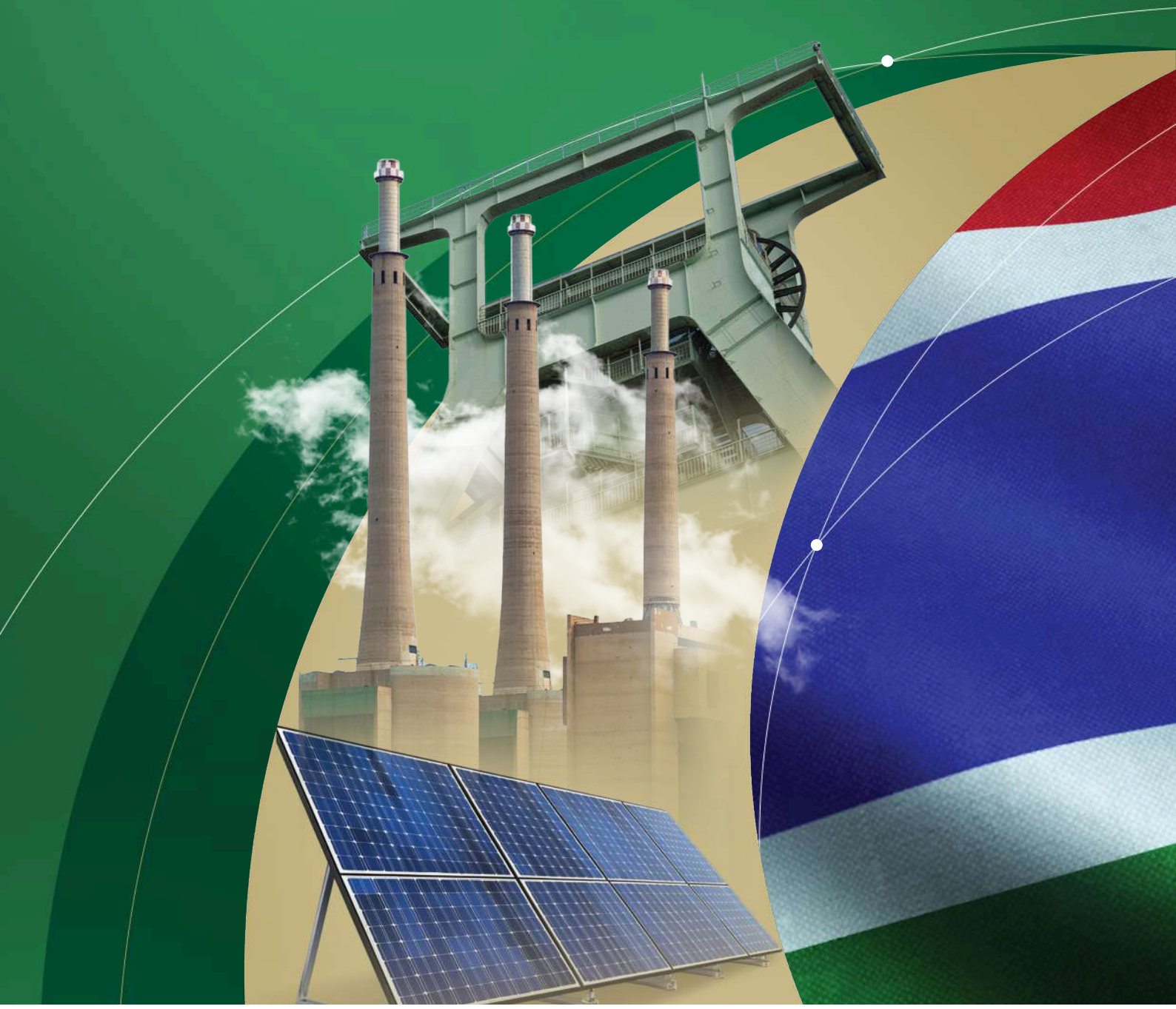
# THE GAMBIA DECARBONIZATION PATHWAYS



AFREC
African Energy Commission

African Union



The National Deep Decarbonization Pathways (NDDPs) is a governance instrument or a strategic plan that has been designed to transform our energy system to significantly reduce greenhouse gas emissions while supporting sustainable economic growth and development. The Gambia, as a Party to the Kyoto Protocol remains committed to translate the aspirations of AU's Agenda 2063 and the Paris Climate Agreement into quantifiable domestic action.

Thus, with the collaboration and support of the African Energy Commission (AFREC) and the African Development Bank (AfDB), the NDDPs was developed to chart Gambia's energy transition path towards its ambitious, fiscally prudent, socially just route to net-zero emissions and sustainable development. It affirms the Gambia's strive in shaping a low-carbon future attuned to our developmental priorities, rather than imported prescriptions. It will form part of the national blueprints for sovereign resilience, inclusive growth and generational justice.

The pathways span a time horizon to 2063—congruent with the AU's Agenda 2063. By setting a clear destination, sequencing interventions across a structured timeline, and outfitting the journey with adaptive mechanisms, the pathway aspires to convert Gambia's abundant renewable wealth from latent potential into tangible prosperity—lighting homes, powering industries, cleaning the air, and positioning the country for the opportunities and responsibilities of a decarbonized global economy.

It covers seven sectors including, electricity, industry, transport, building, oil and gas, agriculture and clean cooking, and was developed through extensive engagements and consultations with various stakeholders, including development partners, the private sector, public sector and civil society, to foster partnerships crucial for achieving the ambitious goals of the NDDPs. These collaborative efforts have played a vital role in shaping the NDDP's strategic direction and ensuring that its objectives are aligned with broader national development goals and priorities, while also fostering the partnerships essential to achieving the NDDP's ambitious targets.

In this regard, on behalf of the Government, the Ministry of Petroleum, Energy and Mines mandated to provide the overall policy direction and guidance for the energy sector is pleased that the Gambia is amongst the three African countries (Botswana, Madagascar and The Gambia) to pilot the development of the National Deep Decarbonization Pathways, domesticating the African Energy Transition Strategy and Action Plan (ETSAP). On this note, we would like to thank all the partners for their valuable support in the development of the NDDP. Finally, our partners are hereby assured of the government unwavering commitment to the full and successful implementation of NDDP.

Hon. Nani Juwara
Minister of Petroleum, Energy and Mines
The Gambia

# ACKNOWLEDGEMENT

The Gambia National Deep Decarbonization Pathways (NDDPs), as well as those for Madagascar and Botswana, have been developed as part of the broader continental initiative under the African Energy Transition Programme (AFRETRAP) spearheaded by the African Energy Commission. Developed to domesticate the African Energy Transition Strategy and Action Plan (ETSAP), this document is a testament to Africa's commitment to a coordinated, yet differentiated, just transition that considers local realities.

The NDDP is a collaborative work of the Ministry of Petroleum, Energy and Mines (MoPEM), AFREC and the African Development Bank (AfDB). Overall oversight was provided by Mr. Kemo Ceesay, Director of Energy of MoPEM with the support of a Technical Working Group (TWG). The TWG consisted of the following members: -

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| 16 | Mr. Pa Amat Manneh | Ministry of Works, Transport and Infrastructure |
| 17 | Mr. Muhammed L. Jaiteh | The Gambia Bureau of Statistics |

The TWG played a fundamental role in providing the primary and secondary data and defining the country's low carbon ambition for electricity, transport, industry, buildings, agriculture, and oil and gas subsectors.

The Stantec core technical team consisting of Dr.Peter ZHOU, Dr. George KYRIAKARAKOS, Dr. George GIANNAKIDIS and Mr Pascal AUGAREILS led the development of the NDDPs. Eng. Nickson Bukachi, AFREC and Ms. Neza Guillaine, AfDB provided both technical input and project management expertise to the project. This is through overall coordination of the project while working in close collaboration with the

TWG, and Stantec represented by Ms. Alba MERILLAS DOCHAO and Ms. Costanza ALESSE.

The development of the document benefited from multisectoral consultations at country level, lessons from the development of the ETSAP at continental level, and insights drawn from the experience in Botswana and Madagascar.

Thanks to AfDB for jointly funding this initiative with AFREC, as well as all stakeholders that contributed to shaping the final document.

While the development of this document demonstrates what we can achieve together, the real work lies in implementing the identified short, medium and long-term priorities. I urge all stakeholders to work together in making the identified programmes a reality. Together, we can contribute to a global sustainable future by leveraging Africa's resources while addressing energy challenges in our continent.

**Mr. Rashid Ali Abdallah**

Executive Director

African Energy Commission

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# ACRONYMS

| | |
|---|---|
| **AfDB** | African Development Bank |
| **AfSEM** | African Single Electricity Market |
| **AFREC** | African Energy Commission |
| **AI** | Artificial Intelligence |
| **AMI** | Advanced Metering Infrastructure |
| **AU** | African Union |
| **BESS** | Battery Energy Storage Systems |
| **CBAM** | Carbon Border Adjustment Mechanism |
| **C&I** | Commercial and Industrial |
| **CCS** | Carbon Capture and Storage |
| **CO** | Carbon Monoxide |
| **$CO^2$** | Carbon Dioxide |
| **DC** | Direct Current |
| **DDP** | Deep Decarbonization Pathway |
| **DDP LT** | Deep Decarbonization Pathway Longer Term |
| **DLMS/COSEM** | Device Language Message Specification / Companion Specification for Energy Metering |
| **E&P** | Exploration and Production |
| **EE** | Energy Efficiency |
| **EPC** | Engineering, Procurement, and Construction |
| **ETSAP** | African Energy Transition Strategy and Action Plan |
| **EU** | European Union |
| **FAO** | Food and Agriculture Organisation |
| **FEC** | Final Energy Consumption |
| **FT** | Fischer – Tropsch |
| **GBoS** | Gambia Bureau of Statistics |
| **GCCI** | Gambia Chamber of Commerce & Industry |
| **GNPC** | Gambian National Petroleum Corporation |

# ACRONYMS

| | |
|---|---|
| **GDP** | Gross Domestic Product |
| **$GH_2$** | Green Hydrogen |
| **GHG** | Greenhouse Gas |
| **GbIS** | Geographic Information System |
| **GPRS** | General Packet Radio Service |
| **GWh** | Gigawatt Hour |
| **HFO** | Heavy Fuel Oil |
| **HVAC** | Heating, Ventilation, and Air Conditioning |
| **IoT** | Internet of Things |
| **IPP** | Independent Power Producer |
| **IPPU** | Industrial Processes and Product Use |
| **KPI** | Key Performance Indicator |
| **$ktCO_2eq$** | kilotonnes of $CO_2$ equivalent |
| **Ktoe** | Kilotonne of Oil Equivalent |
| **LEAP** | Low Emissions Analysis Platform |
| **LPG** | Liquefied Petroleum Gas |
| **MEPS** | Minimum Energy Performance Standards |
| **MoPE** | Ministry of Petroleum and Energy |
| **MTF** | Multi-Tier Framework |
| **MS** | Member State |
| **MW** | Megawatt |
| **NAWEC** | National Water & Electric Company |
| **NDC** | Nationally Determined Contribution |
| **NDDP** | National Deep Decarbonization Pathway |
| **NETSC** | National Energy Transition Steering Committee |
| **NEVs** | New-Energy Vehicles |
| **NG** | Natural Gas |
| **NGO** | Non-Governmental Organisation |
| **NMGP** | Nigeria-Morocco Gas Pipeline |

# ACRONYMS

| | |
|---|---|
| **Ktoe** | Kilotonne of Oil Equivalent |
| **LCA** | Life Cycle Analysis |
| **LDAR** | Leak Detection and Repair |
| **LEAP** | Low Emissions Analysis Platform |
| **LPG** | Liquefied Petroleum Gas |
| **MEPS** | Minimum Energy Performance Standards |
| **MME** | Ministry of Minerals and Energy |
| **MoF** | Ministry of Finance |
| **MoMRE** | Ministry of Mineral Resources and Energy |
| **MoPE** | Ministry of Public Education |
| **MTF** | Multi-Tier Framework |
| **MS** | Member State |
| **MW** | Megawatt |
| **NDB** | New Development Bank |
| **NDC** | Nationally Determined Contribution |
| **NDDP** | National Deep Decarbonization Pathway |
| **NETSC** | National Energy Transition Steering Committee |
| **NEVs** | New-Energy Vehicles |
| **NG** | Natural Gas |
| **NGO** | Non-Governmental Organisation |
| **OGI** | Optical Gas Imaging |
| **OGMP** | Oil and Gas Methane Partnership |
| **OPEX** | Operating Expenses |
| **ORC** | Organic Rankine Cycle |
| **PM** | Particulate Matter |

# ACRONYMS

| | |
|---|---|
| **OGMP** | Oil and Gas Methane Partnership |
| **PPA** | Power Purchase Agreement |
| **PtX** | Power-to-X |
| **PURA** | Public Utilities Regulatory Authority |
| **PV** | Photovoltaic |
| **RBF** | Result-Based Financing |
| **RE** | Renewable Energy |
| **RES** | Renewable Energy Sources |
| **SAF** | Sustainable Aviation Fuels |
| **SCADA** | Supervisory Control and Data Acquisition |
| **SDG** | Sustainable Development Goal |
| **TPES** | Total Primary Energy Supply |
| **TWh** | Terawatt Hour |
| **W** | Watt |
| **WHO** | World Health Organisation |

# Executive Summary

## Overview Purpose and Strategic Alignment

Africa's energy transition in the context of the ETSAP seeks to exploit the vast renewable energy and other cleaner energy resources to meet the huge deficit in access to modern energy services on the continent. Currently, over 600 million Africans are still reliant on traditional biomass and lack access to electricity, hence the urgency to transition to clean and resilient and reliable energy systems is acute. To that end, the ETSAP anchors this vision across six thematic pillars access and energy security, energy efficiency, carbon-smart fossil management, policy harmonization, innovation and human capital development, and sustainable economic growth and prosperity.

In this context, The Gambia alongside Botswana and Madagascar was selected for piloting the development of the National DDP domesticating from the ETSAP.

Despite divergent geographic and socioeconomic contexts, these countries share key vulnerabilities: rapid demographic growth, exposure to climate shocks, and limited fiscal buffers against energy price volatility. The three AU MS thus represent the various African economies that can benefit in a similar manner from a harmonized decarbonization and energy transition drive in the context of the ETSAP.

This report is dedicated to reporting on The Gambia decarbonization pathway.

## Objective and Methodological Approach

Gambia's DDP was crafted with three principal aims:

**Operationalization of ETSAP pillars:** The pathway demonstrates how national actions contribute to regional energy objectives, creating alignment in areas such as off-grid electrification, industrial efficiency, and transport decarbonization.

**Risk-aware investment tool:** By simulating Baseline and DDP scenarios through the Low Emissions Analysis Platform (LEAP)), the model identifies configurations that balance environmental goals with system reliability and economic growth.

**Translation of political commitments into a quantified pathway:** The DDP decomposes aspirational targets into sector-specific technology trajectories, regulatory actions, and investment needs.

The pathway spans a time horizon to 2063 congruent with the AU's Agenda 2063 and is structured in three phases: (i) short-term (2025–2030), targeting quick wins and enabling policies; (ii) medium-term (2031–2040), focusing on scaling technologies and institutional reforms; and (iii) long-term (2041–2050 for The Gambia but with projections to 2063 for consistency with the other countries), emphasizing net-zero readiness and regional integration.

# Methodology & Participatory Design

Four concentric methodological layers underpin the DDP:

- Base year assessment: A 2022 national energy balance was constructed, ensuring accurate reflection of sectoral energy demand, fuel usage, and emissions profiles.
- Scenario analysis: LEAP was employed to simulate Baseline and DDP trajectories, across energy sectors.
- Stakeholder consultations: Conducted in four iterative waves in form of virtual and physical workshops. Stakeholder engagement ensured data accuracy and validation, and co-design of both baseline and DDP policy actions and measures into the future.
- Continental alignment: Metrics and interventions were harmonized with ETSAP's monitoring framework, enabling comparability across Member States and integration into the African Single Electricity Market (AfSEM) and prospective carbon markets on the continent.

# Objective and Methodological Approach

As of 2022, primary energy supply in The Gambia was dominated by traditional biomass (60%), primarily fuelwood for residential cooking, and by imported petroleum products (40%), exposing the country to international price volatility and supply shocks. Electricity generation was entirely fossil-based and reliant on heavy fuel oil, with Karpower accounting for over half of the total production. In 2024, more than 85% of electricity sourced from imports (52.6% via the OMVG interconnection) while NAWEC's internal generation fleet contributed just 11.6% due to systemic outages and maintenance failures. Despite these challenges, electricity access has improved substantially, reaching 77% nationally, 90% and 74.2% in urban and rural areas in 2025. The residential sector continues to dominate final energy consumption, largely via biomass, while transport and industry rely heavily on diesel and fuel oil, with slow electrification and clean fuel substitution. National access to clean cooking is estimated at 52%, and although urban penetration has reached 72%, rural areas remain at 50%, underscoring the need for sustained investment and policy support. The country's greenhouse gas emissions are dominated by emissions from Agriculture, Forestry and Land Use, Land use Change (63%), and energy is the second largest emitter (24%). However, energy related emissions are expected to rise sharply under current trajectories unless mitigation actions are taken. The Gambia's energy transition thus hinges on diversifying its power mix through renewables, strengthening domestic generation capacity, modernising infrastructure, and expanding access to clean fuels, especially in underserved rural communities.



# Objective and Methodological Approach

Three scenarios were analysed, outlining distinct energy futures for The Gambia based on varying levels of policy ambition. The **Baseline** scenario projects current trends forward without major policy changes, while achieving universal electricity and clean cooking access by 2030. The **DDP** scenario builds on the same socio-economic assumptions but implements a broad set of mitigation measures to drive the energy system emission reduction, including efficiency improvements, electrification, and renewable energy expansion. The **DDP LT** scenario extends this ambition further beyond 2040, intensifying decarbonisation efforts through deeper electrification, introduction of hydrogen, fuel switching, and widespread adoption of advanced clean technologies across all sectors.

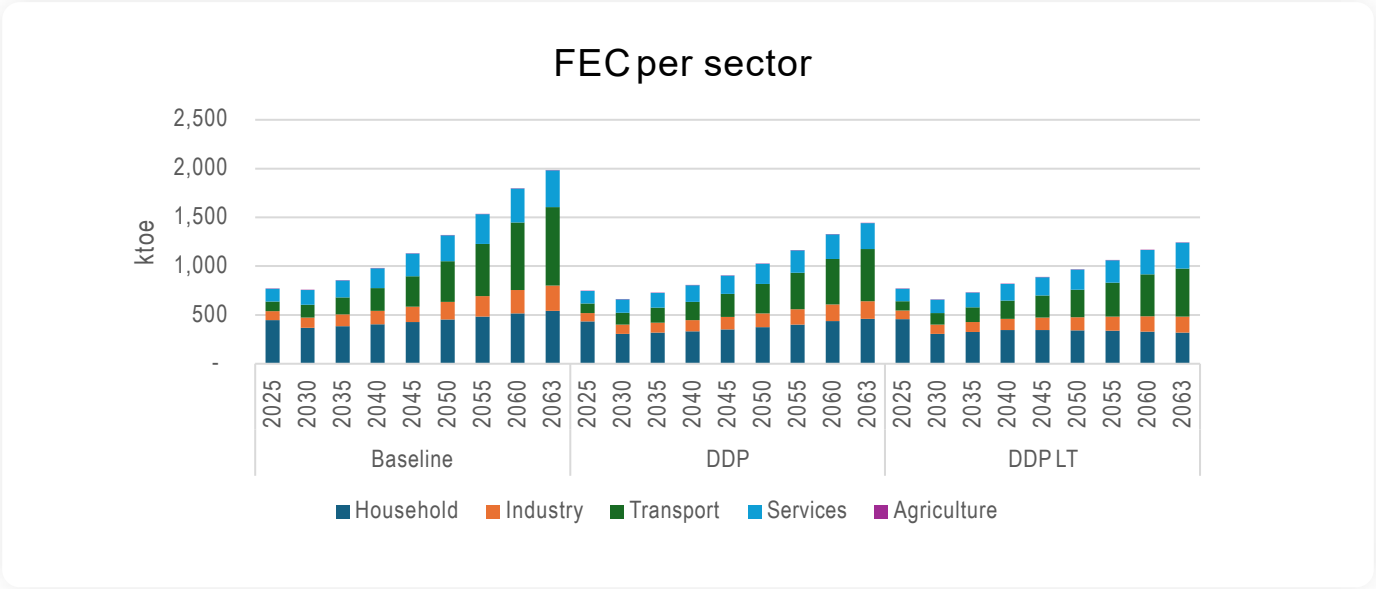


The comparative evolution of The Gambia's total final energy consumption (FEC) under the three scenarios reveals sharply divergent outcomes shaped by the level of policy ambition and structural reform (Figure 1).

By 2030, the Baseline scenario maintains nearly flat FEC at 756 ktoe, while DDP drops to 659 ktoe and DDP LT slightly lower at 657 ktoe. These reductions (20% in DDP and 21% in DDP LT) are driven by household energy savings, where clean cooking and efficiency programs reduce demand from 369 ktoe (Baseline) to 307 ktoe (DDP and DDP LT). Transport and industrial energy use continues to grow modestly in all scenarios.

By 2040, Baseline FEC rises to 978 ktoe (+29% from 2030), DDP grows to 804 ktoe (+22%), and DDP LT to 816 ktoe (+24%), showing divergence in growth magnitude and sectoral dynamics. Transport emerges as the dominant energy-consuming sector in all scenarios, especially Baseline (234 ktoe) compared to DDP and DDP LT (187 ktoe each). Household demand remains significantly lower in DDP (333 ktoe) and DDP LT (345 ktoe) than in Baseline (405 ktoe). Services sector demand rises across the board, with DDP LT showing accelerated electrification.

By 2050, Baseline FEC is estimated to reach 1,315 ktoe, while DDP and DDP LT would be1,023 ktoe and 965 ktoe, respectively, underscoring a trajectory of sustained energy moderation and structural transformation in the decarbonisation pathways. By 2063, the differences are fully pronounced. The Baseline scenario reaches 1,983 ktoe, more than doubling its 2030 levels (+103%), reflecting unchecked demand across all sectors and continued reliance on traditional biomass and fossil fuels. DDP reaches 1,441 ktoe (+119% from 2030), showing moderated growth but significant increases, particularly in transport (534 ktoe). DDP LT caps total FEC at 1,240 ktoe, achieving the lowest long-term growth (+89% from 2030) through widespread electrification, fuel diversification, and demand-side




The evolution of The Gambia's electricity generation shows stark differences across the Baseline, DDP, and DDP Long-Term (DDP LT) scenarios, reflecting the varying levels of policy ambition and structural transformation toward renewable energy integration (Figure 2).

By 2030, all scenarios exhibit growth from 2025 levels but diverge in speed and structure. The Baseline scenario sees electricity generation rise from 0.31 TWh in 2025 to 0.39 TWh, with solar PV contributing 0.13 TWh (33%) and the remainder still largely from heavy fuel oil (HFO). In contrast, DDP reaches 0.54 TWh, powered by 0.38 TWh from solar PV (70%) and a reduced share from fossil sources. DDP LT leads with 0.58 TWh, of which 0.5 TWh (over 90%) comes from solar, alongside small hydro and wind additions, and an early phase-out of HFO-based generation.

By 2040, differences become more pronounced. Baseline reaches 0.64 TWh, still reliant on fossil fuels, with solar only at 0.38 TWh (59%). DDP nearly doubles this, generating 1.13 TWh, led by solar PV (0.83 TWh, or 73%) and supported by 0.11 TWh from a new combined-cycle gas turbine (CCGT) plant. DDP LT reaches 1.35 TWh, with solar PV at 1.1 TWh, growing wind contributions, and a steady decline in fossil-based generation.

By 2050, Baseline generation is estimated to reach 0.9 TWh, with solar share gradually increasing but fossil fuels still playing a significant role. DDP would approach 1.84 TWh, while DDP LT would reach 2.96 TWh,



By 2063, the scenarios diverge completely. The Baseline reaches 1.3 TWh, with solar PV at 0.97 TWh (72%) and fossil sources still providing 20% of inland generation. DDP scales to 3.3 TWh, with solar PV contributing 2.93 TWh (87%), supported by small fossil generation (HFO at 0.14 TWh, CCGT at 0.16 TWh). DDP LT achieves a transformational outcome, with generation peaking at 5.6 TWh (67% more than DDP and more than 4 times Baseline). Solar dominates with 4.78 TWh (85%), wind reaches 0.45 TWh (8%), fossil input is minimal (CCGT 0.16 TWh) and hydro 0.06 TWh).

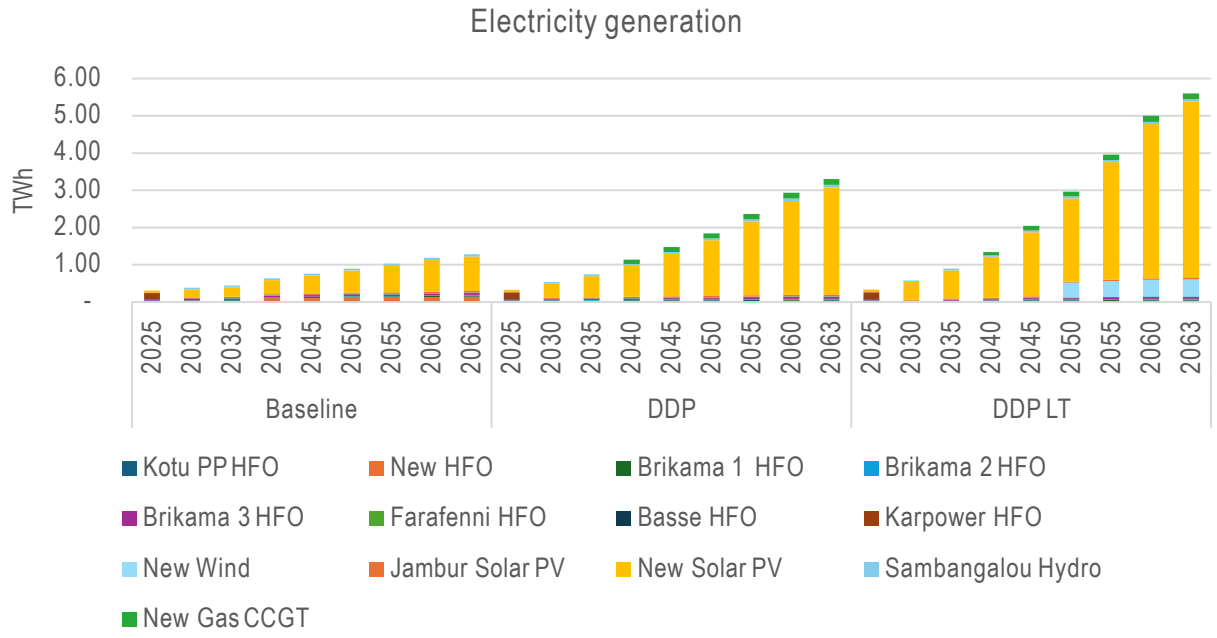



*Figure 2 : Projection of electricity generation per technology.*

The trajectory of energy-related greenhouse gas (GHG) emissions across the scenarios shows increasing divergence over time, reflecting differing rates of electrification, fuel substitution, and decarbonisation of electricity generation (Figure 3).

By 2030, short-term emission trends reveal distinct outcomes. Baseline emissions remain nearly flat, decreasing slightly from 1,011 $ktCO_2eq$ in 2025 to 994 $ktCO_2eq$, with a reduction in transformation sector emissions offsetting increased demand-side emissions. In DDP, total emissions decline to 868 $ktCO_2eq$, with transformation emissions falling from 271 to 83 $ktCO_2eq$, while demand-side emissions increase slightly to 785 $ktCO_2eq$. DDP LT performs even better, cutting total emissions to 792 $ktCO_2eq$, with transformation emissions nearly eliminated (15 $ktCO_2eq$) and demand-side emissions held at 777 $ktCO_2eq$.

By 2040, the divergence becomes more pronounced. Baseline emissions rise sharply to 1,523 $ktCO_2eq$ (+44% from 2030), with demand-side emissions reaching 1,365 $ktCO_2eq$ and transformation emissions at 158 $ktCO_2eq$, indicating continued fossil reliance. DDP emissions grow more moderately to 1,107 $ktCO_2eq$ (+23% from 2030), driven largely by demand growth, while power sector emissions rise modestly to 150 $ktCO_2eq$. DDP LT peaks at 1,077 $ktCO_2eq$ (+27% from 2030), with demand emissions increasing to 957 $ktCO_2eq$, and transformation emissions at 119 $ktCO_2eq$, reflecting increased efficiency and renewables integration.

By 2050, emissions in the Baseline scenario are estimated to reach 2,311 $ktCO_2eq$, driven by fossil fuel growth across sectors. DDP would reach around 1,324 $ktCO_2eq$, with stable transformation emissions. In contrast, DDP LT begins a clear decline, dropping to approximately 939 $ktCO_2eq$, marking the onset of structural decarbonisation.

By 2063, long-term trends diverge dramatically. Baseline emissions escalate to 3,905 $ktCO_2eq$, nearly quadrupling from 2030, with demand-side emissions reaching 3,677 $ktCO_2eq$ and persistent transformation sector output (220 $ktCO_2eq$). DDP continues to rise, reaching 1,507 $ktCO_2eq$ (+73% from 2030), with limited mitigation. DDP LT enters a deep decarbonisation pathway, cutting total emissions to just 396 $ktCO_2eq$ (–63% from 2040 and –50% from 2025). Demand-side emissions are slashed to 182 $ktCO_2eq$ (–81% from 2040), while transformation emissions plateau at 214 $ktCO_2eq$, signifying minimal but persistent fossil generation.

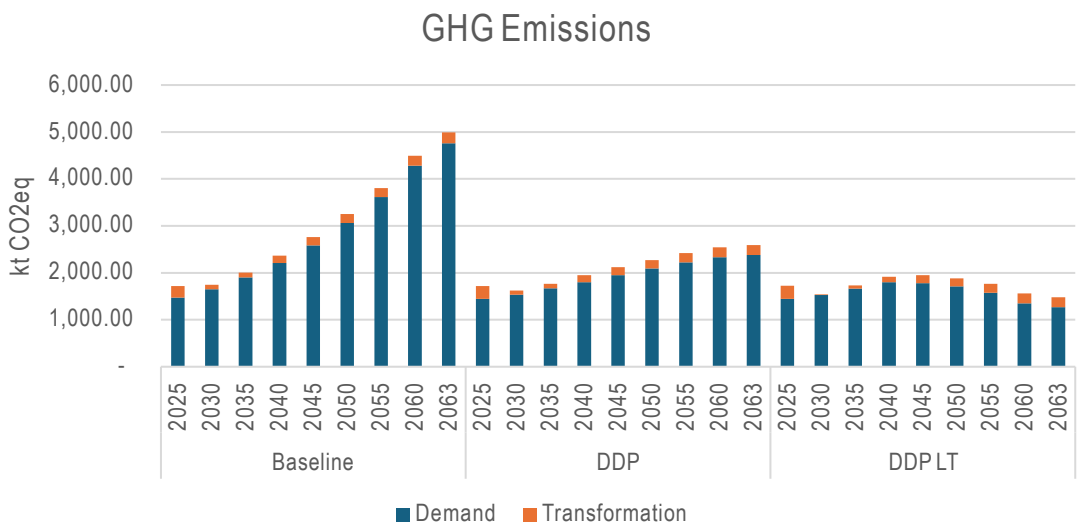



*Figure 3 : Projection of energy related GHG emissions.*

The comparative cost analysis of The Gambia's energy system under the Baseline, DDP, and DDP Long-Term (DDP LT) scenarios reveals key insights into the economic trade-offs of transitioning toward a low-carbon, energy-efficient future. Costs are presented in constant 2022 USD and comprise three main components: (1) demand-side investments (households, transport, services, industry), (2) transformation sector investments (mainly electricity generation), and (3) expenditures on imported fossil fuels (Figure 4).

By 2030, both DDP and DDP LT require modest increases in total system costs relative to the Baseline. DDP incurs a cumulative cost increase of $104 million, driven by $226 million more in demand-side investments and $34 million in additional power generation investments, which are only partially offset by $156 million in fossil fuel import savings. This results in a net 2% increase in total costs over 2025–2030. DDP LT achieves better cost control, with a net increase of just $22 million, thanks to larger fuel savings of $262 million, despite initiating investments for long-term decarbonisation. These outcomes indicate that early decarbonisation actions are affordable and yield near-term fuel expenditure reductions.

By 2040, the medium-term outlook shows growing economic advantages for the clean energy pathways. DDP achieves $58 million in net cost savings relative to the Baseline (0.4% lower), due to $940 million in reduced fossil fuel imports, despite additional investments of $173 million in generation infrastructure. DDP LT delivers even greater benefits: $299 million in total savings (2% below Baseline), with fossil fuel savings exceeding $1.3 billion, which more than compensate for $678 million in extra demand-side investments and $342 million in generation spending. These results highlight the increasing economic viability of clean energy transitions by 2040.

By 2063, the long-term impacts of structural transformation become pronounced. DDP achieves $8.4 billion in cumulative savings13% below the Baseline cost driven by $8.7 billion in avoided fossil fuel imports, even after accounting for $841 million in additional generation investments. DDP LT delivers $6 billion in total system savings (9% lower than Baseline), cutting fuel imports by a remarkable $9.7 billion. These long-term gains require higher upfront spending: $1.7 billion in demand-side measures and $1.9 billion in generation infrastructure, reflecting the cost of large-scale renewables deployment, electrification, and hydrogen uptake.

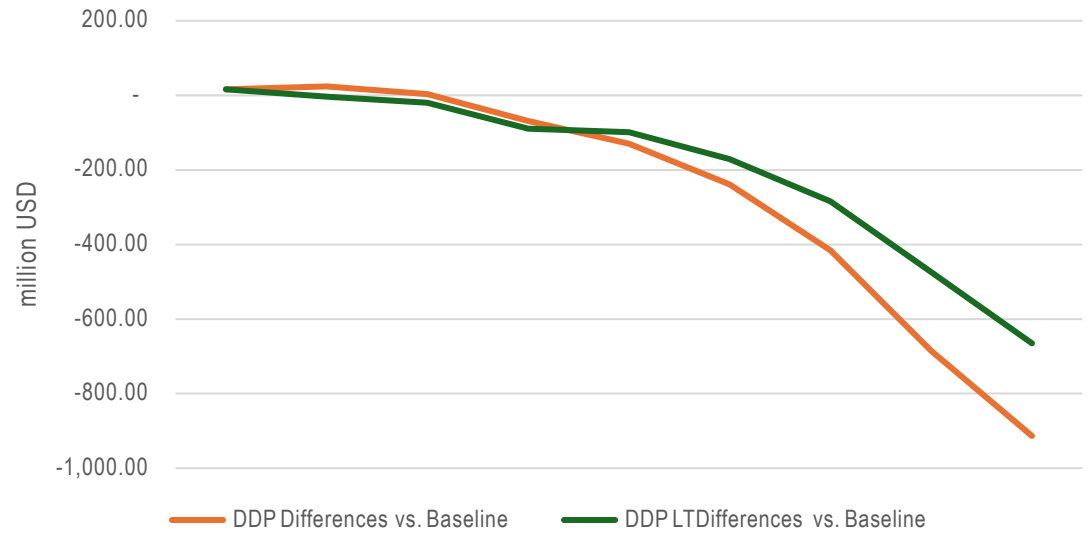



*Figure 4: Total cost compared to the Baseline scenario.*

In conclusion, both the DDP and DDP LT scenarios present clear advantages over the Baseline, offering more sustainable, efficient, and economically viable energy futures for The Gambia. Each pathway achieves significant reductions in energy consumption and emissions through electrification, clean fuel adoption, and structural shifts across all sectors. While DDP focuses on steady decarbonisation and cost-effectiveness, DDP LT pursues deeper transformation, enabling earlier emission peaks and more extensive reliance on renewables. Crucially, both strategies demonstrate that ambitious energy reforms can deliver strong environmental and economic outcomes, reinforcing the case for proactive climate and energy policy.

# List of activities

The list of focused practical, near-term interventions for The Gambia, are aligned with the seven ETSAP subsectors: electricity, industry, transport, buildings, oil and gas, agriculture, and clean cooking as presented in Table 1. These activities are incorporated in the DDP and DDP LT scenarios described above. These represent critical leverage points, where policy ambition is translated into regulatory frameworks, and where clear, targeted signals enable private investment to engage decisively and at scale.

*Table 1: List of activities*

| No. | Sector | Activity | Expected 2030 |
|---|---|---|---|
| 1 | Electricity | Promoting the Uptake of Renewable Energy | 15% decrease in fossil fuel use |
| 2 | Electricity | Enforcing Standards for Smart Distribution | Decrease in losses to 15%; 10% increase in RE penetration |
| 3 | Clean Cooking | Innovate & Plan for Clean Cooking Solutions | 100% access by 2030 |
| 4 | Building | Energy Labelling for Buildings | 10% decrease in primary energy consumption |
| 5 | Building | National Guidelines for Energy Performance in | Additional 10% decrease in energy consumption |
| 6 | Industry | Energy-Efficiency Regulatory Framework | 10% decrease in primary energy consumption |
| 7 | Transport | Rolling-out New-Energy Vehicles (mainly electric | 10% of new 4W sales electric; 25% bus uptake vs. baseline |
| 8 | Agriculture | Development of Bio-energy Supply Chains | 10% increase in access-supporting energy with zero emissions |
| 9 | Oil & Gas | Development of Bio-energy Supply Chains | New infrastructure designed to minimize flaring |

# Reflections and Strategic Significance

The DDP process in The Gambia exemplifies the vital role of integrated planning in operationalizing climate ambition. It also demonstrates the value of methodological coherence across national contexts—enabling credible continental progress tracking, policy benchmarking, and coordinated market development. Furthermore, it signals to investors, regulators, and communities that decarbonization is not merely a climate compliance exercise but a developmental imperative with co-benefits spanning public health, employment, and macroeconomic resilience.

By fostering institutional ownership, embedding adaptive triggers, and emphasizing low-regret investments, the pathway aims not only to inform policy but also to catalyse implementation and investments. The real measure of its success will lie in tangible outcomes - reduced emissions, improved access, and sustained economic transformation - underscoring Africa's agency in steering its own low-carbon future.



# 01

# 1 . INTRODUCTION

## 0.1. Context and Rationale

At the dawn of Africa's energy transition the continent faces a duality: vast renewable electricity and clean fuels potential on one hand and significant energy deficit on the other. Close to 69% of Sub-Saharan Africans still rely on traditional biomass for cooking, while electricity networks struggle to reach the last mile.The African Union has responded by developing the Energy Transition Strategy and Action Plan (ETSAP) which frames a path towards adoption of clean energy combining with just and inclusive industrialisation, social progress and climate resilience. ETSAP rests on six interconnected pillars: universal access and energy security, energy efficiency, carbon smart fossil management, policy and regulatory harmonisation, innovation with human capacity development, and sustainable economic growth and prosperity.

Within this continental architecture, Madagascar, Botswana and The Gambia have been selected undertake their National Deep dive Decarbonization Pathways (NDDP) deriving from the ETSAP. The three countries could hardly be more differen Sahelian flood plains in The Gambia, semi arid savannah in Botswana and the cyclone prone island of Madagascar but they share a common development triad: rapid demographic growth that stretches public infrastructure, pronounced vulnerability to climate shocks, and limited fiscal space to absorb volatile fuel imports. Their diverse starting points therefore provide a robust stress test for the harmonised methodology proposed by the AU; if a single analytical backbone can hold across such varied contexts it can credibly hold continent wide.

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DDPs supply the missing middle between visionary pledges and investable projects. The Gambia has submitted Nationally Determined Contributions (NDC) under the Paris Agreement, yet those documents stop short of tracing detailed technology mixes, financing envelopes or sectoral trade offs. A DDP fills that gap. It assembles a full national energy balance, projects demand under alternative socio economic futures, and calculates the supply mix respecting environmental and reliability constraints. By doing so it translates political intent into a bankable roadmap and strengthens the credibility of future NDC revisions.

The Gambia's electricity supply is constrained by modest installed capacity dominated by imported diesel and heavy fuel oil, with national grid coverage limited mainly to urban centres. Transmission and distribution infrastructure suffers from elevated technical losses and frequent voltage fluctuations, while endogenous renewable resources, particularly high-insolation solar irradiation and agricultural biomass residues, remain largely untapped. In this context, a comprehensive energy transition is imperative: by deploying decentralized solar PV mini-grids, strengthening backbone network interconnections, and integrating advanced demand-side management technologies, The Gambia can extend access to underserved rural communities, curtail fossil-fuel dependence, and enhance resilience to hydrometeorological shocks. Such a paradigm shift not only supports Nationally Determined Contributions but also fosters equitable socio-economic growth, optimizes investment portfolios, and supports a robust, climate-adaptive power architecture.

The adopted development rationale for deep decarbonisation is as follows: Efficient appliances, grid and off grid renewables, decentralised storage and clean cooking solutions reduce household expenditure, free foreign exchange and insulate rural communities from fuel price shocks. Diversified generation portfolios fortify grid resilience against droughts and climate related outages. Local value chains for solar modules, batteries or green hydrogen offer rare opportunities for job creation and mineral beneficiation. Conversely, inaction risks stranded fossil assets, growing balance of payments pressure and escalating health costs from urban air pollution. In short, a well designed transition is cheaper, cleaner and more socially inclusive than business as usual.

This methodology followed for the three DDPs underlines this logic of coordinated diversity. It signals to policymakers, financiers and development partners that national pathways are elements of a larger continental puzzle  whether that concerns standard setting for new energy vehicles, synchronised grid codes or the prospective African carbon market. It also accelerates peer learning: officials in Banjul, Gaborone and Antananarivo can benchmark assumptions, identify common bottlenecks and exchange practical solutions long before final reports are printed.

Uncertainty is, of course, inevitable over a four decade horizon upto 2063. Fuel prices fluctuate, technology costs change and political priorities evolve. For that reason, adaptive management strategiesmodular project design, flexible finance instruments, periodic scenario refresh are integral to the exercise, mirroring ETSAP's own M&E and  risk mitigation framework..

## 1.2. Objectives & Scope.

Designing the NDDP for The Gambia entailed defining clear milestones  anchored by specific targets and a defined timeline resulting in a practical tool for guiding policy, securing finance, and planning technology deployment over the long term.This section therefore sets out in sequential fashion, what the NDDPs seek to accomplish and over which horizon they shall unfold

### 1.2.1 What the DDP aims to achieve.

At its core, the DDP pursues a threefold mission. **First**, it translates the high-level commitments embedded in each country's official targets (e.g., NDCs) and the AUs ETSAP into a quantified, internally consistent road-map. Such a translation is indispensable, because headline percentages "30 % economy-wide emissions by 2030" or "100 % access by 2035"offer insufficient guidance on the granular sequence of capital deployments, technology choices and regulatory adjustments required to reach them. The DDP therefore dissects the pledges, allocates them across sectors, and rebuilds them into an integrated supply–demand architecture that respects system reliability, fiscal prudence and socio-economic equity.

**Second**, the DDP serves as the analytical platform for aligning national trajectories with the six pillars of ETSAPuniversal access and energy security, energy efficiency, carbonsmart fossil management, harmonised governance, innovation & human capacity, and sustainable economic growth and prosperity. While these pillars are continental in scope, their materialisation depends on coherent national actions. Hence the DDP asks, for example, how many megawatts of decentralised photovoltaics must be installed in rural Gambia for the access pillar to be realized, or what suite of transports ector incentives The Gambia must adopt to honour the efficiency pillar. In effect, the DDP is the stitching that binds continental fabric to national tailoring.

**Third**, the pathway provides an investment and risk-management tool for public and private actors alike. Energy assets possess multi-decade lifetimes; ill-timed or ill-matched investments can lock-in carbon intensity, exacerbate balance-of-payments pressure, and strand fiscal resources. The DDP mitigates such hazards by running scenario simulations BAU and the DDP scenarios. The outputs equip ministries of finance with expenditure envelopes, utilities with capacity-expansion plans, development banks with credit-worthiness insights, and communities with information on employment prospects and tariff trajectories.



To render these overarching goals operational, the study adopts the following **functional objectives**:

1. **Base year resolution**

   A contemporary, country-specific energy balance is reconstructed for the base year 2022, disaggregated by sector, end-use and fuel. Where data gaps surface most notably in informal biomass—proxy markers and international databases estimates are harmonised through AFREC database to safeguard coherence and transparency. It has to be highlighted that AFREC only hosts data that have been officially submitted by the AU Member States.

2. **Scenario articulation**

   Four harmonised narratives are elaborated to 2050 and are extended to 2063 for consistency reasons among the DDPs and for being in line with the Agenda 2063:

   - Baseline, rooted in historical growth elasticities with conservative energy access targets;
   - DDP, with the application of the measures co-desinged with the national stakeholders aiming at a pathway of reduced emissions compared to Baseline.
   - DDP LT (Long Term) which shows a pathway of further reduction of GHG emissions after 2040 compared to the DDP scenario towards a net-zero carbon economy by 2050 through an emissions pathway which reduces after reaching a peak around 2040.

3. **Investment scheduling & financing logic**

   The key activities decided refer mostly to policy and regulatory measures to be developed and adopted by the governments of the respective countries aiming to coordinate activities and develop an enabling framework for conducive private sector participation in key infrastructural investments.

4. **Adaptive-management triggers**

   Recognising that any long-horizon plan must be updated to account for real world events, the DDP establishes quantitative data sets fuel-price thresholds, technology-cost break-points, demand-growth deviations that will prompt updating of the DDP every 5 years.

### 1.2.2. Time horizon

The selected time horizon to 2050 for NDDP and the extention to 2063 to be consistent with the ETSAP was aligned with the end-date of the AU's Agenda 2063 and is long enough to afford sufficient scope for technology learning, industrial maturation and social adaptation while focusing on decarbonization development trajectory. The NDDP partitions the horizon into three discrete implementation phases, each with its own strategic content and in order to take stock after each term whether the desired targets are being achieved. The terms also allow adjustments as needed in accordance to both national and global ambitions towards low carbon economies:

**Short Term |** 2025–2030

This phase emphasises "low-hanging-fruit" measures: grid loss reduction, appliance and equipment market transfromation through energy efficiency, accelerated rollout of solar home systems and minigrids, and policy groundwork (standard setting, data architecture, incentive frameworks). The phase applied derisking instruments iike guarantee funds, payment security mechanisms to crowd-in private capital for renewables and clean cooking ventures..

**Medium Term |** 2031-2040

Having stabilised the enabling environment, the focus shifts to scale. Bulk renewables are integrated with strengthened transmission corridors and regional powerpool interconnectors. Electric mobility uptake accelerates, hydrogen and derivatives pilots for freight and fertiliser begin, and heavy industry retrofits gain momentum. Policy convergence across the AU countries becomes tangible through aligned efficiency standards, vehicle emission regulations and taxonomies for green finance.

**Long Term |** 2041-2050

The final phase drives the system towards significant emissions reduction. Residual fossil assets are either decommissioned or replaced by lower emission fuels or equiped with Carbon Cature and Storage options; powertoX facilities convert surplus renewable electricity to synthetic fuels; circular economy principles dominate material flows. Critical mineral beneficiation—nickel, cobalt and lithium refining for batteries and solar glass takes place domestically, supported by green hydrogen hubs. At this stage the regional energy market is mature allowing in turn the full operationalization of continental markets; AfSEM, fuels and carbon markets, enabling trade of electricity, hydrogen and carbon credits.

This 3-phase approach mirrors the natural progress of infrastructure rampup, institutional maturation and behavioural adaptation but remains flexible. When technology costs decrease faster than anticipated or climate impacts intensify earlier, the adaptive triggers mentioned above will guide investments forward or pivot them to alternative options. By embedding such flexibility, the pathway guards against both technological lock-in and policy unresponsiveness.

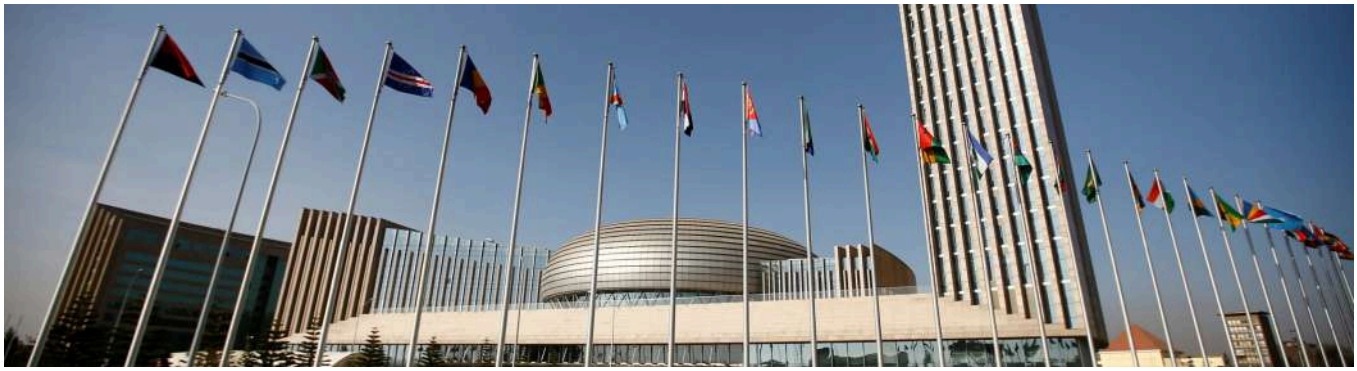
## 1.3. Approach & Methodology

The approach adopted was the same for all the three AU MS pilot countries starting with establishing the same base year of 2022 and establishing agreed targets either from national reports and stakeholders' inputs for the 2030, 2040 and 2050. Base year data for The Gambia used where derived from the AFREC data base and where base year data was insufficient, complemented with benchmarking as needed.

The methodological structure was erected starting with the **base year assessment** that captures national energy system in the reference year 2022 That was followed by **scenario simulations** executed using the LEAP model. Beyond that **stakeholder consultations** took place complemented with both inputs and examination of the outcomes and how they fitted into the context of the African Union's Energy Transition Strategy and its catalogue of "low hanging fruit" interventions.

The steps are mutually reinforcing: the base year grounds the scenarios, the scenarios enrich stakeholder dialogue, the dialogue refines alignment with continental strategy, and the continental anchor in turn supplies coherence and analytical discipline to the entire construct.

Stakeholders play an active role throughout. This iterative engagement not only grounds the reported data in local realities but also builds modelling capacity inside energy directorates—a horizontal action expressly prioritised in ETSAP's implementation plan. Experience has shown that such capacity is indispensable when projects move from the modelling to procurement and when assumptions must be refreshed in the light of new statistics or technology costs.



### 1.3.1. Base year assessment of the energy system

The base year is the foundation of the future pathway and hence has to be accurate for optimal modelling and mapping with clarity the flow of energy from primary extraction through transformation to final consumption, and ultimately to the release of greenhouse gases.

The process started with adopting publicly available datasets including AFREC's continental energy statistics, national utility reports and reports from the regulators, customs import records, and population censuses among others. Where numbers were mismatched, preference was given to sources anchored in national statistical systems, provided they met minimum criteria for temporal consistency and spatial granularity. All activity levels and conversion matrices were harmonized to 2022, choosing that year because it offered the most complete post COVID pandemic data.

Where adequate data were currently un-available an effort was made to utilize the available datasets to the extent possible by addressing as many gaps as possible through the extensive consultation process which involved both virtual stakeholders meetings as well as physical workshops in The Gambia.

Finally, the harmonized energy balance was validated for mass energy equivalence and emissions consistency since the carbon that enters the system must exit either as stored product, atmospheric release, or embedded export.

The resulting energy balance reinforces the forward simulations and expose potential decarbonization opportunities that are worth further intervention irrespective of long-term ambition. For example, An overview of the base year analysis for The Gambia together with the identified key insights are presented in Chapter 2, with a focus on the final energy consumption of the seven sectors that have been identified as key for the decarbonisation pathways in the ETSAP. Annex 1 presents the energy balance that has been used for the analysis as well as all the other base year information that is used for the model calibration, including population, number of households, urbanisation, vehicle fleet and the historical macro-economic path of total and sectoral Gross Domestic Product (GDP).

## 1.3.2. Scenario modelling for Gambia using LEAP

The LEAP model is calculating all emissions based on the inputs it receives, providing certainty that all carbon entered in the energy system is accounted for. This was also one of the reasons that contributed to choosing it as the main system-wide modelling tool.

With the base year established, we moved on to constructing of scenarios using LEAP that offers modularity, user-friendliness, and has an applicability in both developed and developing economies. Its transparent structure resonates with the AU Guidelines' recommendation on use of open source or widely disseminated tools, thereby easing capacity transfer to national planning units. The framework hosts the following narratives for The Gambia:

1. **Baseline scenario**
   extrapolates historical elasticities of GDP, population and structural change, assuming no significant policy shift. Baseline acts as the counterfactual—showing decision-makers the trajectory they implicitly endorse by doing nothing. The key assumption for the drivers used in the scenario are included in Table 2. Annex 1 presents in detail the projections of the scenario drivers, including the macro-economic projections of the GDP, the demographic projections related to the total population and the share of urban-rural population, the number of persons per household and the projection of demand for transportation for passengers and freight.

| | 2030 | 2040 | 2050 | 2063 |
|---|---|---|---|---|
| GDP growth rate | 5.8% | 5.7% | 5.6% | 5.5% |
| Population | 2.88% | 3.86% | 5.17% | 7.54% |
| Urban population share | 62% | 67% | 72% | 77% |
| Persons per household | 8.0% | 7.8% | 7.6% | 7.3% |

Table 2. Key senario drivers

The targets for electricity and clean cooking access in the Baseline scenario for 2030 and 2050 are presented in Table 3

| | 2030 | 2040 | 2050 | |
|---|---|---|---|---|
| Total Electricity Access | 77% | 100% | 100% | |
| Electricity Access Urban | 90% | 100% | 100% | |
| Electricity Access Rurual | 74.2% | 100% | 100% | |
| Total Clean Cooking | 52% | 100% | 100% | |
| Clean Cooking Urban | 72% | 100% | 100% | |
| Clean Cooking Rural | 50% | 100% | 100% | |

Table 3: Access targets for Baseline and DDP Scenarios

2. **DDP Scenario**

DDP pushes the target of GHG emissions towards net-zero (or near zero) by 2050. In this scenario the access targets presented in Table 3 are reached and all the measures co-designed with the national stakeholders aiming at a pathway of reduced emissions are applied in The Gambia. The macroeconomic and demographic drivers of the DDP scenario are the same as in the Baseline, but the scenario implements all the interventions discussed in detail in Chapter 4 including energy efficiency measures, measures for reducing the demand in vehicle kilometres for transportation and for the modal shift from private to public transport modes, electrification of end uses and largescale deployment of variable renewables in the electricity generation. The detailed input assumptions for the DDP scenario can be found in Annex 1.

3. **DDP LT Scenario**

DDP LT is based on DDP scenario (i.e. it uses the same macroeconomic and demographic drivers) but pushes even further the decarbonization of the energy sector in the longer term after 2040. The same targets for energy access as in DDP are used but the efforts for decarbonization are increased after 2040, with increased capacity of renewable energy sources, full electrification of passenger road transport, partial electrification of freight transport, introduction of new energy carriers like hydrogen, fuel switching in industry and services towards cleaner alternatives and electricity, higher energy efficiency achievements and implementation of new technologies in all sectors. The detailed scenario assumptions for the DDP LT are also presented in Annex 1.

LEAP calculates the development of the energy sector based on the projected effects of the measures that are described in detail in the following chapters. The interface visualizes the outcome of the calculations as Sankey flows (refer to Chapter 2 for details), technoeconomic dashboards and cumulative emissions blocks, translating complex calculations into visuals that can be interpreted by nonspecialists hence enabling productive stakeholder engagement.

### 1.3.3. Stakeholder Consultation

The NDDP development process embedded participatory loops at every decision point, transforming stakeholders from only being recipients to co-authors hence empowering ownership of the results. The engagement unfolded in four waves; each wave timed to maximize the knowledge dividend.

- **Wave 1: Data validation** brought together ministries, regulators, statistics bureau, utilities, fuel distributors, and civil society monitors. Participants scrutinized preliminary energy data, flagged anomalies, and provided locally sourced corrections.
- **Wave 2: Scenario framing** convened relevant ministries, regulators and utilities alongside the private-sector and civil society. Here we formulated narrative boundaries, e.g., the strictness of efficiency norms. By discussing implicit assumptions, the exercise protected the model against the critique of “technocratic over-reach.”
- **Wave 3: Results examination** unpacked model outputs to the stakeholders. This disclosure not only strengthened transparency but also gave room for potential refinements.
- **Wave 4: Policy packaging** transformed optimized pathways into actionable measures with indicative timelines. Here the energy transition ceases to be an abstract curve on the modeler’s screen and becomes a ledger entry in ministerial work-plans.

The cumulative effect of the four-wave process is twofold. First, it seeds ownership: when the time comes to defend capital-budget allocations or tariff adjustments, policy-makers can trace the causal chain back to conversations they helped script. Second, it constitutes a crash-course in modelling literacy for civil servants and civil society, thereby advancing ETSAP's human-capacity pillar.

### 1.3.4. Integration with AU Energy Transition Strategy & Low-Hanging-Fruit Actions

The final methodological ring links national findings to the continental structure. This is achieved through a dual-key mechanism: **metric alignment** and **intervention tagging**.

- **Metric alignment** ensures that each sectoral KPI mirrors those in ETSAP's monitoring and evaluation matrix: gigawatts of renewable capacity added, percentage energy productivity improvement, proportion of population with access to clean cooking. By reporting in comparable units, the three pilot DDPs slot naturally into the continental dashboard, permitting apples to apples aggregation and progress tracking. It has to be highlighted that these metrics are the output of the LEAP model and not high-level estimations.
- **Intervention tagging** classifies every action emerging from the calculation into one of three ETSAP time horizons:
- *Short term: Low-hanging fruit* (≤ 2029, minimal policy friction, strong cost competitiveness).
- *Medium term: Scale-up accelerators* (2030–2040, requiring major capital mobilization or institutional reform).
- *Long term: Transformational enablers* (> 2040, contingent on global technology learning and continental market integration).

By mapping measures this way the DDP performs a political service: it signals to the AU which continental platforms—standardization bodies, regional power pools, climate finance facilities—must synchronize to unlock national ambition, and conversely alerts national planners when domestic inertia could hinder continental progress.

Taken in concert, the four rings—baseline assay, LEAP scenario engine, stakeholder co-creation, and continental alignment—forge a methodology that is rigorous without being rigid, visionary without lapsing into utopia. It accommodates the disciplined quantification that engineers and financiers crave, the narrative richness that politicians and citizens understand, and the interoperability that continental governance demands. This approach and methodology accommodate involvement of all stakeholders and achieves understanding of the upcoming results. The success of this approach and resulting methodology goes beyond sophisticated modelling results but catalyse concrete outcomes: e.g. transmission loss reductions visible on utility ledgers, solar farms in rural areas, three stone fires replaced by efficient biomass cookstoves. Only then will the pathway cease to be a strategy on paper but a driver of an African future powered by its own inexhaustible resources of sun, wind, minerals and human ingenuity.



# 2 .ENERGY SYSTEM BASELINE

## 2.1. Overview of the Current Energy System

The Sankey diagram of the energy system of Gambia for 2022, according to the detailed and balance provided by AFREC can be seen in **Figure 5.**

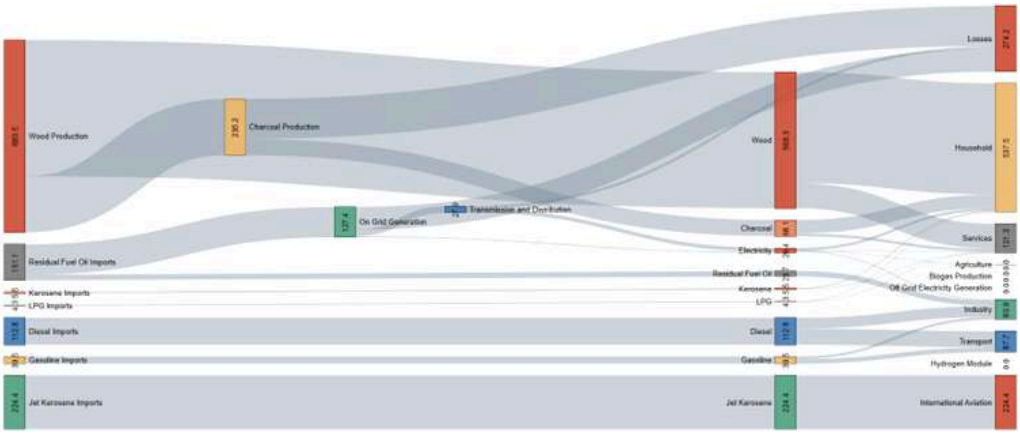



Figure 5 : Sankey diagram Gambia 2022.

The primary energy supply is dominated by local coal production and the import of oil products, mainly used in transportation. Biomass is mainly used in households, either as wood or charcoal.

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### 2.1.1. Primary energy sources (fossil, renewable) & electricity mix

In 2022, Botswana's TPES amounted to 2,467 ktoe. This energy supply was predominantly fossil fuel-based, with diesel (715 ktoe or 29%) and gasoline (433 ktoe or 18%) accounting for the largest shares among petroleum products. Local coal contributed significantly with 692 ktoe (28%), while biomass fuels wood and charcoal collectively added 467 ktoe and are notable for their extensive use in household consumption (Figure 6). Imported electricity (124 ktoe) and LPG (13 ktoe) played more modest roles.

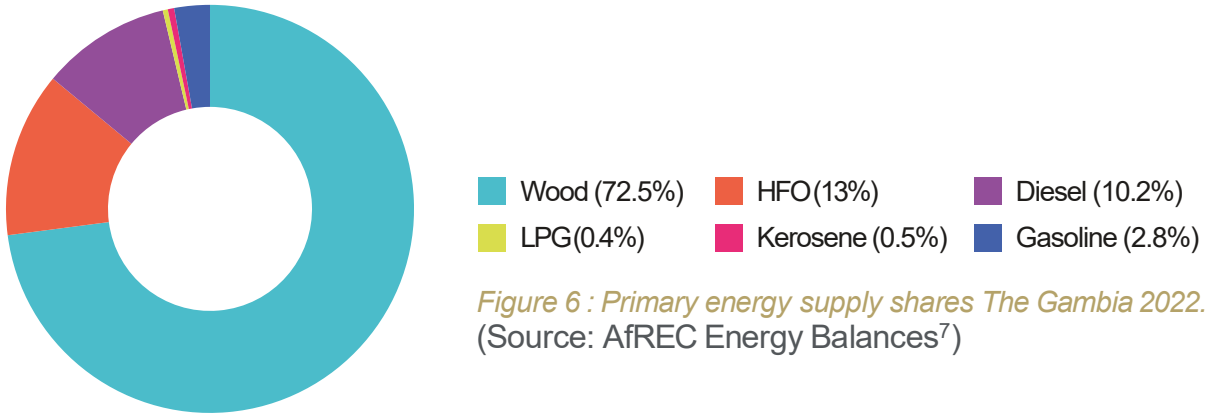



*Figure 6 : Primary energy supply shares The Gambia 2022.*
(Source: AfREC Energy Balances[7])

The remaining 528.5 ktoe (39.7% of the total primary supply) was met entirely through imports of refined petroleum products. Among these, jet kerosene was the largest contributor at 224.4 ktoe, accounting for 16.8% of the total primary supply and mainly used for air bunkers. Diesel followed with 112.8 ktoe, or 8.5%, used primarily in the transport sector and likely also in off-grid and backup electricity generation. Heavy Fuel Oil (HFO), at 151.1 ktoe or 11.3%, remains a critical input for large-scale thermal electricity generation, its share reflecting the country's historical dependence on heavy fuel oils in the centralized electricity generation mix. Gasoline accounted for 30.5 ktoe, or 2.3 % of supply.

Kerosene, often used for lighting and cooking among low-income households, contributed 5.5 ktoe, while LPG represented only 4.3 ktoe, reflecting its marginal penetration in the national cooking energy mix despite recent strategic efforts to promote it as a cleaner alternative (AfREC Enegy Balances[5]). The structure of The Gambia's primary energy supply in 2022 reveals a dual dependency: one on traditional biomass, which continues to dominate the energy landscape due to affordability and accessibility constraints, and another on imported petroleum products, which underpin the modern segments of the economy but expose the country to external shocks. This structure represents a major challenge for the

The Gambia's electricity generation in 2022 remained entirely dependent on thermal sources, with all power plants using imported heavy fuel oil (HFO) as their primary energy input. The single largest contributor to electricity generation in 2022 was the Karpower floating power plant, which supplied nearly 57% of total local generation (NAWEC Request for data October 2023). This plant operates on imported HFO and has emerged in recent years as a stabilizing anchor for electricity supply in the Greater Banjul Area. The energy mix for electricity generation in 2022, was not only fossil-fuel dominated but exclusively reliant on imported heavy fuel oil. The efficiency penalties observed across all plants amplify the environmental and economic burden.

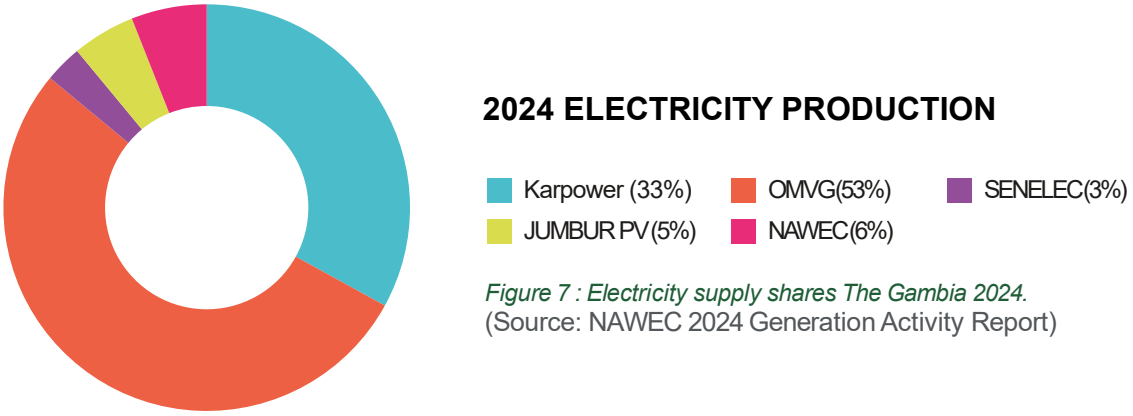



*Figure 7 : Electricity supply shares The Gambia 2024.*
(Source: NAWEC 2024 Generation Activity Report)

In 2024, The Gambia's electricity generation was predominantly reliant on imported power, with imports through the OMVG interconnection, mainly from EDG and SENELEC, contributing approximately 56% of total electricity supply (Figure 7). Within The Gambia, Karpower produced 33% of the electricity supply while NAWEC's generation accounted for only 11.6% (NAWEC 2024 Activity Report). The year was marked by critical underperformance of the internal generation fleet due to prolonged mechanical failures, fuel shortages, and delays in maintenance, leading to low domestic output. Among NAWEC's assets, Brikama III emerged as the most reliable, contributing 18.4 MW with high availability, while older stations such as Kotu and Brikama I remained largely offline, with only isolated operational capacity, and exhibiting very low availability factors and suboptimal efficiencies.

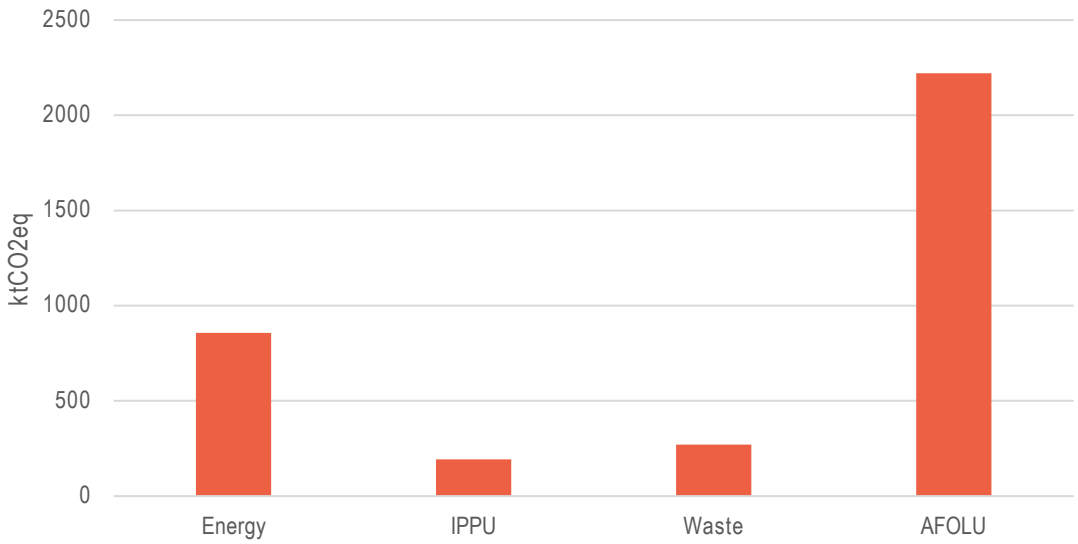
The Wartsila unit at Brikama II operated intermittently and was eventually shut down mid-year due to oil shortages, further limiting internal capacity (NAWEC 2024 Activity Report). The Jambur Solar PV plant contributed 5% of total electricity production with a consistent performance aligned with its design capacity of 23 MWp,but was constrained by seasonal weather variation and lack of Battery Energy Storage System (BESS) issues (NAWEC 2024 Activity Report). With a peak demand of 106 MW and an average system load of 75 MW, the heavy reliance on OMVG imports and Karpower underscores both the fragility and the structural dependence of the power system on imports and fossil fuel fired domestic plants, as well as the urgent need for enhanced generation efficiency, maintenance reliability, and renewable diversification to ensure long-term energy security.

### 2.1.2. Energy access and grid connectivity

Electricity access in The Gambia has seen a remarkable improvement between 2022 and 2024, as reflected in official statistics. National access stood at 82.8% in 2022, however, by the end of 2025, access is expected to reach 77% nationally, with rural access reaching 74.2% and urban access achieving 90%, according to combined data from the Ministry of Petroleum and Energy and the 2024 GBoS Census. This substantial leap reflects the impact of accelerated electrification programmes, large-scale grid extension efforts, and enhanced regional interconnection infrastructure such as the OMVG line. Despite this progress, regional disparities persist, particularly in remote areas where unelectrified household clusters remain. Nonetheless, ongoing government initiatives, including substation upgrades and mini-grid deployment, are expected to drive access rates even higher. By 2026, projections indicate The Gambia will achieve 91% nationwide electricity access, with full coverage in urban areas (100%) and a continued climb in rural electrification to 77.8%, cementing the country's progress toward universal access, which is aimed for 2030 (Ministry of Petroleum and Energy).

## 2.2. GHG Emissions By Sector

According to The Gambia's First Biennial Update Report (BUR1 2024), total greenhouse gas (GHG) emissions for 2020 amounted to approximately 3,542 $ktCO_2eq$ (Figure 8). The Agriculture, Forestry and Other Land Use (AFOLU) sector was by far the dominant contributor, accounting for 2,221 $ktCO_2eq$, or approximately 63% of total emissions. This reflects the country's heavy reliance on land use for livelihoods and the significant impact of deforestation, agricultural practices, and land degradation. The energy sector followed with emissions of 857 $ktCO_2eq$, representing 24% of the national total, largely from fossil fuel combustion and biomass use. Waste-related emissions contributed 271 $ktCO_2eq$ (8%), while emissions from Industrial Processes and Product Use (IPPU) were the lowest at 193 $ktCO_2eq$, accounting for 5% of the total. This emissions profile highlights the critical importance of land use interventions and sustainable energy solutions in The Gambia's climate mitigation strategy. Furthermore, the energy related emissions increased significantly from 620 ktCO2eq in 2010 to 857 ktCO2eq in 2020 (an increase of about 38%) indicating the increasing trend for the contribution of energy to GHG emissions.




Tier 1 access, according to the Multi-Tier Framework (MTF) for Measuring Electricity Access, used for SDG 7 reporting, which includes households that have access to at least 3 watts of power capacity, sufficient to support limited energy services such as task lighting (e.g., LED lamps) and phone charging. Electricity must be available for a minimum of 4 hours per day, including at least 1 hour during evening hours between 6pm and 10pm. There are no specific requirements for reliability, voltage quality, or the legality of the connection at this tier.

Third National Communication, 2020

### 2.2.1. Electricity

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### 2.2.2. Industry

The industrial sector in The Gambia in 2022 recorded a final energy consumption of approximately 83.0 ktoe, drawing on a fuel mix dominated by fossil fuels (AFREC Energy Balances 2025). Diesel was the primary energy carrier, accounting for 45.3 ktoe or about 54.6% of total industrial consumption (AFREC Energy Balances 2025). This was followed by HFO at 23.7 ktoe (28.5%) and gasoline, which contributed 10.3 ktoe (12.4%), and reflecting the sector's reliance on these liquid fuels for process heat and machinery operation. Electricity usage in industry was comparatively modest, totalling 3.7 ktoe, which represented only about 4.5% of the sector's final energy consumption. No use of LPG, wood, or charcoal was reported in the industrial sector, underlining its concentration on high-density, imported fossil fuels. The fuel mix illustrates the carbon-intensive nature of industrial operations in the country, and the limited electricity use or renewable alternatives within this sector. The importance of the industrial sector in The Gambia's economy is underscored by its role in job creation, infrastructure development, and value addition across manufacturing, construction, and agro-processing activities, making it a strategic focus for improving energy efficiency and competitiveness as the country pursues industrialization under its national

### 2.2.3. Transport

The transport sector in The Gambia recorded a final energy consumption of approximately 87.7 ktoe in 2022, making it one of the largest energy-consuming sectors in the country (AFREC Energy Balances 2025). The sector was entirely dependent on petroleum products, with diesel being the predominant fuel, accounting for 67.5 ktoe or around 77% of total transport consumption (AFREC Energy Balances 2025). Gasoline followed with 20.2 ktoe, representing approximately 23% of the total (AFREC Energy Balances 2025). Diesel's dominance reflects its critical role in both freight and public transportation, while gasoline supports the growing fleet of private light-duty vehicles. The absence of electrification highlights the lack of alternative technologies in the national vehicle stock. As a vital component of economic connectivity, trade, and mobility, the transport sector's energy profile is significant both for its contribution to national greenhouse gas emissions and for its exposure to international fuel price volatility, making it a key area for future energy transition and fuel diversification strategies.



### 2.2.4. Buildings

Final energy consumption in The Gambia's buildings sector in 2022 (including both residential and services (commercial and public) segments) amounted to approximately 658.ktoe, making it the largest consuming sector in the national energy balance (AfREC Energy Balances 2025). The residential sector alone accounted for 537.5 ktoe, while the services sector consumed 121.3 ktoe (AFREC Energy Balances 2025). Biomass remained the dominant energy source in households, with wood contributing 463.8 ktoe (86.3% of residential consumption) and charcoal adding another 56.5 ktoe (10.5%). Electricity use in homes totalled 11.1 ktoe, equivalent to just 2.1% of the household energy mix, and LPG contributed a modest 2.4 ktoe (0.44%). In the services sector, electricity accounted for 1.6 ktoe (1.3%), while wood and charcoal contributed 104.6 (86.2%) and 11.6 (9.6%) ktoe, respectively. LPG use in services was 1.8 ktoe (1.5%), and kerosene added a further 1.7 ktoe (1.4%). The overwhelming dependence on traditional biomass in both residential and commercial buildings indicates continued pressure on forest resources, low levels of access to clean cooking fuels. As the buildings sector supports the daily energy needs of the majority of the population and underpins key social services, it plays a critical role in both energy transition planning and poverty alleviation.



### 2.2.5. Oils & Gas

In 2022, The Gambia's energy balance was heavily reliant on imported petroleum products, with no domestic production of oil or gas. The country imported a total of 528.5ktoe in refined petroleum products, including 224.4 ktoe (42.5%) of jet kerosene, 151.1 ktoe (28.6%) of HFO, 112.8 ktoe (21.3%) of diesel, 30.5 ktoe of gasoline (5.8%), 5.5 ktoe (1.0%) of kerosene, and 4.3 ktoe (0.8%) of LPG according to the 2022 energy balance published by AfREC. These imports accounted for approximately 39.7% of the total primary energy supply, underscoring The Gambia's acute dependence on external sources for its modern energy needs.

Recognizing the strategic importance of developing domestic hydrocarbon resources, The Gambia has intensified offshore exploration efforts. The upstream petroleum subsector of The Gambia is governed by three key institutions namely the Ministry of Petroleum, Energy and Mines which is responsible for the policy, the Petroleum Commission, responsible for regulation and the Gambia National Petroleum Corporation (GNPC) responsible for operations. The Gambia has eight offshore exploration blocks and one onshore block. There is currently one licensee on one of the offshore Blocks with the expectation of more in the coming years. The Gambia is at the exploration phase of the upstream petroleum project cycle and over the past five years, two offshore exploration wells have been drilled. The Petroleum Exploration, Development and Production Act of 2004, the law governing the sector, is currently being reviewed and key changes on the draft include the requirement of zero routine flaring.

In 2023, the Gambian National Petroleum Corporation (GNPC) signed a memorandum of understanding with the Nigerian National Petroleum Corporation (NNPC) to collaborate on geological studies, seismic data analysis, and potential drilling activities, aiming to bolster the country's energy security and economic development. .

Furthermore, The Gambia stands to benefit from the proposed Nigeria-Morocco Gas Pipeline (NMGP), a project spanning approximately 5,660 kilometers and traversing 13 West African countries, including The Gambia. The pipeline aims to transport Nigerian natural gas to Morocco, with extensions to Europe, thereby enhancing regional energy integration and providing The Gambia with access to a more diversified and potentially more affordable energy supply. While the NMGP project is still in the planning and development stages, its realization could significantly reduce The Gambia's reliance on imported refined petroleum products and support the country's transition towards a more sustainable and secure energy future.

### 2.2.6. Agriculture

In 2022, The Gambia's agriculture sector accounted for a negligible share of the country's final energy consumption, according to the reported energy balance. This underscores the sector's minimal reliance on modern energy inputs, reflecting a landscape dominated by manual labour and traditional practices. However, recent initiatives signal a shift towards integrating energy solutions into agriculture. Donor funded programs have introduced solar-powered irrigation systems, enhancing water accessibility for farming communities. Additionally, demonstration farms are promoting climate-smart agriculture, showcasing techniques such as organic farming and efficient resource utilization. These developments aim to modernize the sector, improve productivity, and build resilience against climate challenges. Despite these efforts, the overall energy consumption in agriculture remains low, highlighting the need for continued investment in energy infrastructure and capacity-building to support sustainable agricultural growth in The Gambia.



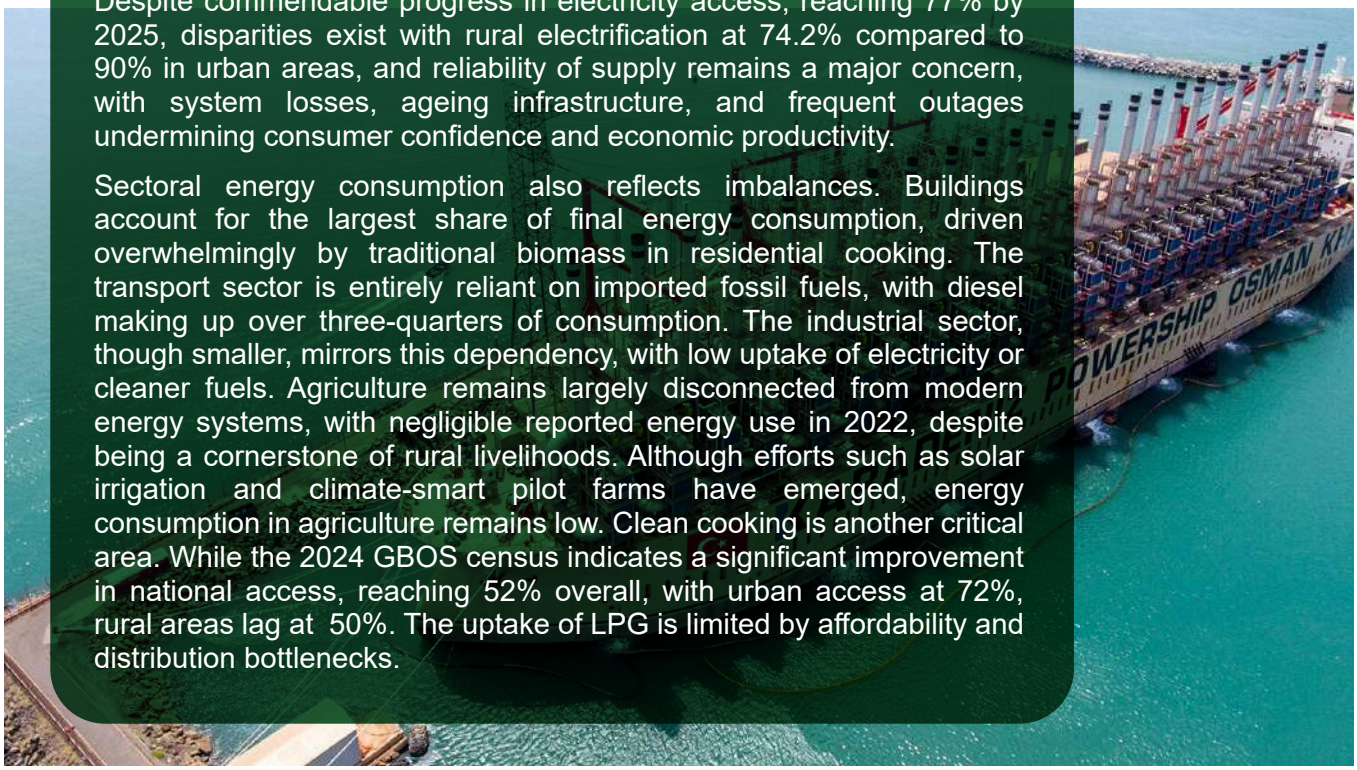
### 2.2.7. Clean Cooking

Data for access to clean cooking in The Gambia for 2022 are scarce, however, the census of 2024, provides indications of the level of penetration of clean cooking practises. National access is estimated to 52%, driven primarily by rapid expansion in urban areas where access surged to 72% (data derived from the 2024 census performed by Gambia Bureau of Statistics (GBoS)). In contrast, rural clean cooking access, though improved, remained lower at 50%, highlighting a persistent urban-rural divide. This progress corresponds to intensified efforts by the government and development partners, notably through the implementation of the National Clean Cooking Action Plan and the 2024 LPG Popularisation Strategy. These initiatives introduced coordinated mechanisms to address structural barriers such as affordability, access to LPG cylinders, and safety concerns, while also promoting improved cookstoves and alternative biomass fuels such as briquettes. Additionally, partnerships with private sector actors have aimed to expand distribution networks and stimulate market transformation. Despite the progress, traditional biomass—including firewood and charcoal—continues to dominate in rural areas, contributing to indoor air pollution, forest degradation, and health burdens for women and children. Reaching the country’s target of universal access to clean cooking by 2030 will depend on sustained policy commitment, increased investment in infrastructure and consumer subsidies, and strengthened awareness campaigns across all regions of the country.

## 2.3. Key Challenges

The Gambia's energy sector faces several structural and systemic challenges that constrain its reliability, sustainability, and capacity to meet growing national demand. The primary energy supply is characterised by a dual dependency on traditional biomass and imported petroleum products. In 2022, biomass, primarily fuelwood, constituted over 60% of total primary energy supply, reflecting a deep reliance on unsustainable fuel sources for cooking and heating, especially in rural and peri-urban households. Simultaneously, nearly 40% of the energy supply was derived from imported refined petroleum products, highlighting the vulnerability of the country to international fuel price volatility and supply disruptions. This dependence on costly imports places a considerable strain on foreign exchange reserves and exposes the economy to global market shocks.

Electricity generation further compounds these challenges. In 2022, domestic power production was entirely fossil-based, heavily reliant on imported heavy fuel oil, with the majority of output delivered by the Karpower barge. Low operational efficiency and high fuel costs typify the country's thermal fleet, exacerbating financial pressures and environmental burdens. By 2024, over 85% of the electricity supply came from imports (52.6% imported via the OMVG interconnection), while 33% was generated in the country by Karpower and NAWEC's generation fleet contributed 11.6% (6% from fossil fuel plants and 5% from Jambur solar PV plant). Chronic mechanical failures, fuel shortages, and delays in critical maintenance work rendered key assets such as Kotu and Brikama I virtually inoperative, severely limiting the country's self-generation capacity. The grid-connected renewable source, Jambur Solar PV, contributed 5% of the electricity supply, initiating a period of renewable electricity penetration in the national electricity generation mix, albeit affected by intermittence in the absence of BESS.




Despite commendable progress in electricity access, reaching 77% by 2025, disparities exist with rural electrification at 74.2% compared to 90% in urban areas, and reliability of supply remains a major concern, with system losses, ageing infrastructure, and frequent outages undermining consumer confidence and economic productivity.

Sectoral energy consumption also reflects imbalances. Buildings account for the largest share of final energy consumption, driven overwhelmingly by traditional biomass in residential cooking. The transport sector is entirely reliant on imported fossil fuels, with diesel making up over three-quarters of consumption. The industrial sector, though smaller, mirrors this dependency, with low uptake of electricity or cleaner fuels. Agriculture remains largely disconnected from modern energy systems, with negligible reported energy use in 2022, despite being a cornerstone of rural livelihoods. Although efforts such as solar irrigation and climate-smart pilot farms have emerged, energy consumption in agriculture remains low. Clean cooking is another critical area. While the 2024 GBOS census indicates a significant improvement in national access, reaching 52% overall, with urban access at 72%, rural areas lag at 50%. The uptake of LPG is limited by affordability and distribution bottlenecks.

Taken together, these challenges underscore the need for a comprehensive energy sector reform. Key priorities include diversifying the energy mix through accelerated investment in renewables, particularly solar with BESS; modernising the fossil fuel generation fleet to enhance reliability and efficiency; reducing fuel import dependency; and scaling up clean cooking and rural electrification initiatives.



# 03

# 3 .SCENARIO & MODELING RESULTS

## 3.1. Baseline Scenario

This section presents the results of the energy system modelling for The Gambia for the Baseline scenario. This scenario explores the pathway of energy demand, supply, and emissions evolution under current policies and achieving the targets of full access to electricity and clean cooking by 2030. The analysis covers sectoral dynamics, fuel use, and emissions trends from 2025 to 2063.

**Final Energy Consumption**

Final energy consumption (FEC) in The Gambia evolves significantly across the short-, medium-, and long-term under the baseline scenario, reflecting structural changes in demand patterns (Figure 9). In the short term (2025–2030), total FEC declines slightly from 769 ktoe in 2025 to 756 ktoe in 2030. This contraction is primarily driven by a reduction in household energy use, which falls from 449 ktoe (58% of total FEC in 2025) to 369 ktoe (49% in 2030), largely due to a shift away from traditional biomass as access to modern fuels and more efficient cookstoves increases. At the same time, energy consumption in the transport sector increases from 98 ktoe (13.0%) to 131 ktoe (17.3%), driven by motorisation and urbanisation. The services sector grows from 132 ktoe (17%) to 152 ktoe (20%), while industry expands modestly from 90 ktoe (12%) to 104 ktoe (14%). In the medium term (2030–2040), total FEC rises from 756 ktoe to 978 ktoe—an overall increase of 29%. All sectors contribute to this growth: household consumption contributes to 405 ktoe (41.4%), indicating stabilisation within a more modern energy mix; transport energy use nearly doubles to 234 ktoe (23.9%), highlighting its role as a key driver of energy demand; services grow to 201 ktoe (20.5%), and industry reaches 138 ktoe (14.1%). These shifts mark a broadening of energy demand away from domestic biomass use toward productive and mobility-driven consumption, characteristic of a transforming economy.

In the long term (2040–2063), final energy consumption more than doubles, from 978 ktoe to 1,983 ktoe by 2063, underscoring the combined impact of population growth, GDP growth, infrastructure development, and increased electrification. By 2063, the transport sector dominates with 805 ktoe (40.6% of total FEC), followed by the household sector at 541 ktoe (27.3%), services at 378 ktoe (19.1%), and industry at 259 ktoe (13.1%). This trajectory confirms a structural transition in the energy economy, with demand shifting towards motorised transport, commercial services, and industrial production. It also highlights the critical importance of investing in clean energy infrastructure, efficiency improvements, and demand-side management to ensure that the rapid rise in energy consumption is met sustainably.

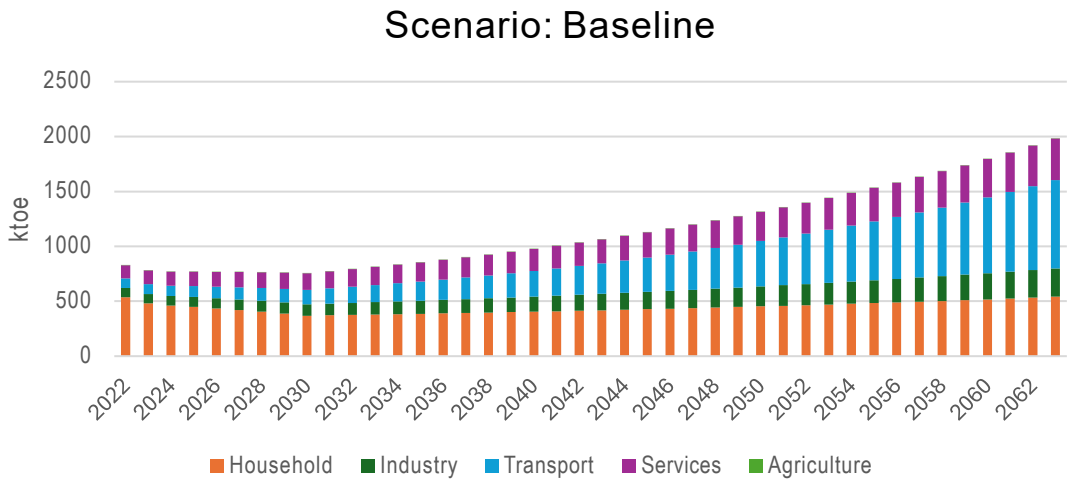



*Figure 9 : Projections of **Final Energy Consumption** per sector for the Baseline scenario.*

Final energy consumption by fuel in The Gambia demonstrates a gradual but clear shift from traditional biomass to modern energy carriers over the short (2025–2030), medium (2030–2040), and long-term (2040–2063) periods (Figure 10 and Figure 11). In the short term (2025- 2030), wood remains the dominant fuel, declining from 478 ktoe in 2025 (62% of total FEC) to 393 ktoe (52.0% of total FEC), reflecting the onset of fuel substitution in households, due to the clean cooking initiatives. Charcoal consumption rises marginally from 74 ktoe to 84 ktoe, while diesel increases from 126 ktoe (16%) to 161 ktoe (21%), driven by growth in transport and industry. Electricity also grows steadily from 21 ktoe to 29 ktoe, increasing its share from 3% to 4%, while LPG expands from 7 ktoe to 16 ktoe, accounting for over 2% of the total FEC by 2030, mainly used for cooking. Kerosene remains marginal, at around 0.4% throughout the period.

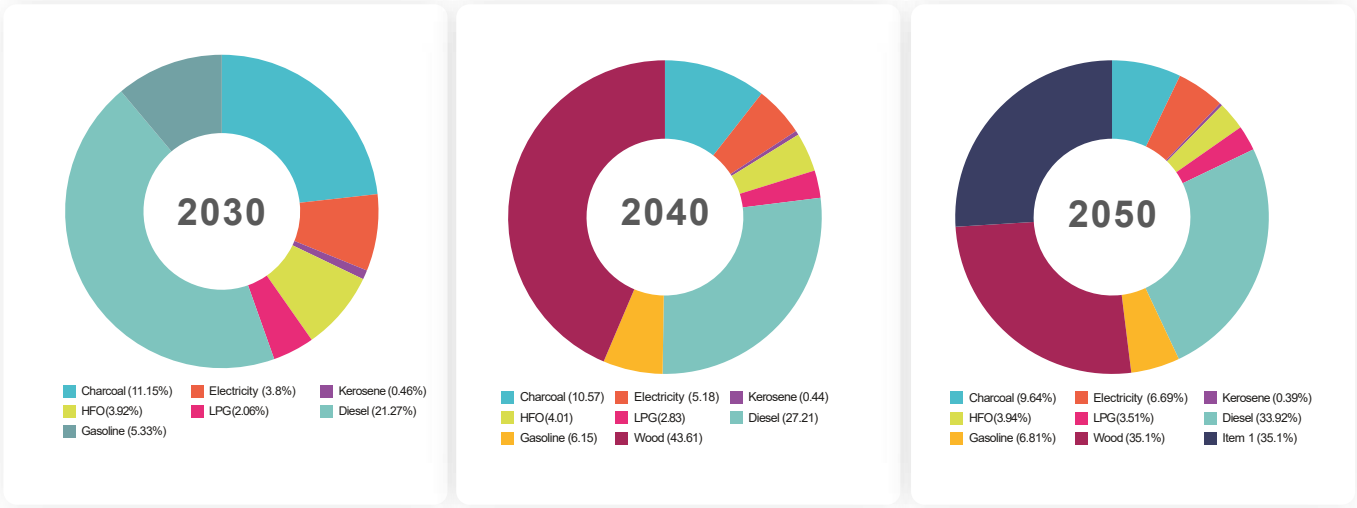



*Figure 10 : **Final Energy Consumption** shares per fuel for the Baseline scenario.*

In the medium term (2030–2040), fossil fuels and electricity are contributing an increasing share to FEC. Diesel nearly doubles, reaching 266 ktoe by 2040 (27% of total FEC), and electricity consumption also rises to 51 ktoe (5% of FEC). LPG nearly doubles to 28 ktoe (3%), underscoring the growing role of clean cooking alternatives. Biomass still plays a significant role, though its dominance continues to wane as wood stabilises around 426 ktoe (43.6%) and charcoal reaches 103 ktoe (10.5%). Gasoline consumption increases gradually, reaching 60 ktoe (6.1% of FEC), consistent with the rising motorisation trend.

In the long term (2040–2063), diesel remains the largest single fuel, reaching 816 ktoe by 2063 (41.2% of total FEC), reflecting sustained growth in freight and industrial uses. Wood's contribution continues to decline in relative terms accounting for just 25.7% of total FEC. Charcoal reaches 164 ktoe (8.3%), while electricity more than triples, reaching 168 ktoe by 2063 and representing 8.5% of the total FEC. LPG continues its expansion to 84 ktoe (4.2%), indicating rising adoption in cooking. The growing share of electricity and LPG, along with the stabilisation of biomass in the Baseline trajectory, suggests a continued energy transition underway, although the dominance of diesel and the limited penetration of renewable fuels such as biogas and hydrogen signal the need for a more diversified and sustainable energy mix in the long term.

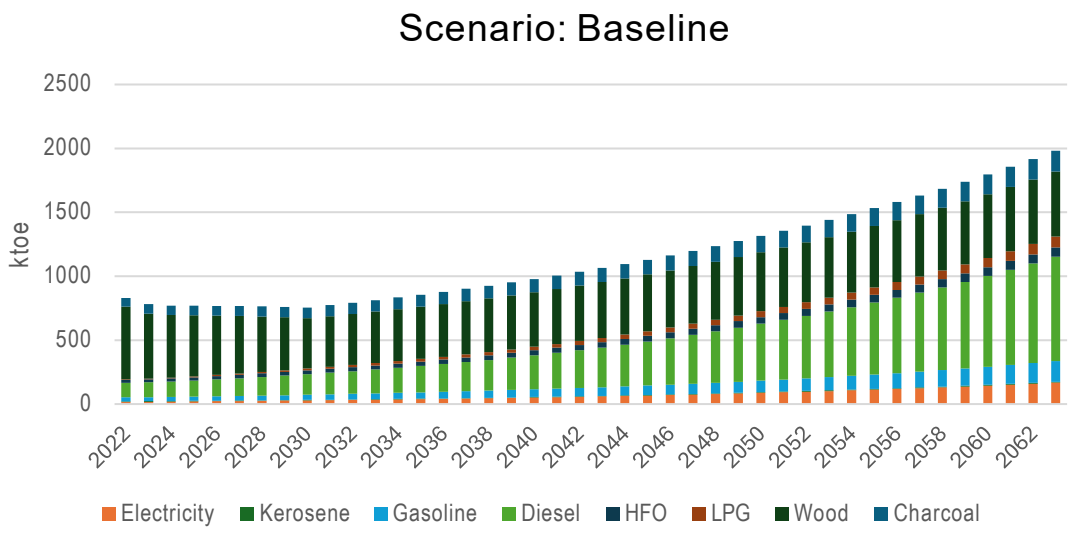



*Figure 11 : Projections of **Final Energy Consumption per fuel** for the Baseline scenario.*

**Household sector by energy fuel/source**

Final energy consumption in the household sector of The Gambia shows a clear long-term transition away from traditional biomass and towards modern fuels such as electricity and LPG (Figure 12).

In the short term (2025–2030), wood remains the predominant energy source, but its consumption declines substantially from 365 ktoe (81% of the sectoral FEC) to 262 ktoe (71.0%), reflecting the impact of clean cooking initiatives and improved access to modern energy carriers. Charcoal use increases moderately from 62 ktoe (14%) to 70 ktoe (19.0%), used mainly in clean cooking devices. Over the same period, electricity use rises from 15 ktoe (3.0%) to 22 ktoe (6.0%), and LPG consumption more than doubles from 5 ktoe (1.0%) to 13 ktoe (3.5%). Kerosene, once used for lighting and cooking in households, drops to a marginal level of just 1 ktoe (0.2%) and remains constant thereafter.

In the medium term (2030–2040), these trends continue. Wood use stabilises around 253 ktoe (62.5%), while charcoal reaches 84 ktoe (20.7%), highlighting continued reliance on traditional fuels among a portion of the population, but used in clean cooking devices. Electricity consumption increases to 42 ktoe (10.4%) and LPG rises to 25 ktoe (6.2%), confirming their growing importance in meeting household energy needs.

In the long term (2040–2063), the modernisation of household energy consumption becomes more pronounced. Electricity use climbs steadily to 151 ktoe (27.9%) by 2063, while LPG reaches 79 ktoe (14.6%). This reflects both wider electrification and complete adoption of clean cooking solutions, especially in urban areas. Meanwhile, wood continues its decline to 183 ktoe (33.8%), and charcoal reaches 128 ktoe (23.7%) by 2063. These patterns signal a gradual but persistent shift towards cleaner fuels, and biomass used in clean cooking devices.

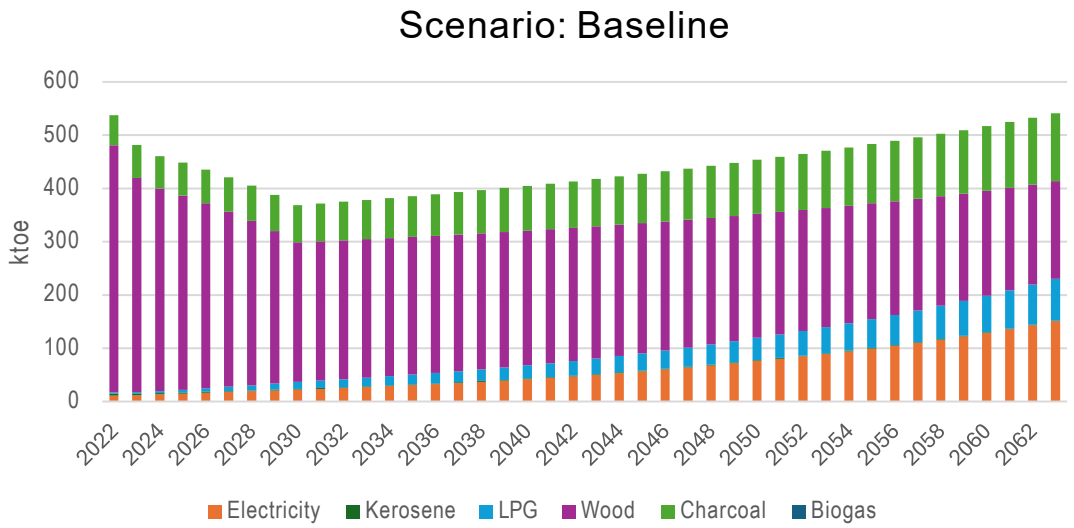



*Figure 12 : Projections of **Final Energy Consumption per fuel** in **Households** for the Baseline.*

**Transport sector by energy fuel/source**

Final energy consumption in The Gambia's transport sector is projected to grow rapidly across the time horizon, remaining entirely dependent on fossil fuels in the Baseline projections.

In the short term (2025–2030), diesel dominates the sector, increasing from 77 ktoe (78.6% of sectoral FEC) to 104 ktoe (79.4% of sectoral FEC), reflecting its use in freight, commercial vehicles, and public transport. Gasoline consumption also rises steadily from 22 ktoe (22.4%) to 27 ktoe (20.6%), driven primarily by private light-duty vehicles. No electrification or use of alternative fuels is observed during this period.

In the medium term (2030–2040), diesel use increases from 104 ktoe (79.4%) to 191 ktoe (81.6%), continuing to account for the vast majority of transport energy needs. Gasoline consumption also grows steadily to 43 ktoe (18.4%) by 2040. The lack of any measurable shift toward electric mobility or low-carbon fuels underscores the continued lock-in to petroleum products and the sector's growing exposure to international fuel market volatility.

In the long term (2040–2063), transport energy demand more than triples, with diesel rising from 191 ktoe (81.6%) to 674 ktoe (83.7%) by 2063. Gasoline follows a similar trend, increasing from 43 ktoe (18.4%) to 130 ktoe (16.1%). This trajectory reflects both an expanding vehicle fleet and structural inertia in fuel supply systems and highlights the need for policy interventions to promote fuel efficiency, modal shifts, and zero-emission vehicle uptake in order to align the transport sector with long-term sustainability and decarbonisation goals..



**Industry sector by energy Fuel/source**

Final energy consumption in The Gambia's industrial sector is projected to grow steadily across all timeframes, with the sector remaining entirely reliant on fossil fuels and electricity.

In the short term (2025–2030), diesel remains the dominant fuel, increasing from 49 ktoe (54.4% of sectoral FEC) to 57 ktoe (54.8%), driven by demand for thermal energy in manufacturing and construction. HFO grows slowly from 26 ktoe (28.9%) to 30 ktoe (28.8%), while electricity use remains modest, rising incrementally from 4 ktoe (4.4%) to 5 ktoe (4.8%). Gasoline use remains flat at around 11–13 ktoe (12.2–12.5%), typically linked to light machinery or internal transport.

In the medium term (2030–2040), diesel use continues to grow, reaching 75 ktoe (54.3%) by 2040. HFO rises to 39 ktoe (28.3%), and electricity consumption increases to 6 ktoe (4.3%), but its share remains low, indicating limited electrification of industrial processes. Gasoline consumption increases gradually to 17 ktoe (12.3%) by 2040. The absence of LPG, or any renewable fuels indicates that the sector remains locked into high-emission fuel pathways.

In the long term (2040–2063), all existing fuel trends continue. Diesel consumption rises to 141 ktoe (54.4%) by 2063, HFO to 74 ktoe (28.6%), and gasoline to 32 ktoe (12.4%). Electricity reaches 12 ktoe (4.6%) but still represents a small share of the sector's total energy mix. The continued dominance of liquid fossil fuels underscores the sector's carbon intensity and signals a key opportunity for future energy efficiency improvements and industrial decarbonisation strategies.

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### Electricity generation

Electricity generation in The Gambia under the baseline scenario shows a gradual transition from exclusive reliance on heavy fuel oil (HFO) towards a more diversified mix that incorporates solar, hydro, and limited wind power over time (Figure 13).

In the short term (2025–2030), generation is based on the existing thermal HFO plants (after Karpower stops operation). HFO-based units (Kotu, Brikama I, II, and III) together account for less than 0.1 TWh per year. Renewable contribution during this period is increasing, with Jambur Solar PV and new solar PV installations beginning to appear from 2024 onwards, reaching 0.24 TWh by 2030. Sambangalou hydro and new wind also enter in operation by the end of the decade.

In the medium term (2030–2040), the renewable share increases substantially. Solar PV grows from 0.21 TWh in 2030 to 0.38 TWh by 2040, becoming the fastest-growing contributor to the generation mix. Existing HFO plants continue to operate at low but consistent levels. Sambangalou hydro stabilises at 0.04–0.05 TWh, and wind contributes 0.01 TWh annually. Notably, a new HFO unit is introduced in 2040, adding 0.08 TWh and gradually ramping up in subsequent years. By 2040, fossil fuels still dominate, but the share of solar and hydro reaches over 70% of total domestic generation.

In the long term (2040–2063), renewable electricity generation continues to expand. New solar PV becomes the leading generation source, rising to 0.93 TWh by 2063, making up more than 70% of total domestic generation. HFO plants retain a smaller but stable role, together contributing under 0.3 TWh by 2063. Sambangalou hydro holds steady at 0.06 TWh, while wind contribution remains constant. By the end of the analysis horizon, total generation reaches 1.3 TWh, with solar as the cornerstone of the national electricity mix, signalling a long-term shift towards decarbonisation. However, the continued presence of fossil fuel units, including a newly commissioned plant points to challenges in phasing out fossil fuels entirely.

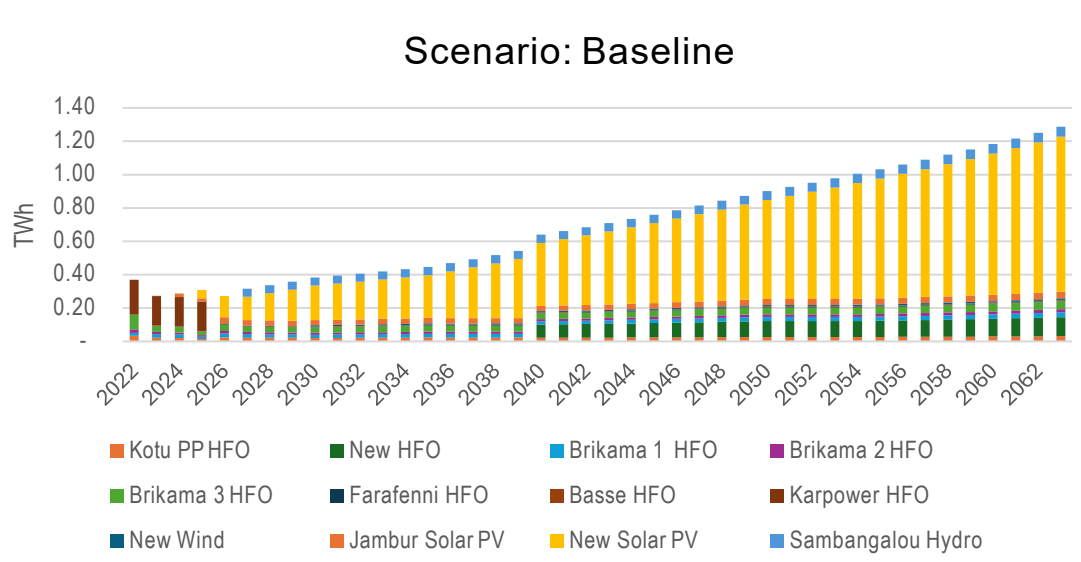



*Figure 13 : Projections of electricity generation per technology in the Baseline scenario*

The evolution of installed electricity generation capacity reveals a gradual but decisive shift from a fossil fuel-dominated system to one increasingly powered by solar and hydro resources (Figure 14).

In the short term (2025–2030), installed capacity expands significantly from 180 MW in 2025 to 262 MW by 2030. This growth is primarily driven by the commissioning of new utility-scale solar PV, increasing to 130 MW by 2030, including the Jambur Solar PV plant (23 MW) and phased additions of new solar facilities. Legacy HFO-based plants, including Kotu, Brikama I–III, and Farafenni maintain their cumulative contribution of roughly 68 MW nominal capacity, unchanged throughout the decade, indicating a stable fossil-fuelled base.

In the medium term (2030–2040), capacity increases further to 409 MW. This growth is again dominated by solar PV, which rises from 143 MW to 273 MW. Sambangalou Hydro, comes online from 2027 onward and remains constant. Wind capacity is introduced in 2030 at a modest 4 MW and remains static. A new HFO plant adds 40 MW from 2040, contributing to capacity expansion but also maintaining fossil generation in the mix. By 2040, over 70% of total installed capacity is non-fossil, reflecting a major structural shift in system design.

In the long term (2040–2063), total installed capacity nearly doubles again, reaching 659 MW by 2063. Solar PV continues to dominate expansion, increasing steadily to 523 MW by 2063. The 40 MW New HFO unit and other legacy plants remain in the system, though their relative share declines. Sambangalou Hydro and wind capacities remain constant. The absence of gas, storage, or additional hydro development suggests a system still relying on inflexible thermal backup despite a solar-heavy generation profile.

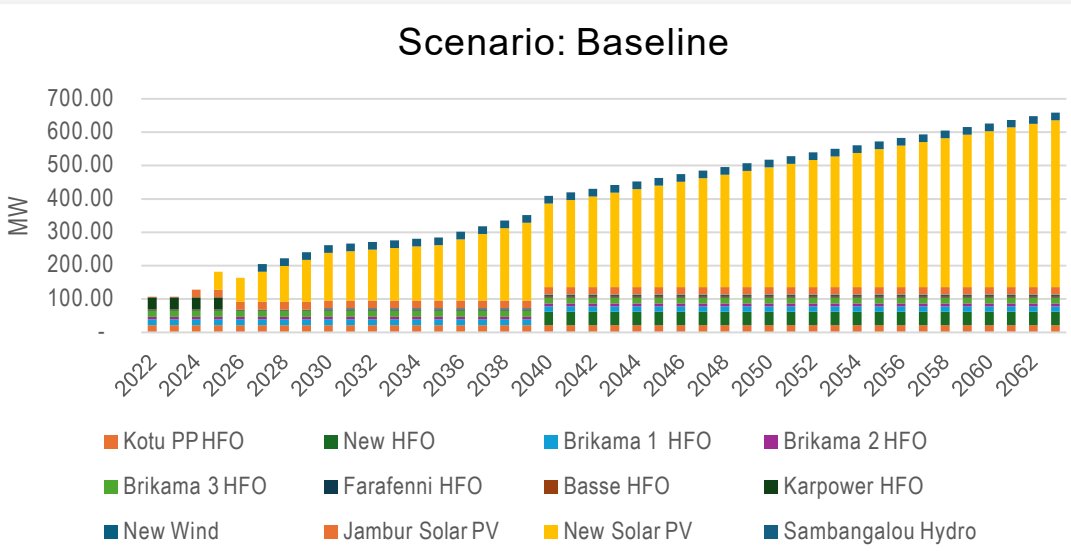



*Figure 14 : Projections of on-grid electricity capacity, Baseline scenario.*

**Energy related GHG emissions (energy combustion activities)**

Greenhouse gas (GHG) emissions from the energy sector in The Gambia are projected to rise steadily and significantly under the baseline scenario, driven by increasing energy demand and gradual expansion of fossil-based generation (Figure 15).

In the short term (2025–2030), total energy-related emissions remain stable (1,011 $ktCO_2eq$ to 994 $ktCO_2eq$). Emissions from the demand side (i.e. direct fuel use in transport, industry, buildings) rise from 760 $ktCO_2eq$ in 2025 to 900 $ktCO_2eq$ in 2030, a 18% increase. Transformation-related emissions, mainly from electricity generation, decline from 251 $ktCO_2eq$ in 2025 to 94 $ktCO_2eq$ in 2030, reflecting the decommissioning of Karpower, operational shifts in thermal plants and early contributions from solar PV.

In the medium term (2030–2040), emissions rise more sharply. Total energy emissions increase from 994 $ktCO_2eq$ to 1,523 $ktCO_2eq$ by 2040, an increase of 53%. Demand-side emissions account for most of this growth, reaching 1,365 $ktCO_2eq$ by 2040 (up 80% from 2025), driven by expanding fossil fuel use in transport and industry. Meanwhile, transformation emissions rise slightly to 158 $ktCO_2eq$ by 2040, picking up from previous reductions as thermal generation persists alongside renewables, including a newly commissioned 40 MW HFO-based plant.

In the long term (2040–2063), energy-related emissions more than double, rising from 1,523 $ktCO_2eq$ in 2040 to 3,905 $ktCO_2eq$ by 2063, an increase of nearly 156%. This surge is driven almost entirely by demand-side emissions, which reach 3,677 $ktCO_2eq$ by 2063, almost five times the 2025 level. Transformation emissions plateau, remaining relatively stable at around 200–220 $ktCO_2eq$ from 2054 onwards, suggesting stagnant fossil-based electricity production despite growing renewable capacity.

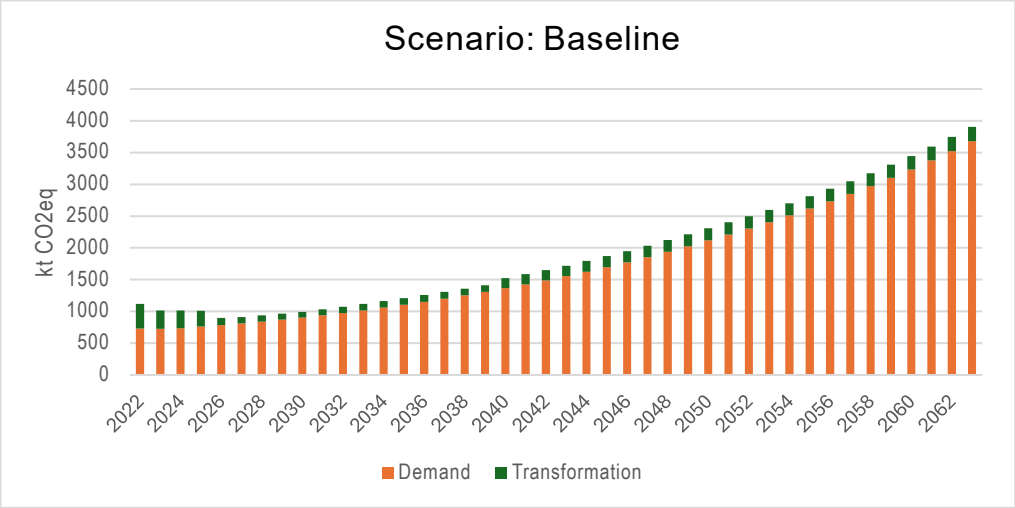



*Figure 15 : Projections of energy related GHG emissions from the demand sector and transformation (electricity generation) sectors.*

**GHG emissions by Demand sectors**

Greenhouse gas (GHG) emissions from the FEC sectors in The Gambia's energy system show a consistent upward trend across all end-use branches, with transport, industry, and household sectors contributing the majority of direct emissions throughout the projection period (Figure 16).

In the short term (2025–2030), total demand-side energy emissions rise from 760 $ktCO_2eq$ to 900 $ktCO_2eq$. Transport is the leading emitter in this period, increasing from 299 $ktCO_2eq$ (38.6% of demand side energy emissions) in 2025 to 400 $ktCO_2eq$ (44.4%) in 2030, driven by rapid growth in diesel and gasoline consumption. Industrial emissions grow from 262 $ktCO_2eq$ (33.8%) to 302 $ktCO_2eq$ (33.6%), while household emissions decline from 149 $ktCO_2eq$ (21.2%) to 141 $ktCO_2eq$ (15.7%), reflecting reductions in traditional biomass use and increased adoption of cleaner fuels like LPG and electricity. The services sector contributes modestly, rising from 50 $ktCO_2eq$ (6.5%) to 58 $ktCO_2eq$ (6.4%) by 2030.

In the medium term (2030–2040), demand-side emissions escalate significantly, reaching 1,365 $ktCO_2eq$ by 2040. Transport continues to dominate, rising from 400 $ktCO_2eq$ to 713 $ktCO_2eq$, increasing its share from 44.4% to 52.2% of demand side energy emissions. Industry contributes 401 $ktCO_2eq$ (29.4%) by 2040, while household emissions recover to 176 $ktCO_2eq$ (12.9%). Emissions from services also increase gradually to 76 $ktCO_2eq$ (5.6%).

In the long term (2040–2063), demand-side emissions more than double, reaching 3,677 $ktCO_2eq$ by 2063. Transport remains the principal source, contributing 2,454 $ktCO_2eq$ (66.7%), followed by industry at 753 $ktCO_2eq$ (20.5%) and households at 326 $ktCO_2eq$ (8.9%). Emissions from the services sector reach 144 $ktCO_2eq$ (3.9%) by 2063. Despite increasing electrification and clean cooking efforts, the slow pace of decarbonisation across transport and industrial energy use keeps the emissions trajectory strongly upward.

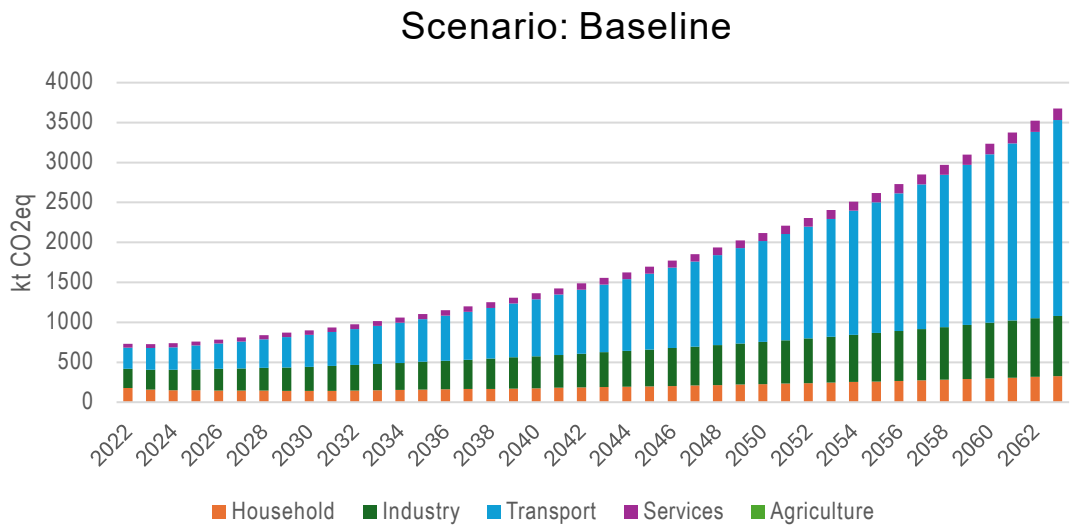



*Figure 16 : Projections of energy related GHG emissions from the final energy consumption sectors.*

**GHG emissions by Demand sectors**

Greenhouse gas (GHG) emissions from the FEC sectors in The Gambia's energy system show a consistent upward trend across all end-use branches, with transport, industry, and household sectors contributing the majority of direct emissions throughout the projection period (Figure 16).

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In the medium term (2030–2040), demand-side emissions escalate significantly, reaching 1,365 $ktCO_2eq$ by 2040. Transport continues to dominate, rising from 400 $ktCO_2eq$ to 713 $ktCO_2eq$, increasing its share from 44.4% to 52.2% of demand side energy emissions. Industry contributes 401 $ktCO_2eq$ (29.4%) by 2040, while household emissions recover to 176 $ktCO_2eq$ (12.9%). Emissions from services also increase gradually to 76 $ktCO_2eq$ (5.6%).

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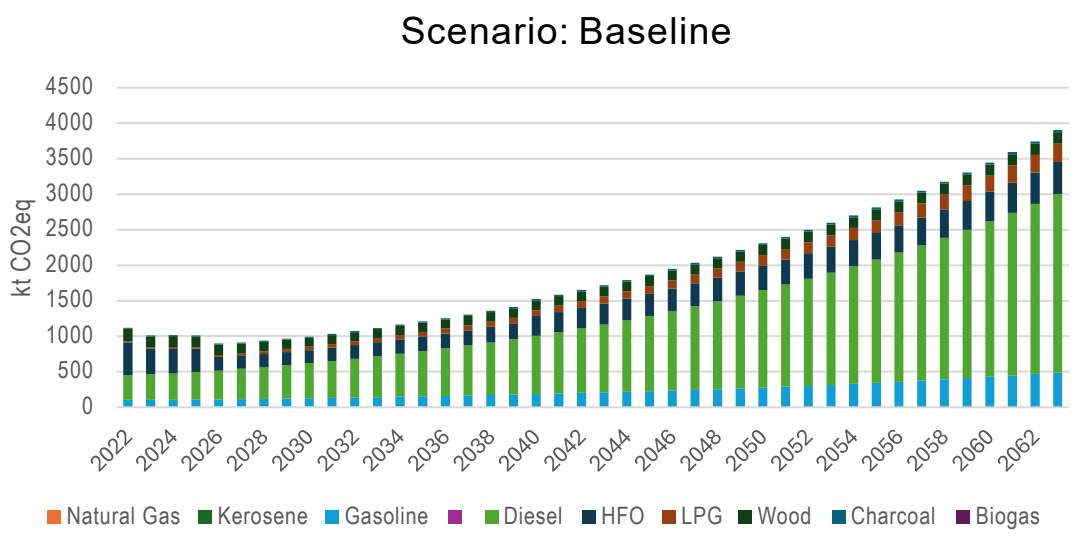



*Figure 17 : Projections of energy related GHG emissions per fuel used in demand and transformation sectors.*

**Key Baseline Scenario Conclusions**

The Baseline scenario for The Gambia projects an energy system shaped by increasing demand, and persistently high reliance on fossil fuels, even as electrification and access to clean cooking improve. Total final energy consumption (FEC) grows substantially over the projection horizon, from 769 ktoe in 2025 to 1,983 ktoe by 2063. Initially, household consumption dominates but its share declines rapidly due to a reduction in traditional biomass use, with transport emerging as the leading energy-consuming sector by 2040. Industrial and services demand also grow, reflecting an evolving economy with higher energy intensity and diversification.

A slow but visible transition from biomass to modern carriers is observed. Diesel becomes the dominant fuel across sectors, increasing more than sixfold by 2063. Electricity grows steadily but remains below 10% of total FEC by the end of the period. LPG shows moderate penetration, especially in households and services, while kerosene becomes negligible. Biomass (wood and charcoal) remains significant, especially in rural areas, highlighting a persistent urban-rural divide in the energy transition.

Sectoral analysis reveals varying patterns. Households experience a long-term shift towards electricity and LPG. Transport demand triples, remaining entirely dependent on diesel and gasoline, with no electrification or fuel diversification. Industry and services continue to rely heavily on diesel and HFO, with little evidence of low-carbon alternatives being introduced. Electricity generation begins with near-total dependence on HFO, but sees growing contributions from solar and hydro from 2025 onwards. By 2063, solar PV accounts for over 70% of total domestic generation, though legacy HFO plants and a new thermal unit remain online. Installed generation capacity grows more than sixfold from 2022 to 2063, driven almost entirely by solar PV and fossil thermal capacity continues to provide firm power throughout the period.

Energy-related GHG emissions increase sharply, rising from 1,011 $ktCO_2eq$ in 2025 to 3.905 $ktCO_2eq$ by 2063. The majority of this increase comes from direct fuel use in transport and industry. Diesel alone accounts for over 60% of emissions by the end of the period. Emissions from biomass decline but reflecting continued rural dependence. Emissions from the electricity transformation sector plateau around 200-220 $ktCO_2eq$ after 2040, with renewables containing emissions growth but not reversing it.

Overall, the Baseline scenario outlines an energy system undergoing expansion and partial modernisation, but remaining carbon-intensive and structurally dependent on liquid fossil fuels. While progress is made on access and renewables, the long-term sustainability and climate alignment of the energy system remain limited in the Baseline trajectory.

## 3.2. Deep Decarbonization Pathway

This section analyses the Deep Decarbonization Pathway, which explores how The Gambia can transition toward a low-carbon energy system aligned with long-term climate goals. This scenario models ambitious shifts in technology, fuel use, and sectoral transformation to significantly reduce greenhouse gas emissions by 2063. It builds on the Baseline scenario by incorporating targeted mitigation measures across all major energy-consuming sectors, as described in more detail in Chapter 4. Furthermore, a more ambitious decarbonisation scenario is examined: DDP Longer Term (DDP LT) in which the mitigation actions are intensified after 2040, leading to a reduction in the total energy related emissions, after a peak in 2040. This is achieved through higher electrification in all sectors and the penetration of renewable electricity generation technologies to the full potential identified in The Gambia, including the penetration of hydrogen options in the hard to abate freight transportation.

More specifically, the main shift in the household sector comes from the change in the cooking appliances. The share of each appliance per type of household can be seen in Figure 18 for the DDP-LT scenario and is presented in more detail in Annex 1. Electric stoves are assumed to reach large shares in electrified homes, while the remaining is taken up by LPG stoves, biogas stoves and improved wood and charcoal stoves.

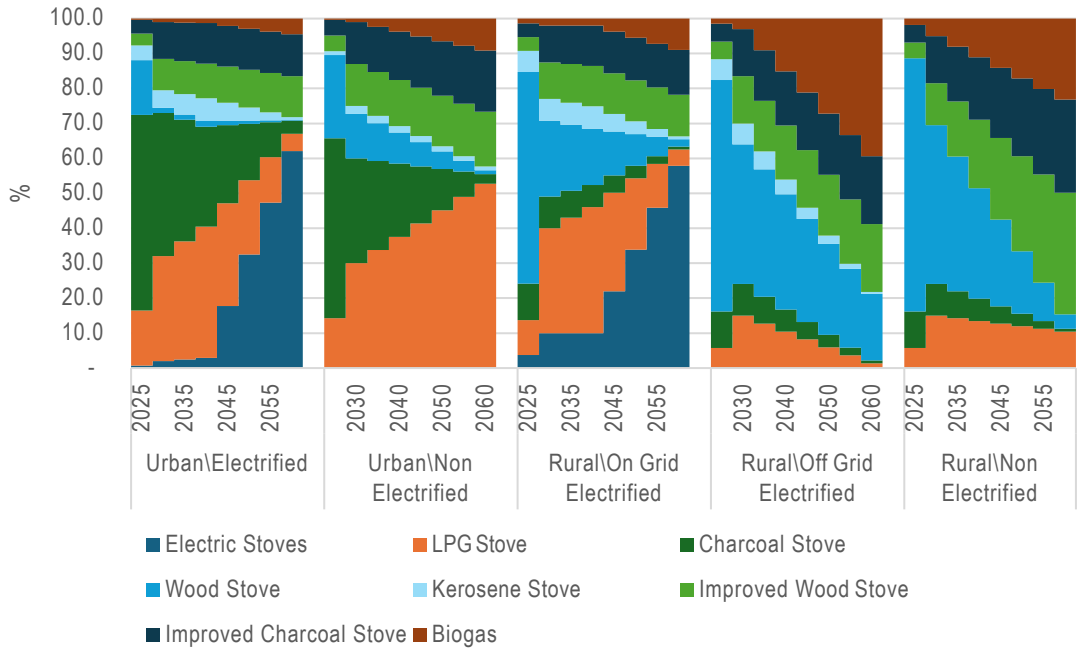



*Figure 18 : Shares of cooking appliances per household type in DDP LT scenario.*

In the transportation sector the assumptions for the penetration of electric vehicles are more aggressive in the DDP LT scenario compared to the DDP (Figure 19) leading to a full electrification of cars by 2050. Busses are assumed to be electrified completely in both DDP and DDP LT pathways by 2063 (Figure 20). Furthermore, 50% of freight vehicles are assumed to be electrified by 2063 in the DDP LT scenario, and the remaining 40% of heavy-duty freight vehicles is switching to hydrogen. In the DDP it is assumed that no electrification of freight road transport takes place.

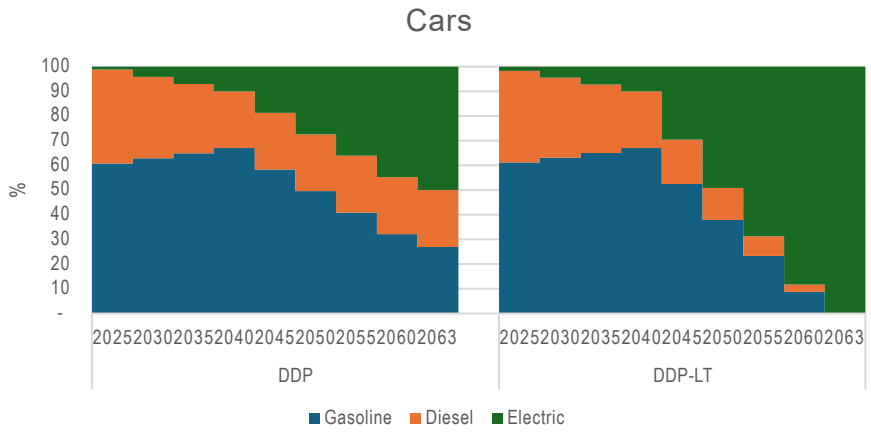



*Figure 19 : Shares of private cars per fuel in DDP scenarios.*

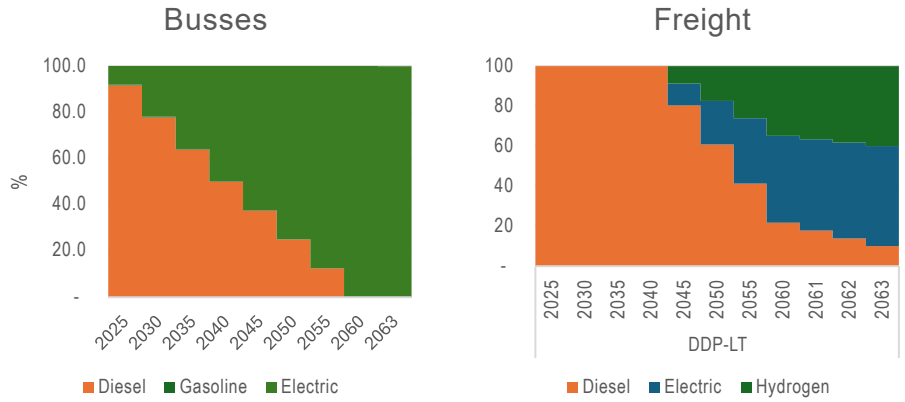



*Figure 20 : Shares of fuels for busses and road freight in DDP LT scenario.*

**Final Energy Consumption**

Final energy consumption (FEC) in the DDP and DDP LT scenarios diverges significantly over time, both in absolute volumes and in sectoral shares, reflecting the degree of ambition in demand-side transformation (Figure 21).

In the *DDP scenario,* FEC drops from 746 ktoe in 2025 to 659 ktoe in 2030 (a reduction of 12%), primarily due to a decline in household consumption from 433 ktoe to 307 ktoe, which reduces its share to the total FEC from 58% to 47%. Meanwhile, transport increases from 97 ktoe to 122 ktoe, raising its share from 13% to 18%, with similar upward trends in industry (from 88 to 93 ktoe, 12% to 14%) and services (from 128 to 137 ktoe, 17% to 21%).

Over the medium term (2030–2040), total FEC grows by 22%, reaching 804 ktoe, with transport accounting for 24% of demand, households 41%, services 21%, and industry 14%.

By 2063, total FEC reaches 1,441 ktoe, more than doubling from the 2030 level. Transport becomes the dominant sector at 534 ktoe (37.1%), followed by households at 461 ktoe (32.0%), services at 265 ktoe (18.4%), and industry at 181 ktoe (12.5%).

In the *DDP LT scenario*, which implements stronger mitigation measures and efficiency improvements, the contraction in energy use is deeper and more sustained. FEC drops from 746 ktoe in 2025 to 657 ktoe in 2030 (a 12% reduction), similar to DDP in absolute terms, but with slightly more pronounced declines in the household sector, which falls to 307 ktoe, reducing its share from 60% to 47%. Industry remains nearly flat (87 to 93 ktoe), while transport rises from 95 to 120 ktoe (from 10.6% to 18.3%), and services grow steadily (128 to 137 ktoe, or 14.6% to 20.9%).

In the medium term, total FEC reaches 816 ktoe in 2040, compared to 804 ktoe in DDP, but with the household sector already stabilised at 345 ktoe (42.3%).

Long-term trends show a decoupling of energy demand from economic activity since by 2063, total FEC reaches 1,240 ktoe, which is 14% lower than in the DDP scenario. Transport remains the largest sector at 493 ktoe (39.8%), followed by households at 320 ktoe (25.8%), services at 265 ktoe (21.4%), and industry at 163 ktoe (13.1%).

In summary, the DDP LT scenario achieves lower overall energy consumption across all sectors, particularly in households, through sustained electrification, and demand-side measures. The transport sector becomes the principal source of energy growth in both scenarios, though to a lesser extent under DDP LT. The combined impact of efficiency gains and fuel switching is evident in the slower FEC growth in DDP LT, rising by 89% between 2030 and 2063, compared to 119% in the DDP scenario.

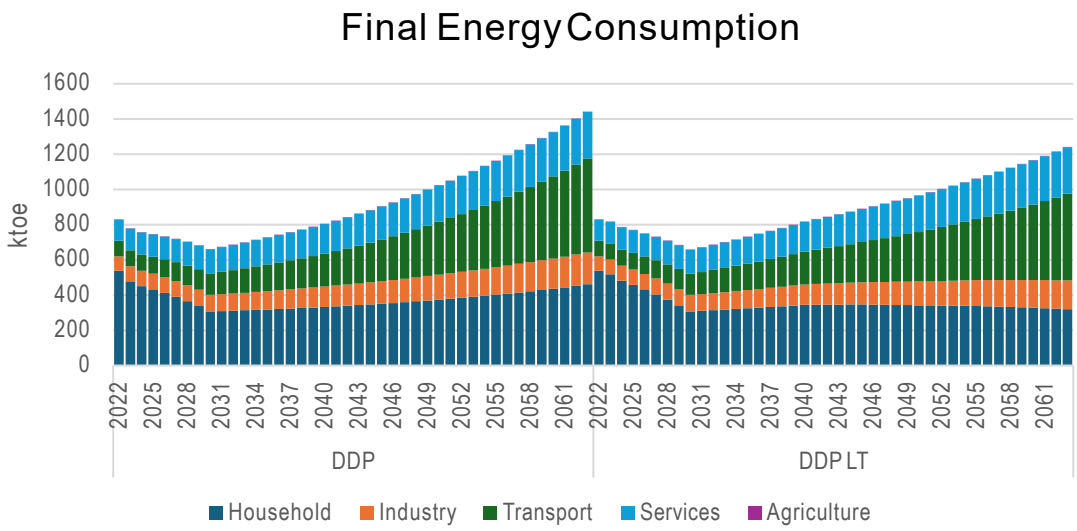



*Figure 21 : Projections of Final Energy Consumption per sector in the DDP scenarios.*

**FEC by Fuel**

Final energy consumption (FEC) by fuel in the DDP and DDP LT scenarios reveals two distinct pathways for The Gambia's energy transition (Figure 22).

Under the *DDP scenario*, traditional biomass remains present in the short term, with wood accounting for 320 ktoe (48.5% of total FEC) and charcoal for 79 ktoe (12.0%) in 2030. However, this reliance gradually declines, since by 2063, wood and charcoal contribute 429 ktoe (30.2%) and 71 ktoe (5.0%) respectively. Diesel remains a key fuel throughout the horizon, rising from 113 ktoe in 2022 to 181 ktoe in 2063, though its share drops from 13.6% to 12.6%. Electricity expands significantly, from 16 ktoe in 2022 to 562 ktoe by 2063, comprising 40.0% of total FEC, the highest share among all fuels. LPG grows modestly but steadily, reaching 89 ktoe (6.2%), while kerosene and gasoline remain minor. Biogas, introduced after 2025, reaches 4 ktoe by 2063, and hydrogen is not present. Overall, DDP delivers strong electrification gains and biomass reduction, yet diesel remains entrenched due to continued transport and industry reliance.

The *DDP LT scenario* achieves a more ambitious shift. By 2030, wood and charcoal are already down to 320 ktoe (48.7%) and 79 ktoe (12.0%), but unlike DDP, their absolute levels begin declining shortly after. By 2063, wood falls to 206 ktoe (16.6%) and charcoal to 42 ktoe (3.4%), with a combined share of just 20%. Electricity, on the other hand, increases even more dramatically, reaching 909 ktoe by 2063 (73.3%), displacing both fossil and biomass fuels across all sectors. Diesel declines significantly from 113 ktoe in 2022 to just 6 ktoe by 2063, and gasoline is completely phased out. LPG peaks at 36 ktoe (2.9%), slightly lower than in DDP, while hydrogen emerges after 2040 and reaches 36 ktoe by 2063, accounting for 2.9% of total demand.

Biogas grows slowly to 10 ktoe. This scenario demonstrates a near-complete electrification of end-uses, coupled with a deep decarbonisation of the fuel mix, reducing fossil fuel use to marginal levels and transitioning decisively to zero-carbon carriers.

In summary, electricity becomes the dominant energy vector in both scenarios, but its share is vastly higher in DDP LT. DDP maintains a more fossil-heavy and biomass-supported energy system, while DDP LT achieves structural transformation after 2040 through widespread electrification and early-stage hydrogen integration after 2040.

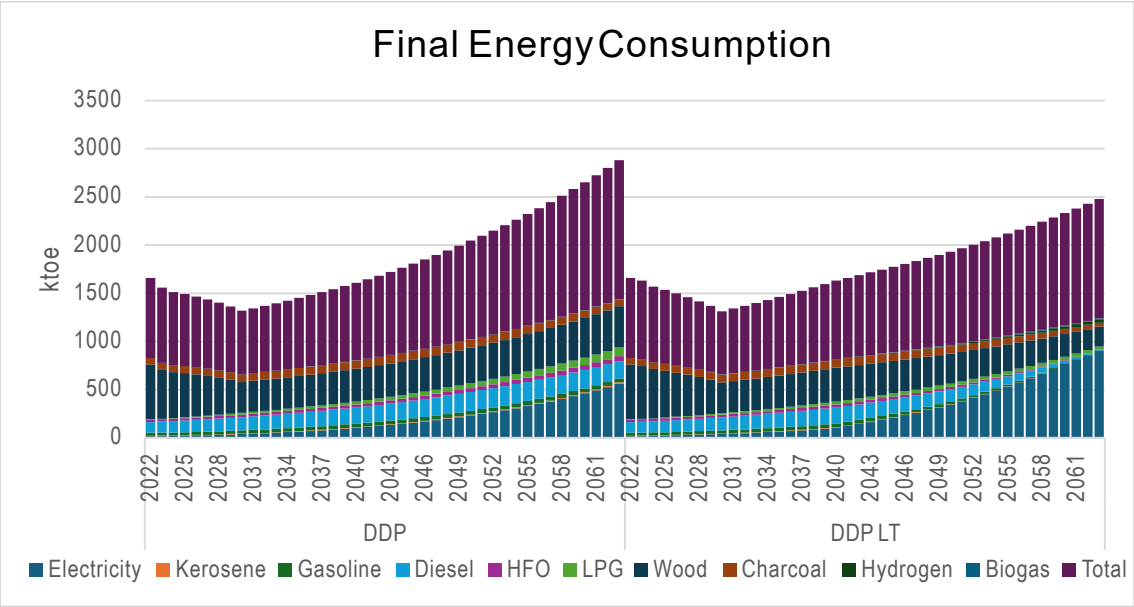



*Figure 22 : Projections of Final Energy Consumption per fuel in the DDP scenarios.*

**FEC by sector and fuel**

In both the *DDP and DDP LT scenarios*, the household sector undergoes a major transformation, primarily through reduced reliance on traditional biomass and increased uptake of electricity and LPG (Figure 23). In the short term (2025–2030), household final energy consumption (FEC) declines markedly—from 433 ktoe to 307 ktoe in DDP and from 458 ktoe to the same 307 ktoe in DDP LT, driven by clean cooking interventions and improved energy efficiency. Wood, while still dominant, drops significantly in both scenarios, falling to 202 ktoe by 2030. Meanwhile, electricity use rises steadily to 21 ktoe and LPG consumption increases from 5 ktoe to 15 ktoe in DDP and DDP LT alike.

In the medium term (2030–2040), DDP sees household FEC rebound to 333 ktoe, and 345 ktoe in DDP LT with electrification continuing to expand. By 2063, total household FEC grows to 461 ktoe in DDP and much lower at 320 ktoe in DDP LT. Notably, in DDP, electricity reaches 117 ktoe and LPG 85 ktoe, while biomass (wood and charcoal) still accounts for nearly 54% of household demand, utilised in clean devices. In DDP LT, electricity dominates at 112 ktoe, while LPG is phased down to just 2 ktoe and biomass drops to 199 ktoe. Biogas appears in both scenarios but remains relatively low 4 ktoe in DDP and 10 ktoe in DDP LT by 2063.

Biogas grows slowly to 10 ktoe. This scenario demonstrates a near-complete electrification of end-uses, coupled with a deep decarbonisation of the fuel mix, reducing fossil fuel use to marginal levels and transitioning decisively to zero-carbon carriers.

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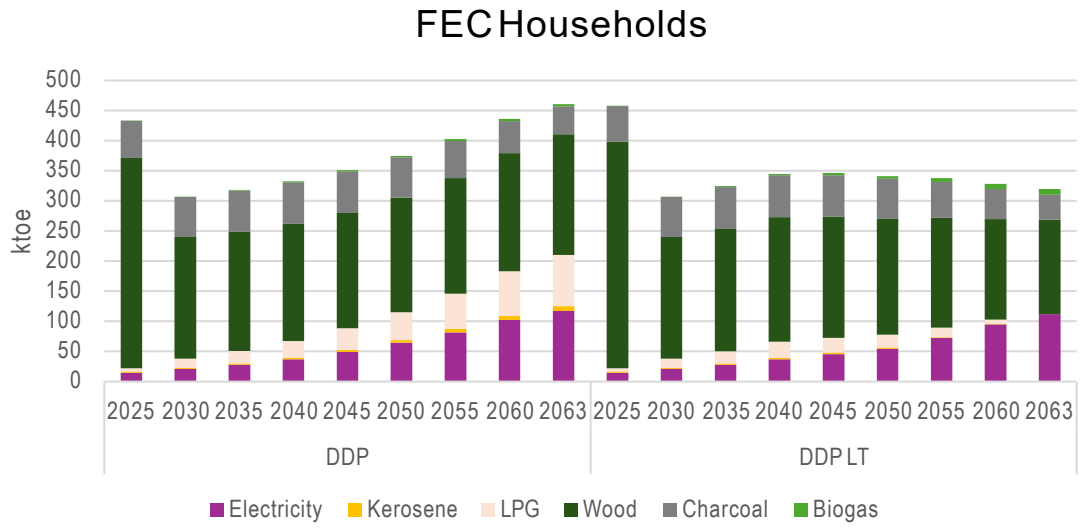



*Figure 23 : Projections of Final Energy Consumption per fuel in households in the DDP scenarios.*

Industrial energy use in both scenarios remains modest in size but undergoes important shifts in its fuel structure (Figure 24). In the short term, total FEC grows from 88 ktoe in 2025 to 93 ktoe by 2030 in DDP and from 88 ktoe to 93 ktoe in DDP LT, with diesel and HFO being the primary fuels. Diesel increases from 48 ktoe to 51 ktoe in DDP, and slightly less in DDP LT. Electricity remains flat at 4 ktoe.

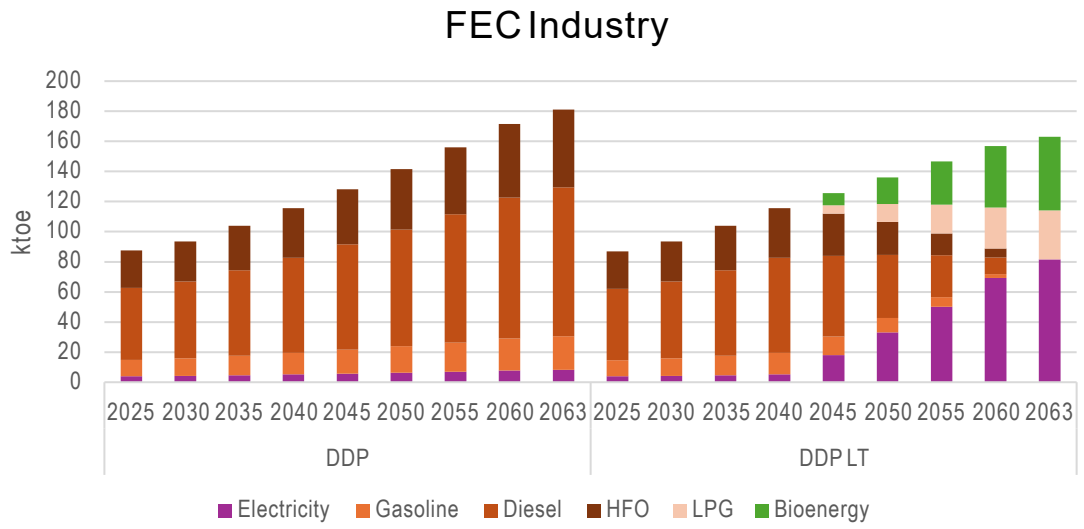



*Figure 24 : Projections of Final Energy Consumption per fuel in industry in the DDP scenarios.*

Over the medium term (2030–2040), total industrial consumption rises to 116 ktoe in both pathways. However, in DDP LT, the sector sees early diversification. Diesel peaks at 63 ktoe in 2040 in DDP, while in DDP LT it also reaches 63 ktoe but begins to decline immediately thereafter. By 2063, total industrial consumption is 181 ktoe in DDP and 163 ktoe in DDP LT. Electricity reaches 8 ktoe in DDP and climbs significantly to 82 ktoe in DDP LT, representing over 50% of total industrial energy use in the long term. Meanwhile, HFO in DDP LT is phased out by 2063, and LPG and wood become relevant only in the LT pathway, accounting jointly for 82 ktoe in 2063, reflecting a broadening of the fuel mix under strong decarbonisation efforts.

Transport FEC rises steadily in both scenarios, but with fundamentally different fuel trajectories (Figure 25). In DDP, total demand increases from 97 ktoe in 2025 to 122 ktoe in 2030, dominated by diesel (87 ktoe) and gasoline (23 ktoe). Electricity is marginal at 13 ktoe in 2030.

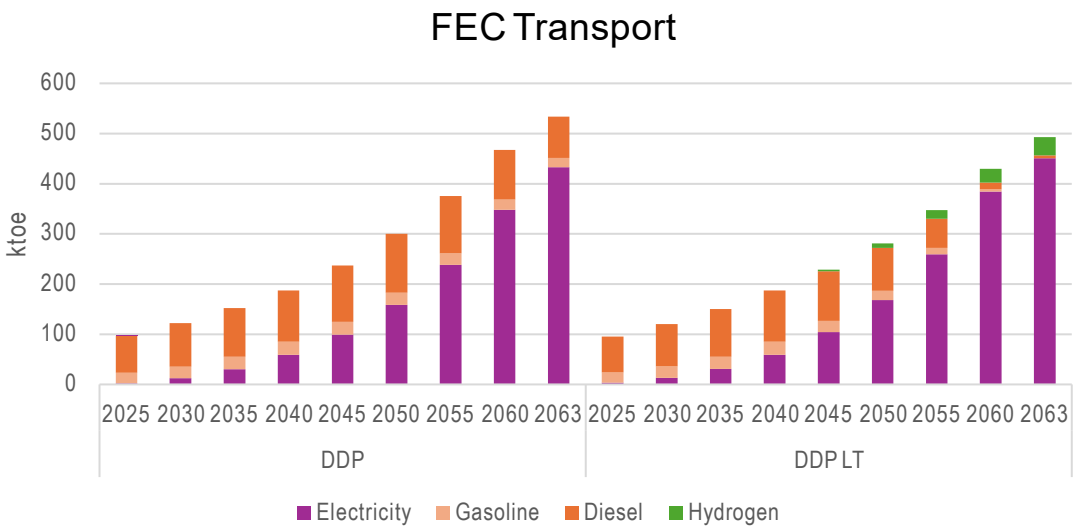



*Figure 25 : Projections of Final Energy Consumption per fuel in transport in the DDP scenarios.*

Over the medium term (2030-2040), transport consumption reaches 187 ktoe by 2040, with diesel accounting for over 102 ktoe and electricity 59 ktoe. By 2063, DDP sees transport energy demand more than double to 534 ktoe, still dominated by diesel at 82 ktoe, gasoline at 18 ktoe, and electricity at 433 ktoe, accounting for 81.1% of sectoral consumption. The DDP LT pathway, however, reflects a deeper transformation since by 2040, diesel begins to plateau and electricity rises rapidly. From 13 ktoe in 2030, electricity reaches 59 ktoe in 2040 and 451 ktoe by 2063, making up over 91.5% of transport demand. Diesel and gasoline are nearly eliminated in DDP LT by the 2060s, and hydrogen enters meaningfully post-2040, reaching 36 ktoe (7.3%) by 2063, confirming DDP LT's structural commitment to transport decarbonisation.

The services sector exhibits steady but moderate growth in energy consumption across both scenarios, rising from 128 ktoe in 2025 to 169 ktoe by 2040. Wood remains the primary fuel in both scenarios during the early period, contributing over 85% of FEC. In DDP, the sector remains biomass-dependent even by 2063, with wood at 228 ktoe and charcoal at 25 ktoe out of a total 265 ktoe. Modern fuels see slow increases as electricity grows from 2 ktoe to 3 ktoe by 2063. LPG and kerosene remain around 4 ktoe each. Conversely, in DDP LT, a more decisive transformation takes place after 2040. Electricity jumps from 2 ktoe to 265 ktoe by 2063, accounting for the entirety of energy consumption in the sector. Wood and charcoal are phased out entirely, and both LPG and kerosene drop to zero. This reflects a scenario in which electrification of all public and commercial services is achieved. The DDP LT pathway thus exemplifies a complete energy transition for the services sector by 2063.

**Electricity generation**

Electricity generation in The Gambia under the DDP and DDP LT scenarios both show marked growth and diversification through 2063, but the speed and structure of the transition are significantly different (Figure 26).

In the DDP scenario, total electricity generation grows from 0.29 TWh in 2024 to 3.3 TWh by 2063, a nearly tenfold increase. New solar PV capacity enters gradually from 2025, with generation growing from 0.05 TWh to 2.89 TWh by 2063, ultimately contributing over 85% of total generation. Sambangalou Hydro, starting from 2027, stabilizes at about 0.16 TWh, while new wind and Jambur Solar PV contribute to the generation. Despite the strong rise of renewables, fossil thermal plants, including legacy HFO units and a new Gas CCGT (entering in 2040 at 0.10 TWh), still contribute roughly 0.3 TWh by 2063, around 9% of the generation mix.

In contrast, under the DDP LT scenario, the transformation is more rapid and aggressive. Total electricity generation increases from 0.29 TWh in 2025 to 5.6 TWh by 2063, which is 67% higher than under DDP, to support extensive electrification. A key difference is the early phase-out of HFO plants, with most reduced to negligible contributions after 2027. The renewable trajectory is accelerated as new solar PV begins earlier and grows to 4.74 TWh by 2063, contributing over 85% of electricity generation. Moreover, new wind energy, expands substantially from 2048 onwards, reaching 0.46 TWh (almost 8%) by 2063. Sambangalou Hydro retains a similar contribution as in DDP, and Gas CCGT ramps up to 0.16 TWh (about 3% of the total generation).

Overall, the DDP LT pathway portrays a more decisive shift away from fossil generation. Solar PV becomes the undisputed backbone of the energy system by mid-century, supported by modest hydro and wind integration. Compared to DDP, which sustains fossil-based generation, the DDP LT scenario achieves deeper decarbonisation earlier, reflecting stronger climate policy ambition and greater

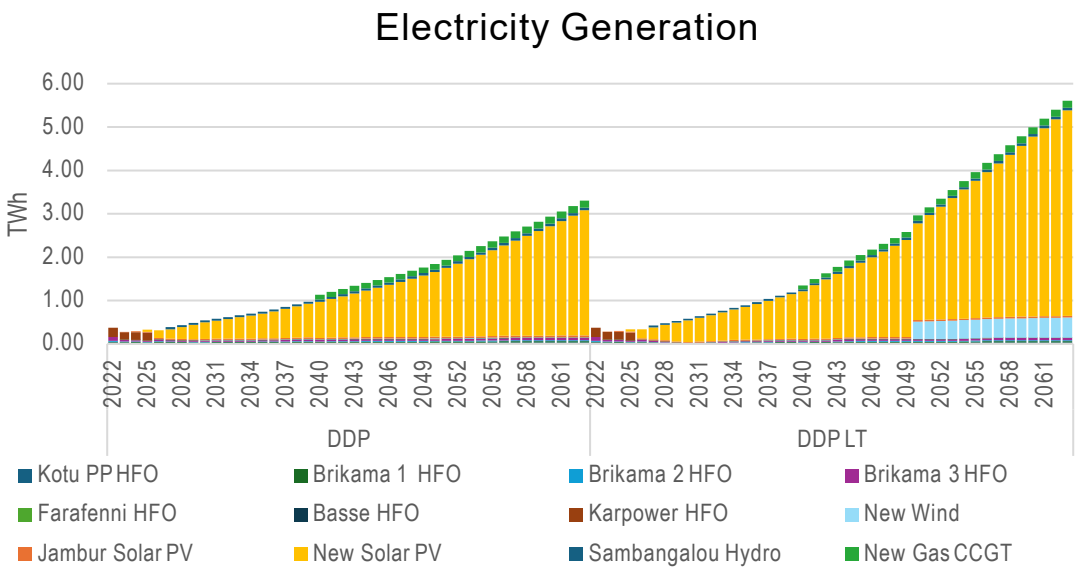



*Figure 26 : Projections of electricity generation per technology, DDP scenarios.*

The evolution of installed capacity in the electricity sector under the DDP and DDP LT scenarios supports the distinct structural pathways seen in the electricity generation, both of which reflect significant expansion but with diverging technological priorities and speed (Figure 27).

In the DDP scenario, total capacity rises from 182 MW in 2025 to 1,659 MW by 2063, with most of the growth attributed to solar PV, which scales from 23MW in 2025 to 1,500 MW by 2063. The area needed for the installation of 1.5GW of solar PV is estimated at 60km2 (approximately 0.6% of the total land area of the country). The roll-out begins in 2025 and accelerates steadily, with continuous annual additions of approximately 50 MW post-2040. The Sambangalou Hydro plant enters in 2027 and remains constant throughout the period, while wind capacity enters modestly in 2030 with a static contribution of 4 MW. Legacy HFO-based plants (Kotu, Brikama I–III, Farafenni, Basse) maintain their combined capacity of about 68 MW, indicating continued backup or base-load reliance. A new Gas CCGT plant adds 40 MW in 2040. Overall, by 2063, non-fossil capacity comprises over 90%, but a significant fossil share persists.

Under the DDP LT scenario, the scale-up is faster and deeper. Installed capacity grows from 182 MW in 2025 to 2,852 MW by 2063, almost 70% higher than under DDP. The growth is overwhelmingly driven by solar PV, which reaches 2,500 MW by 2063, 1,000 MW more than in DDP. This capacity would require an area of 100km2, corresponding to roughly 1% of the land area of the country, using current technology details which are likely to change in the future leading to much lower area requirements. The rollout of RES starts earlier (from 2025) and is more aggressive, with annual additions accelerating beyond 2040. Importantly, wind capacity expands, increasing from 4 MW to 197 MW by 2049, and remains at that level thereafter. While the same legacy HFO plants remain on the system, their role diminishes in terms of share. Thermal additions are limited to the 40 MW Gas CCGT entering in 2040. By 2063, the share of non-fossil technologies reaches 95%, signifying a nearly full transition to renewable generation capacity.

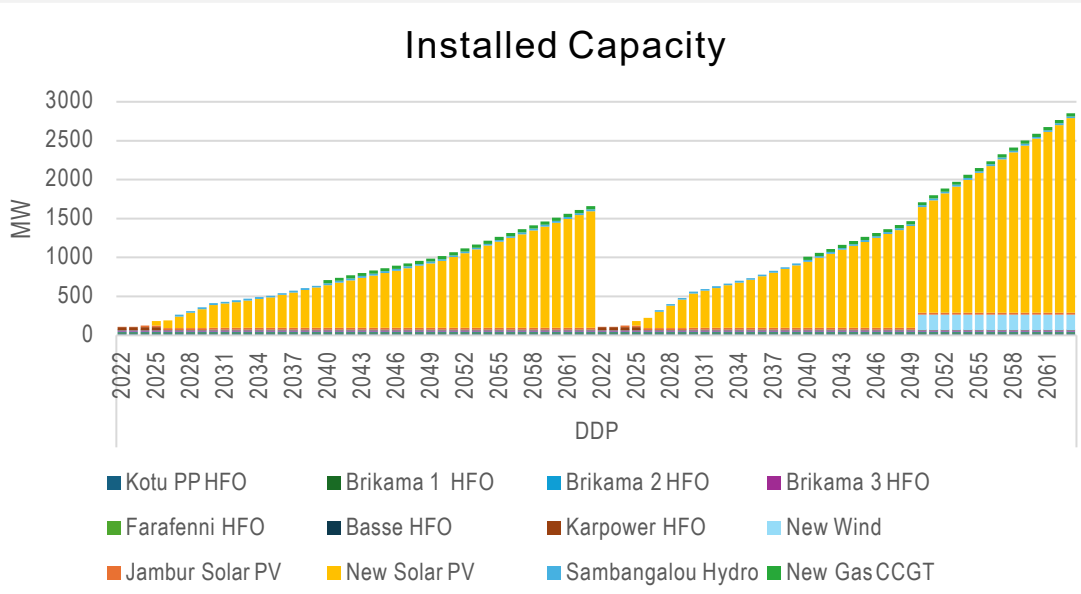



*Figure 27 : Projections of on-grid electricity capacity, DDP scenarios.*

**Energy related GHG emissions**

During the short-term period (2025 – 2030) in the DDP scenario, total emissions stabilise (Figure 28) from 1,006 $ktCO_2eq$ in 2025 to 868 $ktCO_2eq$ by 2030. Demand-side emissions rise from 735 $ktCO_2eq$ to 785 $ktCO_2eq$ (+7%), while emissions from the transformation sector reduce considerably due to the decommissioning of Karpower plant, from 271 $ktCO_2eq$ to 83 $ktCO_2eq$. This indicates the continuation of fossil fuel use in households and transport, with limited early decarbonisation or fuel-switching measures in place.

By contrast, the DDP LT scenario initiates a divergence. Total emissions decline from 1,011 $ktCO_2eq$ in 2025 to 792$ktCO_2eq$ in 2030, but crucially, demand-side emissions plateau (from 734 $ktCO_2eq$ to 777 $ktCO_2eq$, +6%), and the transformation sector's emissions reduce significantly (from 277 $ktCO_2eq$ to 15 $ktCO_2eq$). This is driven by early penetration of renewables, the decommissioning of Karpower and partial fuel substitutions in households and transport, reflecting the onset of structural change even before large-scale system transformation occurs.

During the medium term, the contrast becomes more pronounced. In the DDP scenario, total GHG emissions rise from 868 $ktCO_2eq$ to 1,107 $ktCO_2eq$ (+27%). Demand-side emissions increase by 172 $ktCO_2eq$ to reach 957 $ktCO_2eq$ by 2040, driven by continued reliance on diesel and growing activity in the transport and industry sectors. The transformation sector contributes an additional 67 $ktCO_2eq$, growing from 83 to 150 $ktCO_2eq$ as HFO-based generation continues and the new gas fired plant is in operation, despite growing renewable capacity.

In the DDP LT scenario, emissions peak around 2040 at 1,077 $ktCO_2eq$, but the growth rate is more contained at +36% from 792 $ktCO_2eq$ in 2030. Importantly, this is the absolute peak year for emissions in DDP LT. Demand-side emissions rise more slowly (+23%, from 777 to 958 $ktCO_2eq$), and transformation emissions increase only modestly (+104 $ktCO_2eq$ to 119 $ktCO_2eq$). This suggests a successful decoupling of economic activity from emissions intensity, with renewable power generation scaling up significantly and clean fuels beginning to replace oil products.

From 2040 onward, the DDP scenario enters a moderate trajectory, with total emissions rising from 1,107 $ktCO_2eq$ to 1,507 $ktCO_2eq$ by 2063 (+36%). Demand-side emissions rise from 957 $ktCO_2eq$ to 1,293 $ktCO_2eq$ (+35%), with transport and household sectors remaining dominant emitters due to persistent diesel usage. Transformation emissions plateau at 214 $ktCO_2eq$, since no major fossil-based capacity is added.

In contrast, DDP LT enters a deep decarbonisation phase post-2040, reducing total emissions from 1,077 $ktCO_2eq$ to 396 $ktCO_2eq$ by 2063, a 63% reduction. Demand-side emissions reduce from 958 $ktCO_2eq$ to 182 $ktCO_2eq$, an 81% drop, indicating near-complete fuel switching and electrification in buildings, transport, and industry. Emissions from the transformation sector remain constant at 214 $ktCO_2eq$, mainly from baseload capacity.

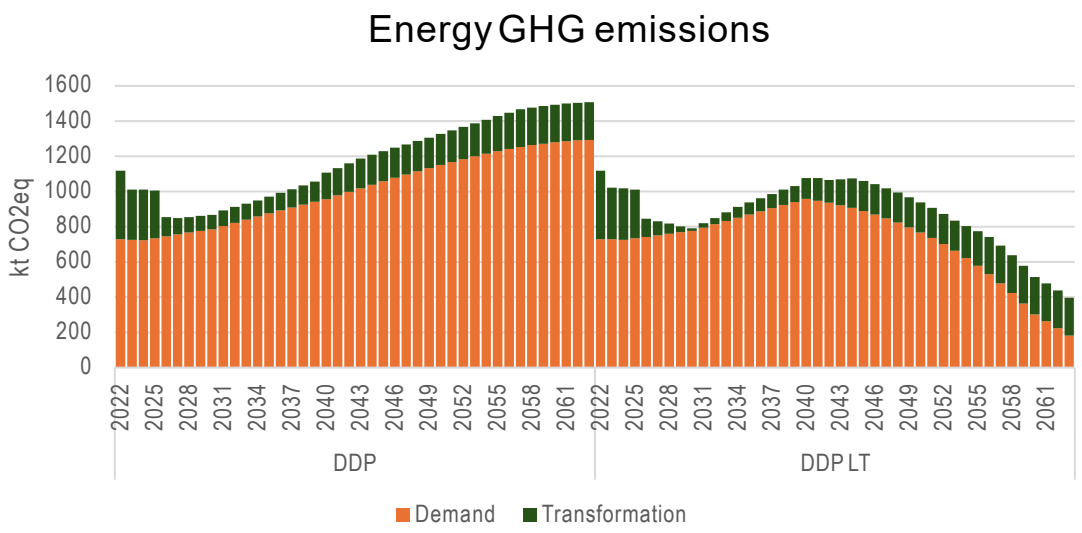



*Figure 28 : Projections of energy related GHG emissions from the demand sector and transformation (electricity generation) sectors.*

Over the short-term period (2025–2030), energy-related GHG emissions across final energy consumption (FEC) sectors in both scenarios show moderate but sectorally differentiated growth (Figure 29). Under the DDP scenario, emissions from FEC sectors rise from 735 $ktCO_2eq$ to 785 $ktCO_2eq$, with transport (+47 $ktCO_2eq$) and industry (+17 $ktCO_2eq$) driving most of the increase, while household emissions decline slightly (-16 $ktCO_2eq$) due to improved fuel access and early electrification. In DDP LT, emissions follow a near-identical path, rising from 730 $ktCO_2eq$ to 777 $ktCO_2eq$, though the household and service sectors already begin to decarbonise more visibly. Transport emissions grow by 44 $ktCO_2eq$, industry by 19 $ktCO_2eq$, but household emissions decrease marginally, and services stabilise, signalling earlier efficiency and clean fuel penetration.

In the medium term (2030–2040), the trajectories diverge significantly. DDP FEC sectors emissions grow from 785 $ktCO_2eq$ to 957 $ktCO_2eq$ (+22%), with nearly half of the absolute increase stemming from transport (from 333 to 389 $ktCO_2eq$). Industry and households also see steady increases (+64 $ktCO_2eq$ and +38 $ktCO_2eq$ respectively), reflecting continued biomass and oil use. Conversely, DDP LT emissions peak at 958 $ktCO_2eq$ in 2040, but with meaningful composition shifts since household emissions are flat, transport, services and industry emissions plateau. This suggests a plateauing of demand-side fossil dependency, setting the stage for deep reductions post-2040.

By the long-term (2040–2063), the split becomes clearer. Under DDP, total FEC sector emissions continue rising, reaching 1,293 $ktCO_2eq$ (+35% over 2040), with all sectors showing steady growth and transport emissions alone remain above 300 $ktCO_2eq$ through 2060. In sharp contrast, DDP LT achieves a deep decarbonisation, reducing FEC emissions by over 75% from 958 $ktCO_2eq$ in 2040 to 182 $ktCO_2eq$ by 2063. Sectoral emissions collapse across the board as households drop from 168 to 60 $ktCO_2eq$, industry from 336 to 104 $ktCO_2eq$, and transport from 389 to just 18 $ktCO_2eq$ and services reach zero by 2063.

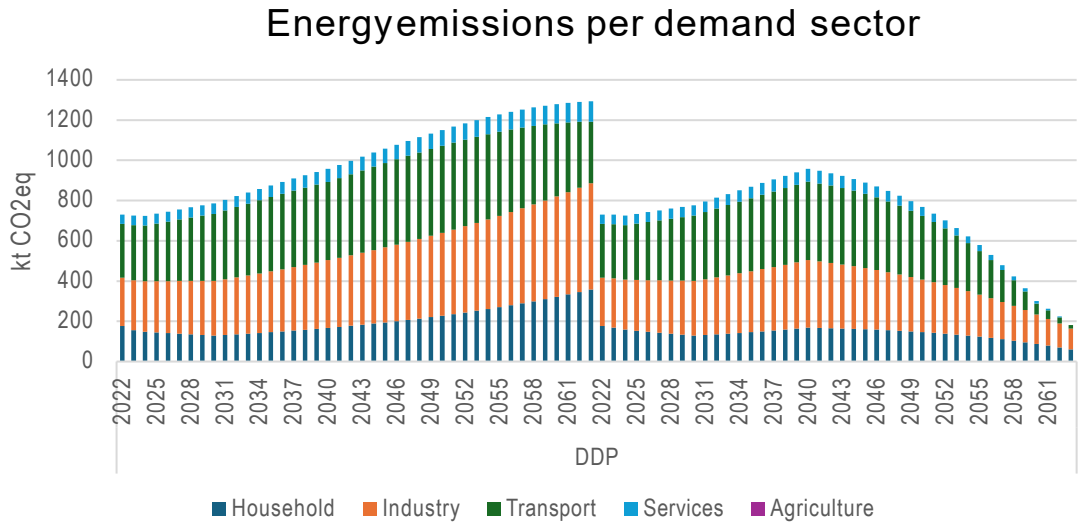



*Figure 29 : Projections of energy GHG emissions from the final energy consumption sectors.*

Looking at the emissions by fuel type over the short term (2025–2030), they remain dominated by diesel, HFO, and gasoline in both DDP and DDP LT scenarios (Figure 30). Under DDP, emissions from diesel rise from 374 $ktCO_2eq$ to 424 $ktCO_2eq$, HFO reduces from 347 to 164 $ktCO_2eq$ due to the decommissioning of Karpower, and gasoline from 92 to 99 $ktCO_2eq$. LPG related emissions begin to rise steadily, while emissions from wood and charcoal gradually decline. DDP LT shows almost identical trends during this period, although emissions from HFO drop faster. In the medium term (2030–2040), the DDP pathway continues its fossil fuel dependency with diesel emissions rising to 509 $ktCO_2eq$ and HFO to 205 $ktCO_2eq$. LPG emissions grow significantly to 92 $ktCO_2eq$. Biomass emissions remain, with wood at 107 $ktCO_2eq$ and charcoal at 16 $ktCO_2eq$. In DDP LT, however, the trajectory shifts as diesel emissions peak at 509 $ktCO_2eq$ but then begin to plateau, gasoline stabilises, and LPG growth slows. Notably, emissions from biomass fuels begin to fall after 2035, and by 2040 biogas and natural gas appear in the mix, indicating diversification.

By the long term (2040–2063), the divergence becomes more pronounced. Under DDP, diesel remains the largest single contributor, reaching 558 $ktCO_2eq$, with HFO at 307 $ktCO_2eq$ and gasoline holding steady around 120 $ktCO_2eq$. In contrast, DDP LT achieves a fundamental structural shift: diesel emissions fall from 509 to just 18 $ktCO_2eq$ by 2063, gasoline from 116 to zero, and HFO from 418 to 150 $ktCO_2eq$. LPG stabilises around 100 $ktCO_2eq$, while biogas and natural gas, take a larger role. Biomass emissions drop significantly, especially from wood (down to 53 $ktCO_2eq$) and charcoal (to 8 $ktCO_2eq$), illustrating a broad-based decarbonisation effort across fuels.

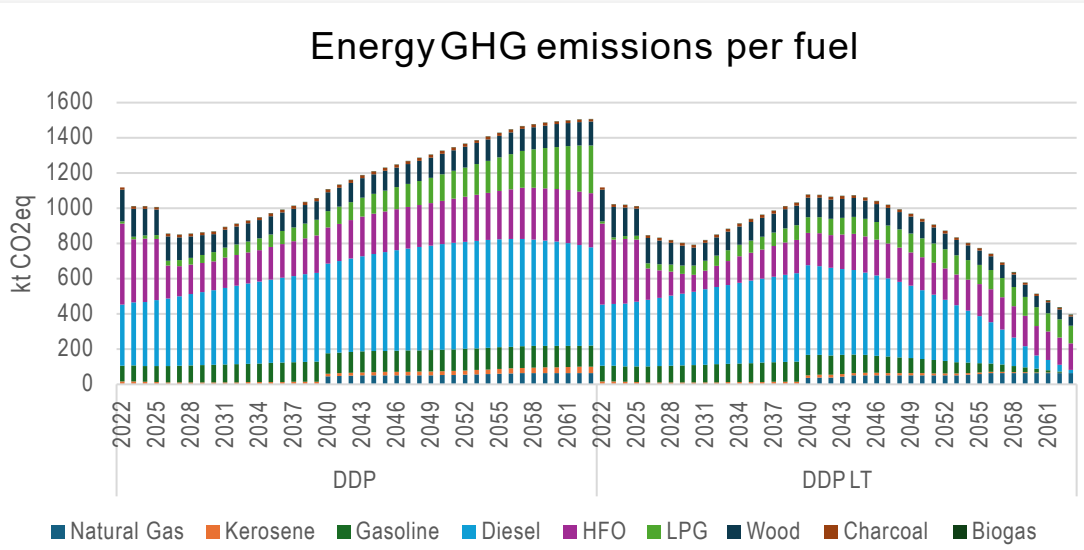



*Figure 30 : Projections of energy related GHG emissions per fuel used in demand and transformation sectors.*

**Key Decarbonization Scenarios Conclusions**

The Deep Decarbonization Pathway (DDP) and its longer-term extension (DDP LT) present two different futures for The Gambia's energy system and its contribution to national climate goals. Both scenarios deliver structural transformations in energy consumption and production, but the degree of ambition, timing of interventions, and ultimate outcomes are divergent.

In terms of final energy consumption (FEC), both scenarios achieve early reductions, particularly in the household sector, largely through clean cooking and electrification strategies. However, while the DDP scenario allows for a steady rebound in total demand, doubling between 2030 and 2063, DDP LT flattens consumption growth, culminating in a 14% lower FEC compared to DDP by 2063. The difference is primarily due to deeper efficiency measures and full decarbonisation in buildings and services. Electricity becomes the dominant energy carrier in both pathways but with a far more decisive role in DDP LT, where it reaches a 73% share of FEC in 2063 compared to 40% in DDP. Biomass and fossil fuels are significantly reduced under DDP LT, with diesel use nearly eliminated and gasoline fully phased out. The emergence of hydrogen and expansion of biogas further demonstrate the diversification of low-carbon fuels under the more ambitious scenario.

Sectorally, the household sector achieves profound transformation in both scenarios by 2030, but DDP LT sustains this momentum through the long term, resulting in a 30% lower FEC in 2063 compared to DDP. Industrial consumption grows modestly in both cases, but only DDP LT achieves significant electrification, with electricity representing over half of industrial FEC by 2063. Transport remains the fastest-growing sector under both scenarios, but only DDP LT curbs its emissions post-2040 via electrification and the integration of hydrogen. Meanwhile, services are entirely electrified in DDP LT by 2063, demonstrating the feasibility of zero-emissions public and commercial infrastructure under strong policy action.

In the electricity generation sector, both scenarios register massive expansions in solar PV and, to a lesser extent, hydro. DDP LT phases out HFO use almost entirely by 2040, integrates wind at scale, and boosts total generation to 5.6 TWh, 67% higher than in DDP. Installed capacity under DDP LT also reaches 2.8 GW by 2063, nearly 1.2 GW more than DDP, reflecting accelerated deployment of non-fossil technologies. This aggressive rollout is critical in enabling the electrification of end-use sectors, particularly in transport, households, and services.

In conclusion, both the DDP and DDP LT scenarios offer structured pathways toward The Gambia's climate and energy goals, but they differ in ambition and impact. The DDP scenario, while reflecting a shift toward cleaner energy, maintains reliance on fossil fuels and biomass, resulting in steadily rising emissions, but at a lower level compared to the Baseline. In contrast, the DDP LT scenario outlines a more ambitious and technically sound roadmap, anchored in widespread electrification, accelerated renewable energy adoption, and deep sectoral efficiency. This enables substantial demand reductions, a cleaner fuel mix, and sharp emissions cuts.

## 3.3.Scenariso Comparison & Key Insights

In this section a comparative analysis of the three scenarios is presented and the key insights are identified.

**Final Energy Consumption**

The comparative evolution of total final energy consumption under the Baseline, DDP, and DDP LT scenarios illustrates the progressively divergent energy futures shaped by the degree of policy ambition and systemic transformation (Figure 31).

In 2025, total FEC was nearly identical across all three scenarios: 769 ktoe in Baseline, 746 ktoe in DDP, and 746 ktoe in DDP LT. However, their trajectories diverge sharply. By 2030, Baseline FEC remains flat at 756 ktoe, while DDP falls to 659 ktoe and DDP LT to 657 ktoe, indicating early effects of mitigation strategies. This represents a decline of 157 ktoe (20.1%) in DDP and 163 ktoe (21.2%) in DDP LT compared to Baseline. The reductions are driven mainly by household energy use, which drops from 369 ktoe in Baseline to 307 ktoe in both DDP and DDP LT due to clean cooking and efficiency programs. In contrast, transport and industry demand continue to grow slightly in all cases.

Between 2030 and 2040, total FEC increases in all scenarios, but with notable differences in magnitude and sectoral structure. Under the Baseline, FEC rises by 222 ktoe to reach 978 ktoe (+29.4%), while DDP increases by 145 ktoe to 804 ktoe (+22.0%), and DDP LT by 159 ktoe to 816 ktoe (+24.2%). Sectorally, transport becomes the leading source of demand, particularly in the Baseline (from 131 ktoe to 234 ktoe, +78.6%) and DDP (from 122 ktoe to 187 ktoe, +53.3%). DDP LT mirrors this trend, with transport reaching 187 ktoe by 2040. Households, while growing more slowly in DDP LT (to 345 ktoe vs. 333 ktoe in DDP), remain significantly below Baseline levels (405 ktoe). Services also expand across all pathways, but more rapidly in DDP LT, which anticipates broader public sector electrification.

By 2063, the energy trajectories become deeply differentiated. The Baseline scenario reaches 1,983 ktoe, marking a +103% increase over 2030 levels, driven by rising demand in all sectors and persistent reliance on fossil fuels and traditional biomass. The DDP scenario follows with 1,441 ktoe (+118.7% from 2030), showing progress but still substantial growth, especially in transport (534 ktoe). In contrast, the DDP LT pathway caps total FEC at 1,240 ktoe, only +88.8% over 33 years, demonstrating a decoupling of economic growth and energy consumption. This is achieved through sustained electrification, particularly in households (320 ktoe) and transport (493 ktoe), and the virtual elimination of traditional fuels in the services sector. Industry stabilises at 163 ktoe in DDP LT, compared to 181 ktoe in DDP and 259 ktoe in Baseline. These trends affirm that DDP LT achieves structural efficiency and decarbonisation, while Baseline locks in high-emissions growth and DDP represents a moderate transition.

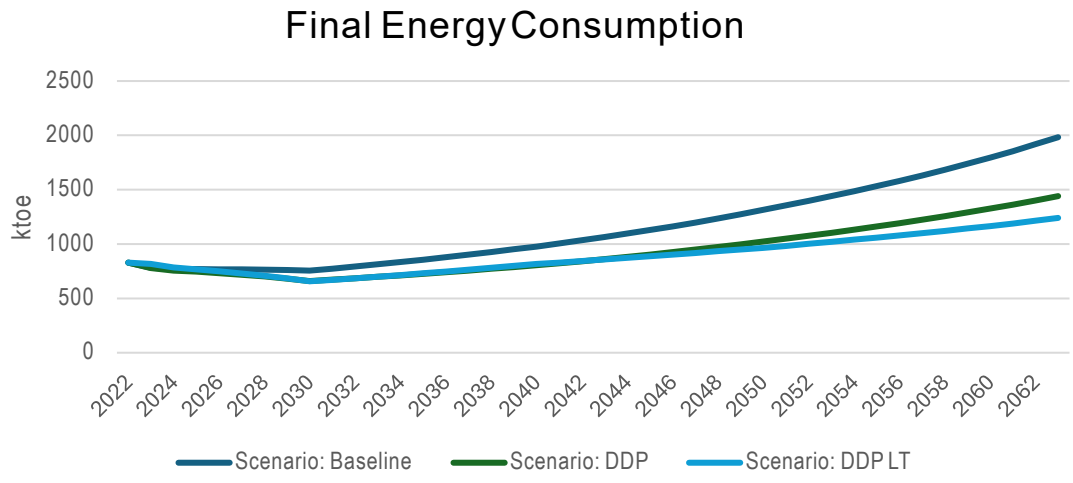



*Figure 31 : Projections of final energy consumption across scenarios.*

Across the Baseline, DDP, and DDP LT scenarios, the fuel composition within each final energy demand sector shifts markedly over time, reflecting the extent of sectoral electrification, fuel switching, and clean energy uptake.

In 2025, biomass (wood and charcoal) dominates household energy use in all scenarios (Figure 32). Wood accounts for 365 ktoe in Baseline, 349 ktoe in DDP, and 376 ktoe in DDP LT. Charcoal demand is relatively stable across scenarios at around 59–62 ktoe. Electricity remains marginal (15 ktoe in all cases), while LPG begins to grow (5 ktoe in Baseline and DDP, slightly higher in DDP LT). By 2030, the differences sharpen as DDP and DDP LT reduce wood use to 202 ktoe compared to 262 ktoe in Baseline, primarily through clean cooking programs. DDP LT shows lower charcoal use, but its LPG consumption (15 ktoe) aligns with DDP. Over the long term, Baseline maintains significant wood reliance (183 ktoe in 2062), while DDP plateaus at 199 ktoe and DDP LT reduces it to 157 ktoe. Electrification increases in all scenarios, with household electricity reaching 112 ktoe by 2063 in DDP LT, compared to 117 ktoe in DDP and 151 ktoe in Baseline.

In industry Baseline and both DDP scenarios show an identical structure in 2025 (Figure 33) as diesel dominates (49 ktoe), followed by HFO (26 ktoe) and gasoline (11 ktoe), with negligible electricity (4 ktoe). By 2030, this structure remains largely unchanged, though diesel use grows more in Baseline (57 ktoe) than in DDP or DDP LT (51 ktoe). Electricity stays static in all cases. The long-term outlook, however, diverges sharply. By 2063, electricity use rises marginally to 12 ktoe in Baseline and DDP, but in DDP LT it surges to 82 ktoe, making it the leading industrial energy carrier. Meanwhile, diesel is virtually phased out in DDP LT (6 ktoe by 2063), while DDP retains 99 ktoe and Baseline reaches 141 ktoe. DDP LT also eliminates HFO, gasoline, and integrates LPG (33 ktoe) and biomass (49 ktoe), signifying a broad decarbonisation and diversification of the industrial fuel mix, absent in the other scenarios.

For transportation, Baseline remains fossil-dependent throughout (Figure 34) the time horizon. Diesel climbs from 77 ktoe in 2025 to 674 ktoe by 2063, gasoline from 22 to 130 ktoe. DDP begins decarbonising early as electricity grows from 6 ktoe in 2027 to 433 ktoe in 2063, representing 81% of transport energy use. Diesel stabilises post-2040 around 82 ktoe, and gasoline declines slightly to 18 ktoe. DDP LT pursues a deeper transition. By 2030, electricity already reaches 13 ktoe, and by 2063, it rises to 451 ktoe, 92% of total transport energy. Diesel drops to 6 ktoe and gasoline is fully phased out. Hydrogen enters post-2040 and reaches 36 ktoe in 2063, marking a structural shift in fuel diversity and carbon neutrality unique to DDP LT.

The services sector is biomass-dependent in the short term, with wood accounting for 114 ktoe in 2025 in Baseline and slightly lower in DDP and DDP LT (Figure 35). Electrification is low across all pathways up to 2030. In Baseline and DDP, bioenergy continues to grow and electricity contribution remains relatively low. By contrast, DDP LT introduces a complete transformation post-2040. Electricity becomes the sole carrier by 2063 at 265 ktoe, displacing all biomass, kerosene, and LPG. DDP LT thus represents full sectoral decarbonisation, in contrast to the other scenarios.



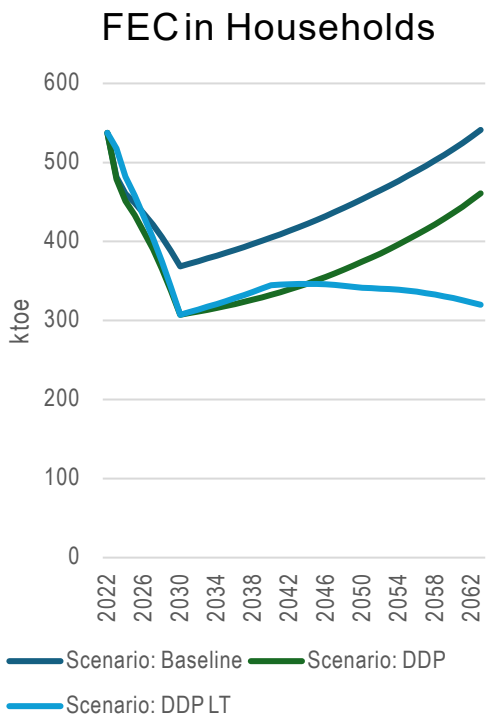



*Figure 32 : Projections of final energy consumption in households across scenarios.*

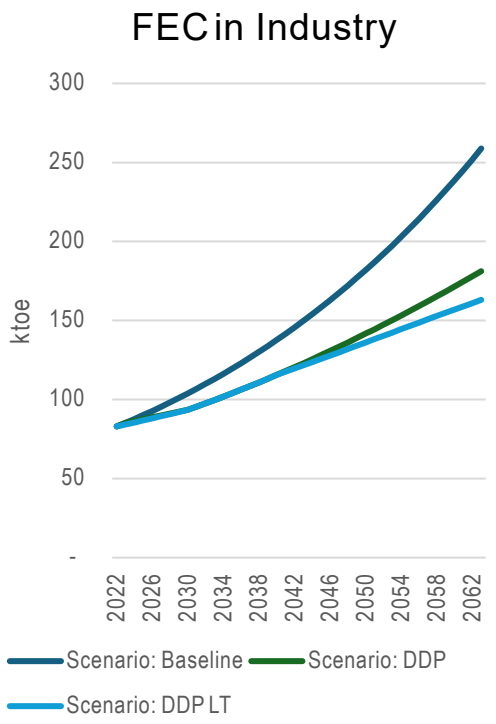



*Figure 33 : Projections of final energy consumption in industry across scenarios.*

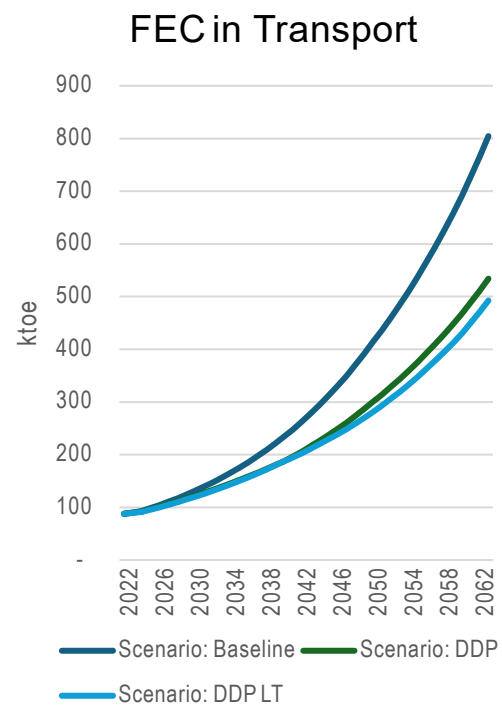



*Figure 34 : Projections of final energy consumption in transport across scenarios.*

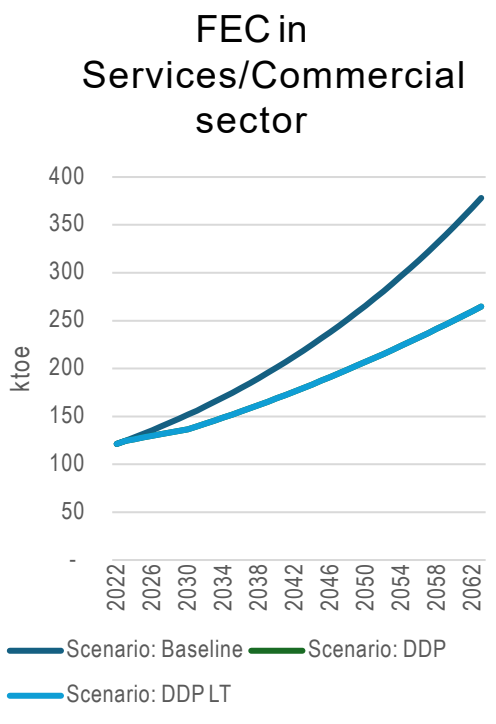



*Figure 35 : Projections of final energy consumption in services/commercial sectors across scenarios.*

**Electricity generation**

The trajectory of total electricity generation diverges significantly across the Baseline, DDP, and DDP LT scenarios (Figure 36).

In the short term (2025–2030), total generation grows steadily in all scenarios but begins to diverge by the end of the period. Baseline generation increases from 0.31 TWh in 2025 to 0.39 TWh in 2030, driven by incremental solar PV deployment, which reaches 0.13 TWh by 2030. DDP expands slightly faster, from 0.33 TWh in 2025 to 0.54 TWh by 2030, due to more aggressive solar PV additions, which account for 0.38 TWh in 2030. DDP LT surpasses both, reaching 0.58 TWh by 2030, combining early reductions in HFO-based generation with accelerated solar expansion (0.5 TWh) and marginal hydro and wind contributions. Despite comparable totals in 2030, DDP LT shows stronger structural change: HFO units contribution is phased out earlier, and renewables account for over 90% of generation, compared to around 85% in DDP and 77% in Baseline.

Over the medium term (2030–2040), DDP and DDP LT diverge substantially. Baseline generation climbs to 0.64 TWh in 2040, with solar reaching only 0.38 TWh, while HFO plants still produce part of the electricity. DDP nearly doubles Baseline's generation, reaching 1.13 TWh in 2040, with solar PV now at 0.83 TWh and 0.11 TWh from the new gas CCGT plant entering in 2040. DDP LT generates 1.35 TWh in 2040, led by solar PV (1.1 TWh) and modest wind, while fossil generation continues to decline. Hydro output remains stable across DDP and DDP LT.

By 2063, the long-term differences are pronounced. Baseline reaches only 1.3 TWh, of which solar provides 0.97 TWh (~72%), and fossil plants still produce about 20% of the total inland generation. DDP expands further to 3.3 TWh, with solar PV contributing 2.93 TWh (87%), HFO plants stabilised at ~0.14 TWh, and CCGT at 0.16 TWh. DDP LT achieves a transformative outcome as total generation reaches 5.6 TWh, 67% more than DDP and over 4 times the Baseline. Solar PV provides 4.78 TWh (85%), wind rises to 0.45 TWh (~8%), and the contribution from HFO is minimal as CCGT adds 0.16 TWh and hydro 0.06 TWh. In summary, while Baseline sees incremental solar growth within a fossil-dominated mix, DDP pushes renewables to the forefront with solar dominance and a moderate fossil decline. DDP LT delivers the deepest structural shift: it almost eliminates HFO contribution, aggressively scales up solar and wind, and fully decouples generation growth from fossil inputs.

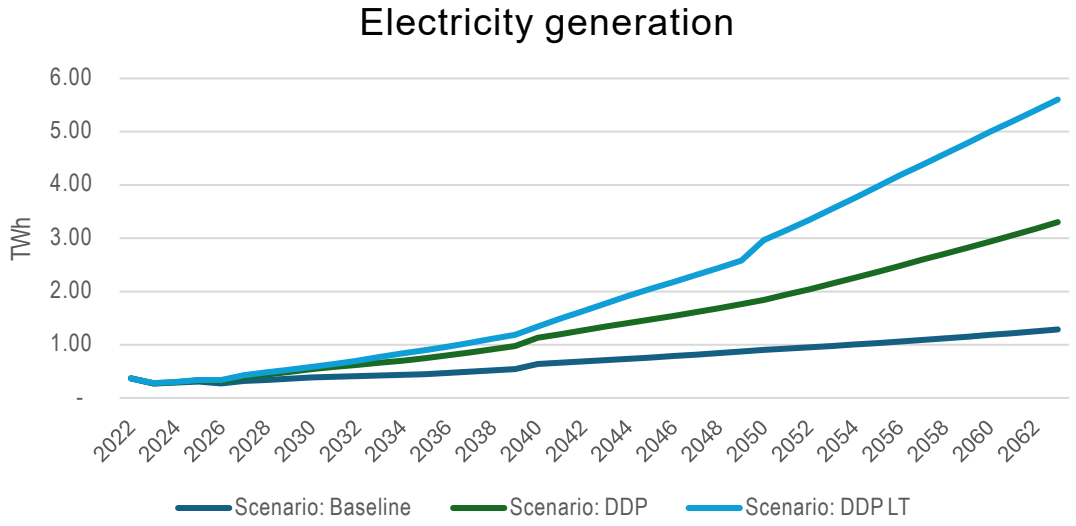



*Figure 36 : Projections of electricity generation across scenarios.*

**Energy related GHG emissions**

Energy-related GHG emissions in The Gambia evolve along markedly different pathways across the Baseline, DDP, and DDP LT scenarios, reflecting the relative pace of electrification, fuel substitution, and decarbonisation of the electricity supply (Figure 37).

In the short term (2025–2030), all scenarios experience a modest rise in emissions, but with clear differences in magnitude and sectoral composition. In the Baseline, total emissions stabilize from 1,011 $ktCO_2eq$ in 2025 to 994 $ktCO_2eq$ in 2030, with demand-side emissions growing by 140 $ktCO_2eq$ while the transformation sector emissions reduced by 156 $ktCO_2eq$ due to the decommissioning of Karpower. In the DDP scenario, emissions change from 1,006 to 868 $ktCO_2eq$, with a similar pattern: demand-side emissions rise slightly (from 735 to 785 $ktCO_2eq$), while transformation emissions decrease from 271 to 83 $ktCO_2eq$. Similarly, the DDP LT pathway has total emissions changing 1,011 to 792 $ktCO_2eq$, as the transformation sector reduces from 277 to 15 $ktCO_2eq$ and demand-side emissions plateau around 777 $ktCO_2eq$.

Over the medium term (2030–2040), trajectories diverge more sharply. Under the Baseline, emissions grow to 1,523 $ktCO_2eq$ (+44%), driven by sustained fossil fuel reliance in both demand (rising to 1,365 $ktCO_2eq$) and transformation (158 $ktCO_2eq$). The DDP scenario registers a 23% increase, reaching 1,107 $ktCO_2eq$ by 2040. Demand-side emissions account for most of this growth (+172 $ktCO_2eq$ from 785 to 957), with the power sector adding 67 $ktCO_2eq$. In DDP LT, total emissions peak at 1,077 $ktCO_2eq$ in 2040, a 27% increase from 2030, but unlike DDP, they decline thereafter. Demand-side emissions in DDP LT grow more slowly, from 777 to 957 $ktCO_2eq$ (+20%), while transformation emissions increase to 119 $ktCO_2eq$. This reflects accelerated electrification and declining fossil intensity per unit of energy supplied.

Long-term dynamics (2040–2063) demonstrate the most dramatic divergence. The Baseline scenario sees an unabated rise in emissions, from 1,523 to 3,905 $ktCO_2eq$ by 2063, a 156% increase, reflecting persistent fossil fuel use across sectors. Demand-side emissions alone nearly triple, reaching 3,677 $ktCO_2eq$, while transformation emissions remain at 220 $ktCO_2eq$. In the DDP scenario, emissions increase by 36%, from 1,107 to 1,507 $ktCO_2eq$. The demand sector drives most of this rise (from 957 to 1,293 $ktCO_2eq$), while transformation emissions plateau at 214 $ktCO_2eq$, indicating limited retirement of fossil generation. By contrast, DDP LT enters a decarbonisation trajectory: total emissions fall from 1,077 to 396 $ktCO_2eq$ (-63%), with demand-side emissions reducing by 81% (from 958 to 182 $ktCO_2eq$). Transformation emissions remain stable at 214 $ktCO_2eq$, highlighting the persistence of some fossil generation. In summary, the Baseline reflects fossil lock-in and continuous growth in emissions. DDP introduces moderate mitigation but fails to reverse trends and the DDP LT scenario achieves peak-and-decline emissions dynamics, realising deep decarbonisation of energy demand through sustained electrification, clean fuel deployment, and eventual containment of power sector emissions.

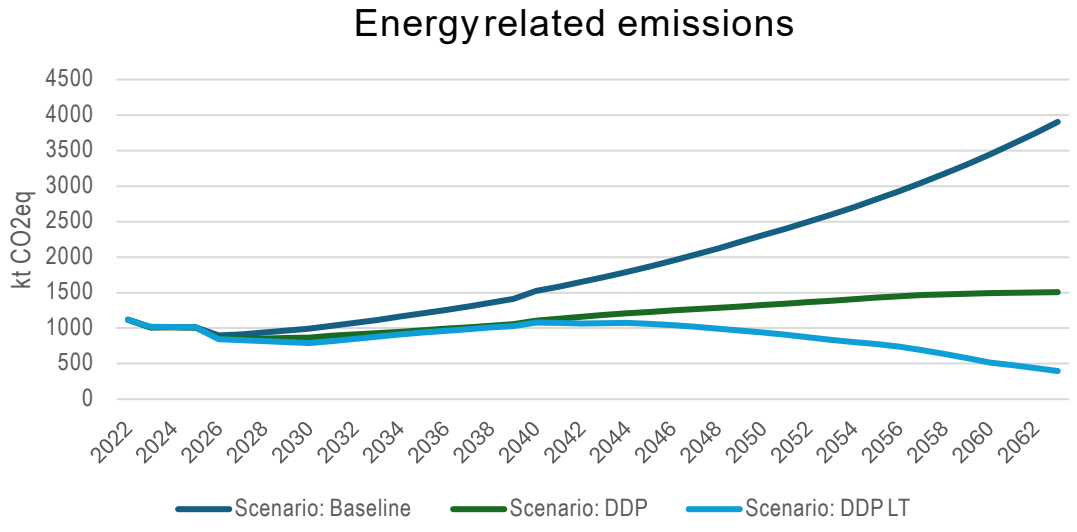



*Figure 37 : Projections of total energy related GHG emissions across scenarios.*

**Cost comparison across scenarios**

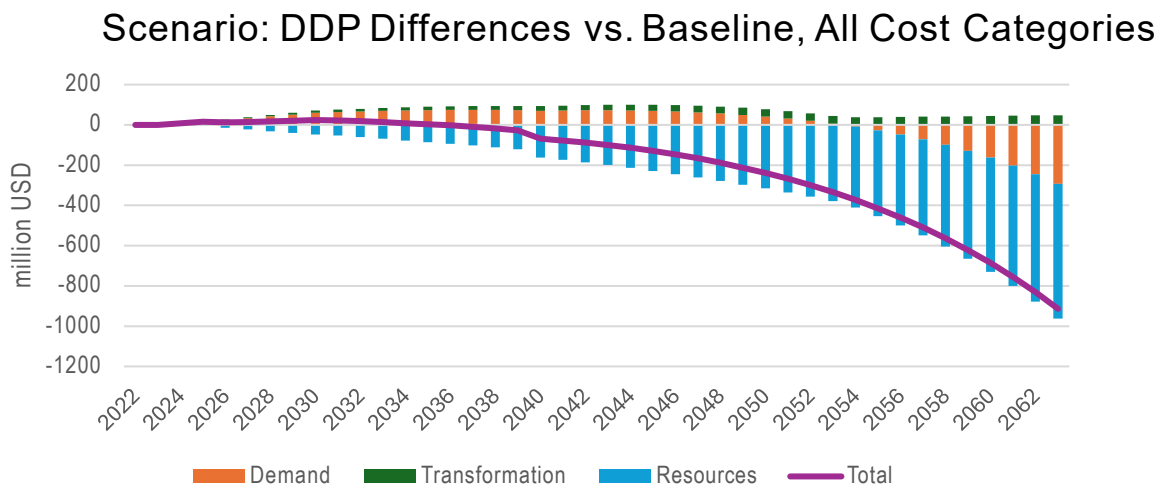
The analysis of annualized costs of the energy system development, reveals important insights regarding the economic implications of the alternative energy pathways discussed above (Figure 38).

The total cost aggregates three key components: investments in the demand sectors (households, industry, transport, services), investments in the transformation sector (mainly electricity generation), and expenditures on imported fossil fuels (labelled “Resources”). In the following analysis these are expressed in constant 2022 USD millions.

The key metric for assessing the economic cost of alternative scenarios is the difference in total cost compared to the Baseline scenario (Figure 38). This difference reflects both the additional investment required for new technologies and the potential savings from reduced fossil fuel imports. This is discussed in detail in the following paragraphs.

Over the short-term period to 2030, the DDP scenario is more expensive compared to the Baseline, with cumulative total cost increase of around $104 million. These come predominantly from fossil fuel import savings, amounting to $156 million, coupled with demand-side investment increase of about $226 million and a cumulative increase in investments in the electricity generation at the level of $34 million. DDP thus delivers an overall cost increase of about 2% relative to the Baseline over the period 2025-2030. DDP LT mirrors this behaviour closely in the short term, achieving total increases of $22 million, underpinned by a $262 million decrease in imported fuel costs and slighter investments than DDP in transformation, in anticipation of deeper long-term decarbonization (Figure 38). Between 2030 and 2040, the divergence in cost structures becomes more pronounced (Figure 38). The DDP scenario, produces cumulative cost savings of $58 million (0.4% below Baseline costs), due to sustained fuel substitution and energy efficiency impacts, which cut fossil imports by $940 million and increases transformation investments by $173 million. DDP LT reaches $299 million savings compared to the Baseline. While transformation investments are significantly higher by roughly $342 million over the decade and demand side technologies investment higher by $678 million, these are offset by fuel savings of over $1.3 billion, resulting in a net benefit of 2% below Baseline cost levels. In the long-term horizon from 2040 to 2063, the cumulative impact of structural energy transformation is unmistakable (Figure 38). The DDP delivers cumulative savings of $8.4 billion over the period 2040 - 2063, corresponding to 13% savings compare to the Baseline, reflecting the effects of decarbonization. Fuel import costs are reduced by $8.7 billion, despite additional investment of $841 million in transformation. DDP LT yields economic advantages, cutting total costs by $6 billion, which is 9% lower relative to the Baseline. Fuel imports alone are reduced by $9.7 billion over this period. However, these gains need the additional $1.7 billion in demand-side investments and the $1.9 billion spent in the transformation sector, much of which reflects large-scale deployment of renewables and end uses switching to electrification and hydrogen.





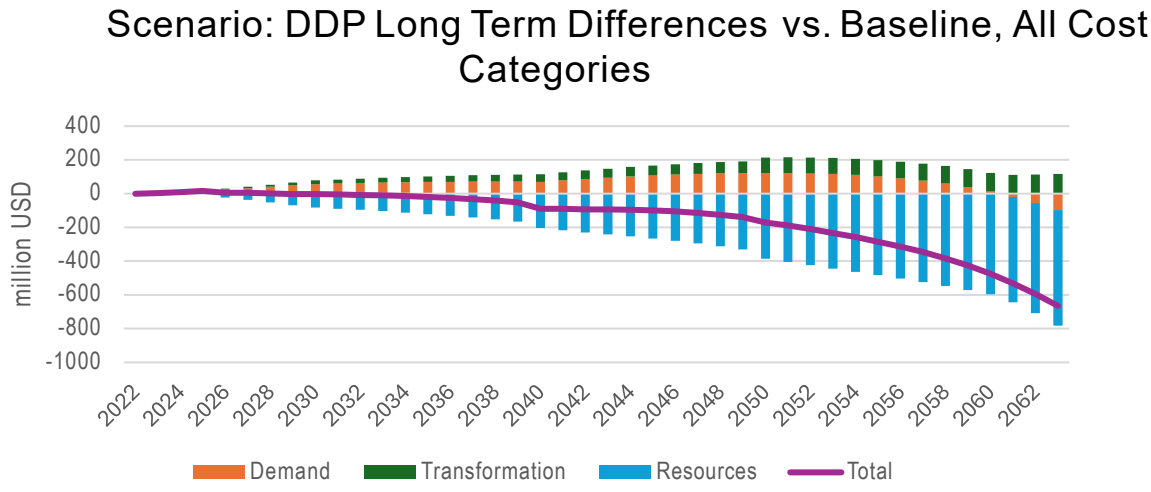




*Figure 38 : Projections of annualised costs differences between the Baseline and DDP scenarios*

**Key Comparative Scenario Analysis Conclusions**

The comparative analysis of the Baseline, DDP, and DDP LT scenarios reveals how the structure, composition, and emissions intensity of The Gambia's energy system evolve under varying degrees of policy ambition.

By 2030 the decarbonisation pathways, DDP and DDP LT, already show early evidence of divergence, with reductions in final energy consumption (FEC), especially in households, driven by accelerated adoption of clean cooking technologies and energy efficiency. The Baseline remains stagnant, maintaining reliance on traditional biomass and inefficient fossil use, whereas DDP and DDP LT reduce total FEC by more than 20% compared to Baseline.

Over the medium term (2030–2040), energy demand increases across all scenarios, but DDP LT overtakes DDP in absolute FEC, driven by faster electrification and structural demand shifts, especially in the public and transport sectors.

By 2063, DDP LT stands out with a decoupled energy-growth trajectory as FEC is 1,240 ktoe, compared to 1,441 ktoe in DDP and 1,983 ktoe in Baseline, an outcome achieved through sustained electrification, fuel switching, and full biomass phase-out in services.

Sectoral decomposition confirms this trend. Households in DDP LT shift decisively toward electricity and biogas, phasing out LPG and reducing biomass use by more than 60% relative to Baseline. The industry sector, which remains fossil-dominated in Baseline and DDP, undergoes broad diversification under DDP LT, with electricity reaching over 50% of total consumption by 2063 and fossil fuels virtually eliminated. Transport transformation is even more striking: in DDP LT, electricity reaches 451 ktoe, 92% of demand, while fossil fuels are phased out and hydrogen reaches 36 ktoe—contrasting starkly with Baseline's fossil dominance and even DDP's moderate electrification. Services follow a similar pattern as DDP LT achieves full electrification by 2063.

Electricity generation pathways further illustrate the scenarios' divergence. Baseline remains fossil-dependent, with only 1.3 TWh produced by 2063 and 72% of this from solar. DDP accelerates the transition, reaching 3.3 TWh with 87% solar, and integrates a modest contribution from gas and hydro. DDP LT achieves a transformative outcome as total generation reaches 5.6 TWh by 2063, with solar contributing 85%, wind 8%, and nearly complete phase-out of fossil generation. This not only supports growing electricity demand from electrification but also fully aligns generation with a net-zero vision.

Energy-related GHG emissions are the ultimate measure of transition success. The Baseline scenario locks The Gambia into a carbon-intensive pathway, with emissions rising from 1,011 $ktCO_2eq$ in 2025 to 3.905 $ktCO_2eq$ in 2063, quadrupling over the period. DDP moderates growth but does not reverse it, reaching 1,507 $ktCO_2eq$ in 2063, while DDP LT achieves absolute emission reduction, peaking at 1,077 $ktCO_2eq$ in 2040 and falling to 396 $ktCO_2eq$ by 2063. This 63% reduction from peak levels is driven by an 81% fall in demand-side emissions, confirming the role of electrification, hydrogen, and clean fuel substitution in decarbonising the energy system.

Finally, from an economic perspective, DDP and DDP LT show progressively stronger cost-effectiveness over time. While DDP results in slight cost increases in the short term due to higher upfront investments, it delivers cumulative savings of $8.4 billion (13%) compared to the Baseline scenario by 2063. DDP LT achieves $6 billion in savings (9%) compared to the Baseline, requiring greater capital investments in transformation and end-use sectors, but yielding higher fossil fuel import reductions ($9.6 billion). These findings reaffirm that deep decarbonisation is not only environmentally imperative but economically advantageous in the long term.



# 4 . KEY POLICY & ACTION AREAS

# Key Policy & Action Areas

## 4.1. Introduction

The preceding chapters have reconstructed each national energy system in detail and have projected its evolution under defined decarbonisation pathways. This chapter descends from scenario trajectories to the ground level decisions that unlock those trajectories. This Chapter therefore assembles a portfolio of short, actionable interventions for The Gambia that correspond to the seven ETSAP subsectors: electricity, industry, transport, buildings, oil & gas, agriculture, and clean cooking. They are the “hinge points” where policy intent meets regulatory engineering, and where private capital receives the confidence signal it needs to mobilise at scale.

## 4.2. Development of action list

The action list is derived from the long inventory of measures embedded in the ETSAP and its companion document, the Guidelines for Low Hanging Fruit and High Impact Activities. That inventory is deliberately expansive, capturing the full spectrum of possibilities across fifty-five Member States. Yet an undifferentiated continental list, however comprehensive, risks being either too abstract or too prescriptive when transposed into specific national contexts. Accordingly, the project team and the national stakeholder working groups undertook a filtration process whose objective was to distil a first set of actions per sector tailored to the realities of The Gambia.

The filtration followed a three-step logic. **Relevance** asked whether the measure addressed an identified bottleneck in the baseline: excessive network losses, regulatory gaps, obsolete building codes, or the absence of standards for flare reduction. **Feasibility** examined institutional maturity, fiscal headroom and political appetite, acknowledging that some ideas are premature until prerequisites—like, a robust grid code or a functioning metering backbone—are in place. **Catalytic leverage** weighed the ratio of policy design effort to downstream private investment or emissions savings; in a resource constrained setting, actions that trigger large follow-on flows rank highest.



## 4.3. Consultive Architecture

Ensuring both national ownership and regional and continental comparability required a deliberate engagement approach. We therefore adopted a four-layer process that is common to all three countries, yet sufficiently flexible to capture their diversity:

1. **Bilateral consultation rounds**: Specialists from the project team met separately or in small groups with regulators, utilities, relevant ministries and civil society monitors. These encounters surfaced granular constraints—informal tariff discounts, permit bottlenecks, missing data fields - often invisible in formal reports.
2. **Preselection and initial appraisal**: Drawing on those bilateral, an initial list of potential activities was compiled, each accompanied by a first cut impact estimate harvested from international experience or rough techno economic calculations. These estimates were deliberately conservative - the aim was to frame a conversation, not pre-empt it.
3. **National multi stakeholder workshop:** The draft actions and their indicative impacts were exposed to the full working group in physical workshops. Participants interrogated assumptions, proposed alternative delivery mechanisms, and refined quantitative targets.
4. **Cooling off and ratification window:** Within forty-eight hours the refined slide deck and a concise record of workshop deliberations were circulated electronically. Stakeholders then had a one-week comment window. Silence after that period counted as assent. Only after this window closed were the activities deemed approved and therefore ready for integration into the DDP scenario set up.

This protocol serves three purposes. First, it provides a transparent audit trail for future reference and donor due diligence. Second, it balances inclusivity with decision speed - preventing iterative paralysis while respecting legitimate voices. Third, it anchors each activity in a public record of co-creation, thereby protecting forthcoming policy instruments against the criticism of technocratic imposition.

## 4.4.Design Philosophy Of The Activity Cards

Because the interventions are predominantly soft - laws, regulations, standards, capacity programmes - they do not carry the billion-dollar price tags associated with power station builds or grid backbones. Their primary resource requirement is technical expertise: economists, lawyers, engineers and social engagement specialists who can draft, benchmark, consult and finalise the instruments. For budgeting purposes, we have therefore adopted a deliberately simple metric: total person days required, multiplied by an all-inclusive professional rate of USD 1,000 per day. This approach may appear reductive, yet it achieves three advantages: clarity, comparability and rapid scalability once more precise scoping becomes possible.

Each activity is captured in a two-section card. Section 1 delivers an executive synopsis—a statement of rationale, intervention description, headline 2030 impact, implementation horizon, indicative budget and institutional mapping. Section 2 expands the technical substance, enumerates milestones, highlights critical enablers and risks, and sketches a light touch monitoring arrangement.

### 4.4.1 Temporal Alignment With Modeling Horizon

The modelling horizon for the Deep Decarbonisation Pathway extends to 2063, aligned with Agenda 2063. Yet in policy praxis the decisive spur lies in the next election cycle or fiscal planning window. Hence this chapter confines its quantitative ambition metrics to 2030, mirroring the first implementation phase of ETSAP and the time frame used in the AU low hanging fruit guidance. By compressing the horizon, we make monitoring credible, lessen forecast error, and produce KPIs that can be directly inserted into Medium Term Expenditure Frameworks or National Development Plans.

That is not to suggest that the actions cease to matter after 2030. Rather, they are conceived as platform enablers - once enacted, they propagate benefits through the medium and long term: renewable procurement rules remain in force, building energy labels continue to steer consumer choices, flare reduction standards safeguard methane budgets. Thus, a modest consultancy outlay in the present decade can lock in structural emissions declines and investment flows for thirty years or more.

### 4.4.2 Interfacing With Scenario Analytics

Although this Chapter is self-standing, its architecture has been designed in full alignment with the scenario analysis. Each headline KPI - loss reduction, renewable share, appliance efficiency index—feeds directly into the parameter files of the LEAP model. Reciprocally, the LEAP results inform the checks on each KPI. If the model shows that even a maximal smart meter roll out could only shave losses by ten percentage points, the activity cannot promise fifteen. This handshake between qualitative insight and quantitative accuracy is the chapter's hidden framework.

GHG impact accounting remains anchored in Chapter 3. Readers will find cumulative emissions savings, marginal abatement costs and investment curves there. Chapter 4 therefore need not replicate those numerics. Its value lies in setting out who must do what, by when, and with which modest resource envelope to render those savings real.

### 4.4.3 High Level Monitarying & Reporting

Given the nascent state of energy data systems in The Gambia, monitoring must tread lightly. Each activity card therefore prescribes a single annual progress review to the National Energy Transition Steering Committee (NETSC), or comparable organ decided in each country, with a short summary transmitted to AFREC for insertion into the continental ETSAP dashboard. The committee will judge success primarily against binary or easily verifiable markers "regulation gazetted," "tariff instrument published," "first cohort of auditors certified." Where richer datasets exist (smart meter roll out, NEV registrations), they will be exploited, but the monitoring regime refrains from inventing metrics that agencies cannot presently sustain.

In the end, the reader should possess a clear, country specific yet continentally harmonised map of immediate actions—actions that are small enough to be financed through a routine consultancy line, yet potent enough to bend emissions curves, attract private capital, and embed a culture of efficiency and innovation across Africa's energy landscape. In the architecture of the Deep Decarbonisation Pathway, these policies are the foundations.

The action list applied to The Gambia is presented in the tables below.

## 4.5. Electricity Sector

*Table 4: Promoting the Uptake of Renewable Energy for Grid & Distributed Generation Systems*

# Executive Synopsis

| Executive Synopsis | Promoting the Uptake of Renewable Energy for Grid & Distributed Generation Systems |
|---|---|
| Sector / High-level Pursuits | Electricity · Universal Access & Clean Energy Mix |
| Rationale | The national generation mix is still dominated by fossil fuel power stations utilizing HFO. These units variable-cost spikes erode NAWEC's balance sheet and perpetuate tariff volatility, also leading to high imports through WAPP. Yet irradiation levels exceed 2 000 kWh $m^{-2}$ $yr^{-1}$ and wind corridors remain untapped. Unlocking independent power procurement and behind-the-meter solar can relieve the fiscal choke-hold while expanding access. |
| Core Intervention | Design the future policy and regulatory framework concerning renewable electricity. Possible areas to investigate include:<br>(i) Possibility of IPPs to sign standardised power-purchase agreements,<br>(ii) measures to empower C&I customers to enter direct-supply contracts, and<br>(iii) design of a net-billing code for < 100 kW PV systems behind the meter<br>(iv) |
| Expected 2030 Impact | 15% decrease in fossil fuel use while an overall increase in energy consumption is observed supporting the universal access to electricity target for 2030. |
| Implementation Horizon | Start Q3 2025<br>Completion Q4 2027 |
| Indicative Budget | 60 WD × USD 1 000 = USD 60 000 |
| Implementation Horizon | Ministry of Petroleum & Energy (MoPE) (lead) • Public Utilities Regulatory Authority (PURA) • National Water & Electric Company (NAWEC) • Gambia Chamber of Commerce & Industry (GCCI) |

*Table 4: Promoting the Uptake of Renewable Energy for Grid & Distributed Generation Systems*

# Technical Detail

| | |
|---|---|
| Detailed Description | The chosen measures will be detailed and clear pathways for their eventual integration into the regulatory framework of the country will be developed. |
| Key Outputs & Milestones | |
| Critical Enablers | • Ministerial sponsorship<br>• Fuel-levy escrow<br>• NAWEC billing reforms |

| | | |
|---|---|---|
| Budget secured | Q4 2025 | Tender notice announced |
| Draft recommendations on the future policy and regulatory framework | Q2 2026 | Draft submitted to ministry |
| National consultation workshop | Q3 2026 | ≥ 60 participants; comments logged |
| Roadmap for implementing the recommendations | Q2 2027 | Roadmap published |

# Risks management analysis

| | **Risks** | **Mitigation Measures** |
|---|---|---|
| | PPA bankability doubts. | Development bank partial-risk guarantee. |
| | Land-acquisition delays. | Pre-zoned solar parks. |
| Key Outputs & Milestones | • Annual update to National Energy-Transition Steering Committee<br>• RE capacity progress uploaded to AFREC dashboard | |
| Next Immediate Steps | • Endorse ToR<br>• Secure budget<br>• Launch consultant EOI on PURA portal<br>• Inception mission scheduled for January 2026 | |

*Table 5: Enforcing Standards for Smart Distribution Grids*

# Executive Synopsis

| Executive Synopsis | Enforcing Standards for Smart Distribution Grids |
|---|---|
| Sector / High-level Pursuits | Electricity · Infrastructure Modernisation & Energy Efficiency |
| Rationale | System losses hover above 22 %. Non-technical losses e.g., meter bypassing, compound technical bottlenecks. Enforceable smart-grid standards are the quickest route to reverse revenue haemorrhage and create flexibility for variable RE. |
| Core Intervention | Issue a PURA-led "Smart Grid Code" mandating:<br>(i) phased deployment of Advanced Metering Infrastructure (AMI) meters,<br>(ii) SCADA integration,<br>(iii) cyber-security protocols,<br>(iv) Loss reduction incentive scheme for NAWEC. |
| Expected 2030 Impact | Decrease in network losses to 15% due to improved efficiency by 2040 and 10% by 2063.<br>Increase in intermittent renewables penetration by 10% due to smart metering and flexibility. |
| Implementation Horizon | Start Q3 2025<br>Completion Q4 2027 |
| Indicative Budget | 80 WD × USD 1 000 = USD 80 000 |
| Lead & Partnerships | Ministry of Petroleum & Energy (MoPE) (lead) • Public Utilities Regulatory Authority (PURA) • National Water & Electric Company (NAWEC) • Gambia Chamber of Commerce & Industry (GCCI) |

# Technical Detail

| | | | |
|---|---|---|---|
| Detailed Description | The Code will prescribe functional specifications (DLMS/COSEM compliant meters, GPRS/4G/5G communication), set quarterly roll-out quotas, and establish a loss-reduction target curve linked to a tariff-setting incentive. Cyber-security rules will align with ISO 27 001. | | |
| Key Outputs & Milestones | Budget secured | Q4 2025 | Tender notice announced |
| | Draft Code completed | Q2 2026 | Published for comment |
| | Pilot AMI roll-out (1000 meters) | Q2 2027 | 95 % read-success rate |
| | Roadmap for implementing the recommendations | Q4 2027 | Publication in the Government Gazette |
| Key Outputs & Milestones | • Donor co-financing for meters<br>• TelCo Coverage | | |

## Risks management analysis

| | Risks | Mitigation Measures |
|---|---|---|
| | Resistance from informal users | Social tariff- design |
| | Meter tampering | Tamper-proof seals |
| Key Outputs & Milestones | • Loss-factor audit verified annually by PURA and uploaded to AFREC. | |
| Next Immediate Steps | • Approve ToR<br>• Engage meter-specification consultant<br>• Launch public-consultation portal | |

## 4.6. Clean Cooking Sector

*Table 6: Innovate & Plan for Clean Cooking Solutions*

## Executive Synopsis

| Executive Synopsis | Innovate & Plan for Clean Cooking Solutions |
|---|---|
| Sector / High-level Pursuits | Clean Cooking · Universal Access & Health |
| Rationale | Many households in rural areas still rely on fuel-wood and charcoal. The attendant indoor-air pollution is implicated in one-in-eight premature deaths, while accelerated forest depletion undermines climate resilience. Scattered donor pilots have proven technical feasibility; what remains is an integrated national strategy that synchronises supply chains, finance and behaviour change. |
| Core Intervention | Design and launch a voluntary-to-mandatory Building Energy-Label Scheme (Classes A–G), coupled with a green-mortgage discount and a property-tax rebate for Class A–C buildings. |
| Expected 2030 impact | 10% decrease in primary energy consumption of the building sector due to improved efficiency |
| Implementation Horizon | Start Q1 2026<br>Completion Q1 2028 |
| Expected 2030 impact | 100 WD × USD 1 000 = USD 100 000[1] |
| Lead & Partners | MoPE (lead) • Ministry of Transport, Works and Infrastructure (MoTWI) (lead) • Gambia Association of Construction Contractors (GACC) • PURA • TGSB • Local Gov't Authorities • ECREEE |

[1] As discussed during the consultation workshop, the two activities in the building sector would benefit if deployed in an integrated manner and they could also offer improved resource efficiencies.

# Technical Detail

| | |
|---|---|
| Detailed Description | The scheme will define performance bands based on kWh m-² yr-¹, tailored to climate zone 1B. A digital registry will house pre-verified software tools (e.g., DesignBuilder) and list certified auditors. Initial rollout targets new hotels and government buildings, with voluntary uptake for residential developers; mandatory coverage to be considered for commencement in 2030. |

Key Outputs & Milestones

| | | |
|---|---|---|
| Budget secured | Q1 2026 | Technical specification posted for comment |
| Label methodology drafted | Q4 2026 | Document on MoPE website |
| Auditor-training curriculum approved | Q2 2027 | 20 auditors certified |
| Voluntary label launched | Q4 2027 | First 10 projects registered |
| Mandatory phase begins | Q1 2030 | Regulation in Gazette |

Critical Enablers

- green-mortgage facility
- Property - tax by-law revison

# Risks management analysis

| Risks | |
|---|---|
| Insufficient auditor capacity | Phased introduction |
| Developer push-back | Public-recognition awards |

Monitoring & Reporting

- Annual registry audit
- kWh/m² data integrated into national energy-statistics yearbook.

Next Immediate Steps

- Convene technical committee
- Align with ECOWAS model Building Code
- Secure donor support for training

## 4.7.Bulding sector

*Table 6: Energy Labelling for Buildings*

# Executive Synopsis

| Executive Synopsis | Energy Labelling for Buildings |
|---|---|
| Sector / High-level Pursuits | Buildings · Energy Efficiency |
| Rationale | Cooling loads are rising sharply as incomes climb and the climate warms. Without clear consumer information, developers default to least-cost envelopes that lock in decades of inefficiency. An energy label offers a market-visible signal that rewards better design and prepares the ground for future mandatory codes. |
| Core Intervention | Design and launch a voluntary-to-mandatory Building Energy-Label Scheme (Classes A–G), coupled with a green-mortgage discount and a property-tax rebate for Class A–C buildings. |
| Expected 2030 impact | 10% decrease in primary energy consumption of the building sector due to improved efficiency |
| Implementation Horizon | Start Q1 2026<br>Completion Q1 2028 |
| Expected 2030 impact | 100 WD × USD 1 000 = USD 100 000[1] |
| Lead & Partners | MoPE (lead) • Ministry of Transport, Works and Infrastructure (MoTWI) (lead) • Gambia Association of Construction Contractors (GACC) • PURA • TGSB • Local Gov't Authorities • ECREEE |

# Technical Detail

| | | | |
|---|---|---|---|
| Detailed Description | Guidelines will employ adaptive comfort models for hot-humid climates, prescribe U-values ≤ 1.5 W m$^{-2}$ K$^{-1}$ for roofs, solar-heat-gain coefficients ≤ 0.35 for glazing, and mandate energy audits every five years for large tertiary sector buildings. A compliance manual will illustrate passive-design architecture types also aligned where possible with traditional practices for improved acceptance. | | |
| Key Outputs & Milestones | Budget secured | Q3 2026 | Tender notice announced |
| | Consultation workshops in the country | Q2 2027 | Regional events realized for extensive consultation. |
| | Draft guidelines prepared | Q2 2027 | 20 auditors certified |
| | Voluntary label launched | Q4 2027 | Draft Guidelines on misitry website |
| | Validation of guidelines | Q1 2028 | Guidelines published |

| | |
|---|---|
| Critical Enablers | • Donor TA for thermal-simulation training |

## Risks management analysis

| | Risks | Mitigation Measures |
|---|---|---|
| | Cost concerns by developers. | Phased compliance<br>Fiscal incentives. |
| Monitoring & Reporting | • Bi-annual survey of permit approvals tagged “compliant”<br>• Summary to MoPE. | |
| Next Immediate Steps | • Draft ToR<br>• Secure technical assistance grant<br>• Initiate baseline energy-intensity study. | |

### 4.8. Industry Sector

*Table 8: Energy-Efficiency Regulatory Framework for Industrial Decarbonisation*

## Executive Synopsis

| Executive Synopsis | Energy-Efficiency Regulatory Framework for Industrial Decarbonisation |
|---|---|
| Sector / High-level Pursuits | Industry · Energy Efficiency & Competitiveness |
| Rationale | The manufacturing base - mills, breweries, cold-stores, agro-industry - is small but growing. Without early efficiency standards, rising consumption could erase gains from renewable generation. |
| Core Intervention | Develop and enact an **Industrial Energy-Efficiency Regulation** mandating periodic energy audits, management action plans, and a fiscal “energy-savings certificate” redeemable against corporate tax. |
| Expected 2030 impact | 10% decrease in primary energy consumption of industry sector due to improved efficiency |
| Implementation Horizon | Start Q1 2026<br>Completion Q2 2028 |
| Expected 2030 impact | 100 WD × USD 1 000 = USD 100 000 |
| Lead & Partners | MoPE (lead) • Ministry of Trade, Industry, Regional Integration and Employment (MoTIE) • PURA • Gambia Chamber of Commerce and Industry (GCCI) • UNIDO• ECREEE |

## Technical Detail

| | |
|---|---|
| Detailed Description | Regulation will require facilities consuming > 1 GWh per year to undertake ISO 50 001-aligned audits, submit costed action plans, and report progress annually. An “energy-savings certificate” tradable against corporate tax will incentivise over-compliance. Capacity-building modules for local auditors included. |

Key Outputs & Milestones

| | | |
|---|---|---|
| Budget secured | Q1 2026 | Tender notice announced |
| Draft regulation & guidelines | Q3 2026 | Circulated to industry |
| Pilot audits (5 plants) | Q4 2026 | Reports submitted |
| Regulation gazetted | Q4 2027 | Regulation in Gazette |
| First certificate issuance | Q1 2028 | Certificates posted on government website |

| | |
|---|---|
| Critical Enablers | • Technical support<br>• Tax-authority buy-in |

## Risks management analysis

| Risks | Mitigation Measures |
|---|---|
| Audit fatigue | Phased thresholds |
| Limited local expertise | Auditor-training grants |

| | |
|---|---|
| Monitoring & Reporting | • Annual audit-compliance report compiled by PURA<br>• Aggregate energy-savings data forwarded to AFREC |
| Next Immediate Steps | • Create inter-ministerial drafting task-force<br>• Secure funding<br>• Launch pilot-audit tender |

*Table 10: Scoping, Piloting & Rolling-out New-Energy Vehicles (NEVs)*

# Executive Synopsis

| Executive Synopsis | Scoping, Piloting & Rolling-out Electric Vehicles |
|---|---|
| Sector / High-level Pursuits | Transport · Improved public transportation system, Decarbonisation & Air-Quality |
| Rationale | Road transport consumes a considerable shareof national diesel and is the fastest-growing source of urban air pollution. The country lacks a policy signal to guide electric-mobility investors and financiers. Early pilots can short-circuit the "chicken-and-egg" dilemma of vehicles versus charging infrastructure. |
| Core Intervention | Conduct a **National NEV Feasibility Study** → issue an **Electric-Mobility Incentive Decree** (duty waiver, registration rebate) → implement two urban e-bus pilots and a corridor of electric chargers linking Banjul to Brikama. |
| Expected 2030 impact | • 10% of new sales of 4wheel vehicles to be electric<br>• For busses 25% increase in comparison to Baseline due to switch from private cars and new passengers. |
| Implementation Horizon | Start Q1 2026<br>Completion Q1 2028 |
| Indicative Budget | 50 WD × USD 1 000 = USD 50 000 |
| Lead & Partners | MoTWI (lead) • MoPE• PURA • NAWEC • City-Council Banjul • ECREEE |

# Technical Detail

| | | | |
|---|---|---|---|
| Detailed Description | The study will analyse duty-waiver scenarios, grid-impact modelling, and total-cost-of-ownership parity. The Decree will set a five-year 0 % import duty for BEVs and define a registration-rebate schedule declining as volumes rise. Two e-bus pilots will test procurement, maintenance and fare-integration models; NAWEC will deploy ten chargers on the Banjul–Brikama corridor. | | |
| Key Outputs & Milestones | Budget secured | Q1 2026 | Tender notice announced |
| | Consultation workshops in the country | Q3 2026 | Report approved |
| | Draft guidelines prepared | Q2 2026 | Regulation in Gazette |
| | Voluntary label launched | Q4 2027 | Two e-bus routes |
| | Validation of guidelines | Q1 2027 | 10 chargers operational |

## Risks management analysis

| | Risks | Mitigation Measures |
|---|---|---|
| | Power outages | Battery-backup at chargers to support the grid with potentially distributed PVs also installed if feasible. |
| | Consumer range anxiety | Public-education campaign |
| Key Outputs & Milestones | • Quarterly vehicle-registration data and charger-utilisation reports submitted to MOPE. | |
| Next Immediate Steps | • Draft ToR<br>• Secure grant<br>• Convene automotive importers round-table | |

## 4.9. Algriculture Sector

*Table 11: Development of Bio-energy Supply Chains*

## Executive Synopsis

| Executive Synopsis | Development of Bio-energy Supply Chains |
|---|---|
| Sector / High-level Pursuits | Agriculture · Renewable Fuels & Rural Jobs |
| Rationale | Rice husks, ground-nut shells and livestock manure are burned or dumped, emitting methane and wasting energy. Organised collection and conversion into biogas or briquettes can displace |
| Core Intervention | I. Establish **at least 2 regional biomass hubs** (collection/processing),<br>II. pilot **modular biogas digesters in alignment with the chosen hubs realities**, and<br>III. issue a **Sustainable Biomass Standard** to govern feedstock harvesting and traceability.<br>Investigate sustainable agro-forestry applications. |
| Expected 2030 impact | 10% decrease in primary energy consumption of industry sector due to improved efficiency |
| Implementation Horizon | Start Q2 2026<br>Completion Q4 2028 |

| | |
|---|---|
| Expected 2030 impact | 100 WD × USD 1 000 = USD 100 000 |
| Lead & Partners | MoPE (lead) • Ministry of Trade, Industry, Regional Integration and Employment (MoTIE) • PURA • Gambia Chamber of Commerce and Industry (GCCI) • UNIDO• ECREEE |

## Technical Detail

| | |
|---|---|
| Detailed Description | GIS mapping will identify feedstock hot-spots within 30 km of milling centres. Hubs will house shredders, dryers and briquetters; digesters (30–50 m³) will generate electricity for local mini-grids. The biomass standard will cap extraction rates to avoid soil nutrient depletion and establish chain-of-custody documentation compatible with voluntary carbon markets. Mapping of sustainable forestry and reforestation activities will shed light in possibility of sustainable agro-forestry applications |

Key Outputs & Milestones

| | | |
|---|---|---|
| Budget secured | Q1 2026 | Tender notice announced |
| Biomass atlas completed | Q3 2026 | Atlas uploaded |
| Sustainability standard drafted | Q4 2026 | Draft online |
| Hub sites secured & MoUs signed | Q4 2027 | ≥ 2 MoUs |
| First digester commissioned | Q1 2028 | ≥ 50 m³ unit operational |

Critical Enablers

- Extension-service network
- Carbon-credit demand

## Risks management analysis

| Risks | Mitigation Measures |
|---|---|
| Feedstock seasonality | Long-term offtake contracts |
| Land-tenure disputes | Community land agreements |

Monitoring & Reporting

- Annual audit of biomass throughput and digester runtime
- Summary to MOPE.

Next Immediate Steps

- Engage consultant
- Initiate stakeholder mapping
- Draft sustainability-standard outline

*Table 12: Standards for Minimising Flaring in Refineries / Platforms*

# Executive Synopsis

| Executive Synopsis | Standards for Minimising Flaring in Refineries / Platforms |
|---|---|
| Sector / High-level Pursuits | Oil & Gas · Methane & Carbon Emissions Management |
| Rationale | Planned refinery and offshore developments risk embedding routine flaring, forfeiting valuable gas and emitting $CO_2$ and methane. Designing flare-reduction standards now will ensure new facilities adopt best-available technology from day one. |
| Core Intervention | Draft and adopt a **Zero-Routine-Flaring Standard** aligned with OGMP 2.0, World Bank "Zero Routine Flaring by 2030" as well as ECOWAS experience, integrate into EIA licensing, and create a flare-gas monetization incentives catalogue (e.g., CNG, LPG extraction). |
| Expected 2030 impact | • New refineries are designed with minimum flaring considerations (no impact in the modelling exercise). |
| Implementation Horizon | Start Q4 2025<br>Completion Q4 2026 |
| Indicative Budget | 30 WD × USD 1 000 = USD 30 000 |
| Lead & Partners | Petroleum Commission (lead) • National Environment Agency (NEA) • TGSB • Ministry of Finance and Economic Affairs (MoFEA) |

# Technical Detail

| | | | |
|---|---|---|---|
| Detailed Description | The standard will define allowable flare volumes, measurement methodologies (optical gas imaging, mass-balance), and reporting intervals. EIA procedures will be amended to require a flare-reduction plan and economic analysis of utilisation options. Fiscal incentives—accelerated depreciation for flare-gas recovery systems—will be catalogued for Ministry-of-Finance adoption. | | |
| Key Outputs & Milestones | Budget secured | Q1 2026 | Document online |
| | Stakeholder workshop | Q3 2026 | Minutes |
| | Standard gazetted & effective | Q4 2026 | Gazette notice |
| Critical Enablers | • International Oil Companies Corporate Social Responsibility funds,<br>• Global Gas Flaring Reduction Partnership (GGFR) expertise | | |

# Risks management analysis

| | Risks | Mitigation Measures |
|---|---|---|
| | Weak enforcement | Third-party verification |
| | Data manipulation | Satellite flare-detection (VIIRS) |
| Key Outputs & Milestones | • Annual flare-volume reports audited by Petroleum Commission<br>• Aggregate data sent to AFREC | |
| Next Immediate Steps | • Secure GGFR advisory support<br>• Engage consultant<br>• Initiate legal-gap analysis | |

## 5. Annex 1 : Detailed model inputs

This Annex is included as an embedded excel file. Please click this icon to access it.



## 6. Annex 2 : Detailed model results

This Annex is included as an embedded excel file. Please click this icon to access it.



## 7. LEAP Model



AFREC
African Energy Commission

African Union



# Location

Banjul, the capital. The specific address is Block C,
31 Bijilo Annex Layout, Kombo North District, near Banjul.