer preferential loans for installing energy-saving equipment.
- Develop pilot projects for high-efficiency housing in major cities to demonstrate the economic and energy benefits of these initiatives.

5. **Financing Mechanisms:**
To meet the energy needs of rural areas and low-income households, off-grid solutions must be expanded:

- Support entrepreneurship in the solar home system (SHS) sector, improving access to financing for local businesses and encouraging pay-as-you-go models.
- Facilitate the emergence of local hybrid mini-grid initiatives, supporting project developers in navigating regulatory processes and streamlining investment procedures.
- Establish local distribution and maintenance platforms for solar equipment to ensure the availability and durability of off-grid solutions.
- Encourage the training of local technicians specialized in solar energy and decentralized electricity infrastructure maintenance, creating skilled employment opportunities and ensuring quality after-sales service.

Enhancing energy efficiency in the ECOWAS residential sector requires a pragmatic approach centered on innovation, entrepreneurship, and the empowerment of local stakeholders.

The region must foster the development of economically viable energy solutions through an enabling regulatory framework, incentives for private investment, and increased consumer awareness

> *By supporting local entrepreneurs and facilitating access to efficient technologies, ECOWAS can successfully achieve its energy transition while driving economic growth and creating sustainable employment opportunities.*

CONCLUSION

This report represents the first dedicated report on the Energy Efficiency sector in West Africa. It documents the implementation status of ECOWAS Energy Efficiency Policy while helping to address the shortage of quality data on energy efficiency in the region. The provision of energy efficiency data for the period 2018-2022 provides relevant information to develop and adjust sustainable energy promotion pathways at both regional and Member State levels.

Analysis of final total energy consumption within ECOWAS reveals sustained growth in energy demand, with an average annual rate of 3.85%, consistent with the region's economic dynamics. In 2022, final total consumption reached 129,871 ktoe, representing 23.5% of Africa's energy consumption, with Nigeria as the primary consumer (56.2% of the total). However, per capita consumption remains below the African average (0.305 toe vs. 0.390 toe), with significant disparities persisting between countries. The energy mix remains largely dominated by biomass (60%), followed by petroleum products (33.1%), while electricity, natural gas and coal constitute minor sources. Biomass (including waste) accounts for 60% of total consumption, followed by petroleum products (33.1%), electricity (5.5%), natural gas (2.4%) and coal (0.3%). Notably, the composition of the energy mix varies considerably between countries. Some nations like Cabo Verde, Senegal and Ghana stand out with a pronounced energy mix featuring significant electricity shares (15-24%) and lower biomass dependence (23-35%) compared to regional averages. Other countries including Burkina Faso, Togo, Niger, Sierra Leone, Liberia and Guinea-Bissau remain heavily biomass-dependent, with shares exceeding 70% of their national energy balance.

> *These disparities underscore the need for differentiated approaches to modernize energy systems that account for national specificities.*

The residential sector represents the primary energy consumer (55% of total consumption), with biomass predominating for cooking (77% of household energy use). Access to clean cooking solutions remains limited in most countries, except in Cabo Verde where adoption rates exceed 80%.

Progress has been achieved in fossil-fuel electricity generation, with improved

efficiency in natural gas (increasing from 37.8% to 45.6%) and crude oil (from 40.3% to 55%).

In 2022, the overall electricity loss rate in the ECOWAS region stood at 21.3%, with 9.1% attributable to technical losses. While this level remains below the African average (estimated at 23%), it continues to raise concerns when measured against international standards and regional power sector performance targets.
Despite notable progress, the ECOWAS region still faces significant structural challenges, particularly regarding access to modern energy, improved energy efficiency, and reduced electricity losses.

> *These trends underscore the urgent need for an inclusive and sustainable energy transition to ensure resilient and equitable development.*

Enhancing energy efficiency in ECOWAS's residential sector requires a pragmatic approach centered on innovation, entrepreneurship, and local stakeholder empowerment. It is crucial to promote economically viable energy solutions, supported by an enabling regulatory framework, investment incentives, and enhanced consumer awareness, to successfully achieve the energy transition while fostering economic growth and sustainable job creation.


A
B
C
D
E
F
G
SECTION A-A
MASTER SUITE

REFERENCES

UN. 2022. Tracking SDG7: The Energy Progress Report 2022. Department of Economic and Social Affairs Sustainable Development.
https://sdgs.un.org/publications/tracking-sdg7-energy-progress-report-2022-47726

ECOWAS Energy Information System. 2022. ECOWAS Energy Outlook: biomass energy in focus
World Energy Counsil. 2013. World Energy Perspective. Energy Efficiency Technologies.
World-Energy-Perspectives-Energy-Efficiency-Technologies-Overview-report.pdf

World Energy Counsil. 2013. Energy Efficiency Technologies. Energy Efficiency Potentials and Barriers for Realization in the Industry Sector.
https://www.worldenergy.org/assets/downloads/EE-Technologies-ANNEX-I-Energy-Efficiency-Potentials-and-Barriers-for-Realization.pdf

World Energy Counsil. 2013. Energy Efficiency Technologies. Energy Efficient Solutions for Existing Communities.
https://www.worldenergy.org/assets/downloads/EE-Technologies-ANNEX-II-Energy-Efficient-Solutions-for-Existing-Communities.pdf

World Energy Counsil. 2013. Energy Efficiency Technologies. Energy Efficient Solutions for Thermal Power Plants.
https://www.worldenergy.org/assets/downloads/EE-Technologies-ANNEX-III-Energy-Efficient-Solutions-for-Thermal-Power-Solutions.pdf

World Energy Counsil. 2013. Energy Efficiency Technologies. Energy Efficient Solutions for Thermal Power Plants.
https://www.worldenergy.org/assets/downloads/EE-Technologies-ANNEX-III-Energy-Efficient-Solutions-for-Thermal-Power-Solutions.pdf

DHS Program. 2010 to 2023. Benin, Burkina Faso, Cote d'Ivoire, Gambia, Ghana, Guinea, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo. Demographic and Health Survey.
https://www.dhsprogram.com/publications/index.cfm

IEA. 2017. Market Report Series: Energy E"ciency 2017. Paris: IEA.
https://www.iea.org/reports/energy-efficiency-2017

IEA. 2018. Energy Efficiency 2018: Analysis and Outlooks to 2040. Paris: IEA.
https://www.iea.org/reports/energy-efficiency-2018

IEA. 2019a. Africa Energy Outlook 2019: World Energy Outlook Special Report. Paris: IEA. https://www.iea.org/reports/africa-energy-outlook-2019

IEA. 2019b. Energy E”ciency 2019: The Authoritative Tracker of Global Energy E”ciency Trends. Paris: IEA. https://www.iea.org/reports/energy-efficiency-2019

IEA. 2019c. Global EV Outlook 2019: Scaling Up the Transition to Electric Mobility. Paris: IEA. https://www.iea.org/reports/global-ev-outlook-2019

IEA. 2019d. Innovative Regulatory Approaches with Focus on Experimental Sandboxes. Paris: IEA. https://www.iea-isgan.org/wp-content/uploads/2019/05/ISGAN_Casebook-on-Regulatory-Sandbox-A2-1.pdf

IEA. 2020. Recommendations of the Global Commission for Urgent Action on Energy E”ciency. Paris: IEA. https://www.iea.org/reports/recommendations-of-the-global-commission-for-urgent-action-on-energy-efficiency

IEA. 2021a. Achievements of Energy E”ciency Appliance and Equipment Standards and Labeling Programmes: A Global Assessment in 2021. Paris: IEA. https://www.iea.org/reports/achievements-of-energy-efficiency-appliance-and-equipment-standards-and-labeling-programmes

IEA. 2021b. “Carbon Emissions Fell across All Sectors in 2020 except for One—SUVs.” IEA, Paris. https://www.iea.org/commentaries/carbon-emissions-fell-across-all-sectors-in-2020-except-for-one-suvs

IEA. 2021c. Demand Response. Paris: IEA. https://www.iea.org/reports/demand-response
IEA. 2021d. Energy Efficiency 2021. Paris: IEA. https://www.iea.org/reports/energy-efficiency-2021.

IEA. 2021e. Sustainable Recovery Tracker: Monitoring Progress towards Sustainable Recoveries from the Covid-19 Crisis. Paris: IEA. https://www.iea.org/reports/sustainable-recovery-tracker

IEA. 2021f. Net Zero by 2050—A Roadmap for the Global Energy Sector. Paris: IEA. https://www.iea.org/reports/net-zero-by-2050

IEA. 2021g. Tracking Clean Energy Progress: Data Centres and Data Transmission Networks. Paris: IEA.
https://www.iea.org/reports/data-centres-and-data-transmission-networks.

IEA. 2021h. “World Energy Balances 2020.” IEA, Paris.
https://www.iea.org/data-and-statistics.

IEA. 2021i. World Energy Investment 2021. Paris: IEA.
https://www.iea.org/reports/world-energy-investment-2021 .

IEA. 2021j. World Energy Model. Paris: IEA.
https://www.iea.org/reports/world-energy-model.

IEA. 2022a. “Digital Demand-Driven Electricity Networks Initiative.” IEA, Paris.
https://www.iea.org/programmes/digital-demand-driven-electricity-networks-initiative

IEA. 2022b. “Policies Database.” IEA, Paris.
https://www.iea.org/policies

Malmodin, J., and D. Lundén. 2018. “The Energy and Carbon Footprint of the Global ICT and E&M Sectors 2010–2015.” Sustainability 10 (9): 3027.
https://www.mdpi.com/2071-1050/10/9/3027

MOP (Ministry of Power, Government of India). 2021. “Guidelines: Revamped Distribution Sector Scheme.” MOP, New Delhi.
https://powermin.gov.in/sites/default/files/uploads/Final_Revamped_Scheme_Guidelines.pdf.

REN21 (Renewable Energy Policy Network for the 21st Century). 2019. “Policy Landscape.” In Renewables 2019: Global Status Report. Paris: REN21.
https://www.ren21.net/gsr-2019/chapters/chapter_02/chapter_02

SEPSE (Secretaría de Planificación del Subsector Energía). 2021. Estrategia Nacional de Redes Eléctricas Inteligentes: 2021–2031. San Jose: SEPSE.
https://sepse.go.cr/wp-content/uploads/2021/08/ENREI-FINAL.pdf

UN (United Nations). 2018. International Recommendations for Energy Statistics (IRES). New York: UN.
https://unstats.un.org/unsd/energystats/methodology/documents/IRES-web.pdf

UN. 2021. Towards the Achievement of SDG 7 and Net-Zero Emissions. New York: UN. https://www.un.org/sites/un2.un.org/files/2021-twg_2-062321.pdf

UK BEIS (Department for Business, Energy & Industrial Strategy). 2021. "Digitalising Our Energy System for Net Zero: Strategy and Action Plan 2021." London: BEIS. https://www.gov.uk/government/publications/digitalising-our-energy-system-for-net-zero-strategy-and-action-plan

USGS (U.S. Geological Survey). 2021. "Cement." In Mineral Commodity Summaries, January 2021. Reston, VA: USGS. https://pubs.usgs.gov/periodicals/mcs2021/mcs2021-cement.pdf

WEC (World Energy Council). 2018. "The Role of ICT in Energy Efficiency Management: Household Sector 2018." WEC, London. https://www.worldenergy.org/assets/downloads/20180420_TF_paper_final.pdf

World Bank. 2021. RISE—Regulatory Indicators for Sustainable Energy. Washington, DC: World Bank. https://www.worldbank.org/en/topic/energy/publication/rise---regulatory-indicators-for-sustainable-energy

ResearchGate. 2021. What Drives Energy Efficiency in Africa?. Insights from 12 Selected Countries Using Incremental Decomposition Analysis. https://www.researchgate.net/publication/354491431_What_Drives_Energy_Efficiency_in_Africa_Insights_from_12_Selected_Countries_Using_Incremental_Decomposition_Analysis

4E (Energy E"cient End-Use Equipment Technology Collaboration Programme). 2018. Intelligent E"ciency: A Case Study of Barriers and Solutions—Smart Homes. Paris: International Energy Agency (IEA). https://www.iea-4e.org/wp-content/uploads/publications/2018/03/Case_Study_HEMS_Final_Report.pdf

4E. 2021. "EDNA Total Energy Model 2.0." IEA, Paris. https://www.iea-4e.org/edna/tem/

CLASP. 2021. "CLASP Policy Resource Center." CLASP, Washington, DC. https://cprc-clasp.ngo/.

EESL (Energy effciency Services Limited) and IEA (International Energy Agency). 2017. "India's UJALA Story: Energy Efficient Prosperity." EESL, New Delhi.

https://eeslindia.org/img/uajala/pdf/UJALA_ Case_Studies_1.pdf

GFEI (Global Fuel Economy Initiative). 2022. “Vehicle Fuel Economy in Major Markets 2005–2019.” Working paper 22, GFEI, Paris.
https://www.globalfueleconomy.org/media/792005/wp22-vehicle-fuel-economy-in-major-markets.pdf

ANNEX1 : LIST OF INDICATORS AND DEFINITION

Clean Cooking Energy and technology access Rate (CCET)	The percentage of the population with primary access to clean cooking fuels and technologies, such as LPG, natural gas, electricity, biogas, ethanol, and improved biomass stoves that meet international health and safety standards. $\text{CCET Access Rate}=\left(\frac{\text{Population with Access to Clean Cooking Fuels and Technologies}}{Total\ Population}\right) X\ 100$ ***Data Source:*** *The data utilized in this document are derived from publications issued by national statistical institutes, based on national population censuses and large-scale surveys such as Demographic and Health Surveys (DHS), Malaria Indicator Surveys (MIS), and Multiple Indicator Cluster Surveys (MICS), all of which include a section detailing household characteristics.*
Efficiency Electricity Generation Rate from fossil fuel (EEG) Rate	The ratio of electricity generated from coal and coal products to the energy input from these fuels, expressed as a percentage. It reflects how efficiently coal and coal products are converted into electricity. $\text{EEG Rate (\%)}=\left(\frac{\text{Electricity Output } from\ Coal,Oil,Crude\ Oil\ and\ Natural\ Gas}{energy\ Input\ from\ Coal,Oil,Crude\ Oil\ and\ Natural\ Gas}\right) X\ 100$ $\text{EEG Rate }_{ECOWAS}=\frac{\sum(\text{Electricity Output } from\ Coal,Oil,Crude\ Oil\ and\ Natural\ Gas)_{\ country}}{\sum(energy\ Input\ from\ Coal,Oil,Crude\ Oil\ and\ Natural\ Gas)_{country}}$ ***Date Source:*** *Energy Balance of each ECOWAS Country from 2018 to 2022*
Electricity Consumption in Residential sector (ECRS)	The total amount of electricity consumed by households for purposes such as lighting, cooling, heating, and powering appliances, and other use. $\text{ECRS}_{ecowas} = \sum \text{ECRS}_{country}$ ***Data Source:*** *Energy Balance of each ECOWAS Country from 2018 to 2022*
Electricity Transmission and distribution losses Rate (ETDL) Rate	$\text{ETDL Rate} = \frac{Electricity\ Losses}{Electricity\ Ouput\ main+Electricity\ Ouput\ CHP+Electricity\ Imports}\text{x100}$ Where • Electricity losses are electricity transmission and distribution losses • Electricity output is the main electricity output from main activity producer electricity plants • Electricity output CHP is electricity output from combined heat and power plants

	$$\text{ETDL Rate}_{ECOWAS} = \frac{\sum Electricity\ Losses_{country}}{Electricity\ Ouput\ main + Electricity\ Ouput\ CHP + Electricity\ Imports_{country}}$$ ***Data source**: Energy Balance of each ECOWAS Country from 2018 to 2022*
Energy Intensity in Agricultural Sector (EIAS)	The amount of Final energy consumed per unit of economic output in the agricultural sector. It measures the energy efficiency of agricultural activities and is typically expressed as energy consumption (MJ) per unit of agricultural value added in GDP (USD). $$\text{EIAS} = \frac{Final\ Energy\ Consumption\ in\ MJ\ of\ Agricultural\ sector}{Agriculture\ value\ add\ (USD\ constant\ 2015)}$$ $$\text{EIAS}_{ECOWAS} = \frac{\sum Final\ Energy\ Consumption\ in\ MJ\ of\ Agricultural\ sector_{country}}{Agriculture\ value\ add\ (USD\ constant\ 2015)_{country}}$$ ***Data source**: Energy Balance of each ECOWAS Country from 2018 to 2022 and World Bank Data*
Energy Intensity in Industry Sector (EIIS)	The amount of Final energy consumed per unit of economic output in the industry sector. It measures the energy efficiency of industry activities and is typically expressed as energy consumption (MJ) per unit of agricultural value added in GDP (USD). $$\text{EIIS} = \frac{Final\ Energy\ Consumption\ in\ MJ\ of\ Industry\ sector}{Industry\ value\ add\ (USD\ constant\ 2015)}$$ $$\text{EIIS}_{ECOWAS} = \frac{\sum Final\ Energy\ Consumption\ in\ MJ\ of\ Industry\ sector_{country}}{Industry\ value\ add\ (USD\ constant\ 2015)_{country}}$$ ***Data source**: Energy Balance of each ECOWAS Country from 2018 to 2022 and World Bank Data*
Energy Intensity in Residential Sector (EIRS)	The Final energy consumption in the residential sector per unit of household. It indicates the energy efficiency of energy use in households, typically considering factors such as energy consumed for lighting, heating, cooking, and appliances. $$\text{EIRS} = \frac{Final\ Energy\ Consumption\ in\ MJ\ of\ Residential\ sector}{Number\ Of\ Household}$$

	$$\text{EIRS}_{ECOWAS} = \frac{\sum Final\ Energy\ Consumption\ in\ MJ\ of\ Residential\ sector_{country}}{Number\ Of\ Household_{country}}$$ ***Data source**: Energy Balance of each ECOWAS Country from 2018 to 2022 and World Bank Data*
Energy Intensity in Services and Trades Sector (EISS)	The amount of Final energy consumed per unit of economic output in the Services and Trades sector. It measures the energy efficiency of Services and Trades activities and is typically expressed as energy consumption (MJ) per unit of agricultural value added in GDP (USD). $$\text{EISS} = \frac{Final\ Energy\ Consumption\ in\ MJ\ of\ \text{Services and Trades}sector}{\text{Services and Trades}\ value\ add\ (USD\ constant\ 2015)}$$ $$\text{EISS}_{ECOWAS} = \frac{\sum Final\ Energy\ Consumption\ in\ MJ\ of\ \text{Services and Trades}sector_{country}}{\text{Services and Trades}value\ add\ (USD\ constant\ 2015)_{country}}$$ ***Data source**: Energy Balance of each ECOWAS Country from 2018 to 2022 and World Bank Data*
Total Final Energy Consumption	**Total Final Energy Consumption (TFEC):** The total amount of energy consumed by end-users, including households, industry, agriculture, services, and transport. TFEC excludes the energy used in energy transformation processes (e.g., electricity generation, refining) and losses during distribution. It represents the final stage of energy use and is typically expressed in energy units such as terajoules (TJ), gigawatt-hours (GWh), or tonnes of oil equivalent (toe). TFEC can also be broken down by energy source (e.g., electricity, natural gas, oil products) or by sector to provide a detailed analysis of energy demand. $$\mathbf{TFEC}_{ECOWAS} = \sum \mathbf{TFEC}_{country}$$ ***Data source**: Energy Balance of each ECOWAS Country from 2018 to 2022*
Total Final Energy Consumption in Agriculture sector	The total energy consumed by agricultural activities such as irrigation, machinery operation, greenhouse heating, and crop drying. This includes energy used directly in farming operations and agro-processing activities. $$\text{TFECA}_{ECOWAS} = \sum \text{TFECA}_{country}$$ ***Data source**: Energy Balance of each ECOWAS Country from 2018 to 2022*

Total Final Energy Consumption in Industry sector (TFECI)	The total amount of energy consumed by the industrial sector for manufacturing, processing, and related activities. This includes energy used in factories, production plants, and industrial facilities but excludes energy used for energy transformation processes $\mathrm{TFECI}_{ECOWAS} = \sum \mathrm{TFECI}_{country}$ ***Data source**: Energy Balance of each ECOWAS Country from 2018 to 2022*
Final Energy Consumption in Residential sector (TFECR)	The total energy consumed by households for domestic activities such as lighting, heating, cooling, cooking, and the use of electrical appliances. It represents direct energy use within residential buildings. $\mathrm{TFECR}_{ECOWAS} = \sum \mathrm{TFECR}_{country}$ ***Data source**: Energy Balance of each ECOWAS Country from 2018 to 2022*
Final Energy Consumption in Services and Trades sector (TFECS)	The total energy consumed by the commercial, trade, and public services sectors, including energy used in office buildings, retail stores, schools, hospitals, and other service-oriented facilities. $\mathrm{TFECS}_{ECOWAS} = \sum \mathrm{TFECS}_{country}$
Final Energy Consumption in Transport sector (TFECT)	The total amount of energy consumed for transportation purposes across all modes, including road, rail, air, and maritime. This includes energy used for passenger and freight transport by vehicles, airplanes, ships, and trains. $\mathrm{TFECT}_{ECOWAS} = \sum \mathrm{TFECT}_{country}$ ***Data source**: Energy Balance of each ECOWAS Country from 2018 to 2022*
Final Energy Consumption in Residential from Biomass and waste (TFECRbz)	The total amount of energy consumed by households derived from biomasss (e.g., firewood, charcoal, biogas) and waste (e.g., agricultural residues). This includes energy used for cooking, heating, and other domestic activities. $\mathrm{TFECRbz}_{ECOWAS} = \sum \mathrm{TFECRbz}_{country}$
Final Energy Consumption in Residential from Coal (TFECRco)	The total amount of energy consumed by households derived from coal or coal products. This is typically used for heating, cooking, or other household needs. $\mathrm{TFECRco}_{ECOWAS} = \sum \mathrm{TFECRco}_{country}$

Final Energy Consumption in Residential from Fossil fuel (TFECRco)	The total energy consumed by households derived from fossil fuel sources, including coal, oil, and natural gas. It accounts for energy used for activities such as cooking, heating, and powering appliances. $$\text{TFECRff}_{ECOWAS} = \sum \text{TFECRff}_{country}$$
Final Energy Consumption in Residential from Natural Gas (TFECRng)	The total amount of energy consumed by households sourced from natural gas. This energy is primarily used for cooking, space heating, and water heating. $$\text{TFECRng}_{ECOWAS} = \sum \text{TFECRng}_{country}$$
Final Energy Consumption in Residential from Oil (TFECRoil)	The total energy consumed by households derived from oil and oil products, such as kerosene or LPG (liquefied petroleum gas). It is commonly used for cooking, heating, and lighting in some regions. $$\text{TFECRoil}_{ECOWAS} = \sum \text{TFECRoil}_{country}$$
Total Final Energy Consumption per capita (TFECc)	This indicator represents the average amount of energy consumed per person in a specific region or country. It is calculated by dividing the **Total Final Energy Consumption (TFEC)** by the total population of the region or country during the same period. $$\text{TFECc} = \frac{\text{Total Final Energy Consumption}}{Total\ Population}$$ $$\text{TFECc}_{ECOWAS} = \frac{\sum \text{TFECc}_{country}}{\sum Total\ Population_{country}}$$ ***Data source**: Energy Balance of each ECOWAS Country from 2018 to 2022 and World Bank Data*
Primary Energy Intensity (PEI)	Ratio between Total Energy Supply and GDP is measured in MJ per 2015 USD constant. Energy intensity (EI) indicates how much energy is used to produce one unit of economic output. A lower ratio indicates that less energy is used to produce one unit of economic output. EI is an imperfect indicator, as changes are affected by other factors other than energy efficiency, particularly changes in the structure of economic activity. $$\text{PEI} = \frac{Total\ Energy\ Supply}{GDP\ (USD\ constant\ 2015)}$$

	$$\mathrm{PEI}_{ECOWAS} = \frac{\sum Total\ Energy\ Supply_{country}}{\sum GDP\ (USD\ constant\ 2015)_{country}}$$ ***Data source**: Energy Balance of each ECOWAS Country from 2018 to 2022 and World Bank Data*
Total Energy Supply	This represents the amount of energy available in the national territory during the reference period. It is calculated as follows: Total energy supply = Primary energy production + Import of primary and secondary energy – Export of primary and secondary energy – International (aviation and marine) bunkers – Stock changes $$Total\ Energy\ Supply_{ECOWAS} \sum Total\ Energy\ Supply_{country}$$ ***Data source**: Energy Balance of each ECOWAS Country from 2018 to 2022*
Compound Annual Growth Rate (CAGR)	This formula is used to calculate all the annual growth rates in this document. $$\mathrm{CAGR}\ (\%) = \left(\frac{Situation_{t2}}{Situation_{t1}}\right)^{\frac{1}{t2-t1}} - 1$$

ANNEX 2: LIST OF PARTICIPANTS

List of participants in Energy Efficiency data collection training and gathering workshop from June 24th to June 28th, 2024 in Cotonou

No	Country	Name	Institution/ Organisation	Position
1	Benin	Pascal Sourougnon DEGBEGNON	Ministère de l'Energie, de l'Eau et des Mines	Chef Service des Études et de la Planification
2	Benin	Largum MADOUGOU	DGPER	Coordonnateur P2EGeDBE
3	Benin	Todeman ASSAN	Ministère de l'Energie, de l'Eau et des Mines	Director General of Energy Planning and Rural Electrification
4	Burkina Faso	Bakary LINGANI	Ministère de l'Energie, des Mines et des Carrières	Directeur des Énergies Conventionnelles
5	Burkina Faso	Windpouiré Rebecca ZABSONRE	Ministère de l'Energie, des Mines et des Carrières	Chef de service de la maîtrise de l'énergie
6	Cape Verde	Mario Joao MARQUES DE OLIVEIRA	Ministério da Indústria, Comércio e Energia	Técnico
7	Cote d'Ivoire	Angui Sylvain KOBENAN	Direction Générale de l'Energie	Sous-Directeur de l'Energie Hydraulique et Éolienne
9	Cote d'Ivoire	Francois KOKOLA	Direction Générale de l'Energie	Responsable du Service de l'Evaluation, du Suivi Economique et de la Statistique
10	Gambia	Tijan JALLOW	Ministry of Petroleum & Energy	Senior Planner
11	Gambia	Emmanuel CORREA	Ministry of Petroleum & Energy	Senior Energy Officer
12	Ghana	Laura ZORDEH	Energy Commission of Ghana	Assistant Manager
13	Ghana	Kofi Agyekum ANSONG-DWAMENA	Energy Commission of Ghana	Statistician
14	Guinea Bissau	Mendes DIVALDINO	Ministério da Energia	Técnico/ Responsável adjunto da Estatistíca
15	Guinea Bissau	Noé Saba N´BUNDÉ	Ministério Da Energia	Assessor Para Relações Público-Privadas
16	Guinea Conakry	Bourhane BANGOURA	Ministère de l'Energie de l'Hydraulique et des Hydrocarbures	Chef de section Système d'information Energétique

No	Pays	Nom	Institution/ Organisation	Titre
17	Guinea Conakry	Alpha Ibrahima DIALLO	Ministère de l'Energie, de l'Hydraulique et des Hydrocarbures	Ingénieur Energéticien (DESS) chargé d'études, point focal collecte de données PANER, PANEE, Se4ALL
18	Liberia	Danwin F. HOFF	Ministry of Mines and Energy	Energy Data Officer
19	Liberia	Mentor Zahn KOTEE	Ministry of Mines and Energy	Assistant Director for Grid
20	Mali	Seydou TANGARA	Direction Nationale de l'Energie	Chef de Section Economie d'Energie et de l'Efficacité Energétique
21	Mali	Mahamoud TRAORE	Ministère de l'Energie et de l'Eau du Mali (ANADEB)	Chef de Département Promotion de la Production et des Technologies
22	Nigeria	Ejura Gloria EZEKIEL	Energy Commission Of Nigeria	Assistant Chief Scientific Officer
23	Nigeria	Teddy OMOREGBEE	Federal Ministry Of Power	Engr.
24	Senegal	Amadou Makhtar SARR	Ministère de l'Energie du Pétrole et des Mines	Chargé du Systèmes d'information Géographiques et des Données d'électrification Rurale
25	Senegal	Fatma SOW	Ministère de l'Energie du Pétrole et des Mines	Chef du Bureau Efficacité énergétique
26	Sierra Leone	Benjamin KAMARA	Ministry of Energy	Chief Director of Energy/ ECREEE Focal Point
27	Sierra Leone	Shebora Onikeh KAMARA	Ministry of Energy	Director of Policy, Research, Planning, Monitoring and Evaluation
28	Togo	M'ba DJASSAH	Direction Générale de l'Energie	Directeur de la planification
29	Togo	Aboudou-Kafarou AKONDO	Direction Générale de l'Energie (DGE)	Ingénieur chargé d'études et suivi des projets
30	Algeria-AFREC	Oueddo ABDOULAYE	AFREC	Senior Policy Officer Statistician

No	Pays	Nom	Institution/ Organisation	Titre
31	Algeria-AFREC	Salome MAHEYA	AFREC	Senior Policy Officer Energy Statistics
32	Algeria-AFREC	Samson Bel-Aube NOUGBODOHOUE	AFREC	Head of Energy Information System and Statistics Division
33	Burkina Faso - UEMOA	Salif BAGAYOKO	Commission de l'UEMOA	Chargé de l'Energie
35	ECOWAS Commission-Abuja	Eya Sophie DESSI	Direction de l'Energie de la Commission	Entry Level Power Engineer
36	Cape Verde - ECREEE	Jean Francis SEMPORE	ECREEE	Executive Director
38	Cape Verde - ECREEE	Mawufemo MODJINOU	ECREEE	Principle Project Officer. Energy Efficiency
39	Cape Verde - ECREEE	Hodonou Alexandre BINAZON	ECREEE	Energy Data Expert
40	Cape Verde - ECREEE	Marcel FLAN	ECREEE	Energy Adviser
41	Cape Verde - ECREEE	Mistoul Jihane Gnanki BAKOUNOURE	ECREEE	Energy Efficiency Junior Expert
44	Niger - ECREEE	Nassourou BELLO	ECREEE	Project Coordinator

ECREEE
Towards Sustainable Energy

ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE)

Address: Achada Sto Antonio C.P 288, Praia - Cabo Verde

Tel: (+238) 260 4630

E-mail: info@ecreee.org

Follow ECREEE on Social Media