



**PRESIDENTIAL  
INITIATIVE**  
ON CLIMATE CHANGE, RENEWABLE  
ENERGY & FOOD SECURITY



SIERRA LEONE

# ENERGY TRANSITION AND GREEN GROWTH PLAN

SUPPORTED BY



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# FOREWORD

It is with immense pride that I present Sierra Leone's Energy Transition and Green Growth Plan, a blueprint for a sustainable and prosperous future. This plan represents a significant stride towards achieving universal energy access while laying the foundation for clean energy, which is essential for transformative advancement in our economy and society.

By the year 2040, we aspire for every household to have access to reliable and affordable electricity, alongside increased levels of clean cooking access. Energy is fundamental to advancing human capital, particularly in the realms of education and health. With sustainable energy powering our schools and hospitals, we can foster the growth and development of a skilled and healthy population capable of driving our nation forward. Our ambitions extend beyond merely fulfilling basic needs; we are also focused on how leapfrogging to clean energy technologies can increase agricultural productivity and create sustainable industries.

I am confident that this Energy Transition and Green Growth Plan will advance our shared vision of prosperity alongside environmental stewardship. This plan outlines how Sierra Leone can embark on a low-carbon development trajectory to become a middle-income nation by

2050. Energy will be a pivotal enabler in this endeavour. Through rapid adoption of renewable energy and energy efficiency across key sectors—including power, mining, transport, industry, and agriculture—we will reduce our reliance on fossil fuels and make significant strides in combating climate change.

The economic benefits are profound. Transitioning to clean energy will help avoid fossil fuel imports and stimulate job creation. In the coming decades, this transition is set to drive GDP growth, positioning Sierra Leone as a leader in sustainable energy solutions and industrial development. Our agro-food and mining industries will be powered by clean energy, increasing productivity, and ensuring sustainable growth. Furthermore, this transition presents vast social opportunities, fostering greater participation and development of women and youth

Looking ahead, Sierra Leone is well-positioned to become energy independent, leveraging our abundant renewable energy resources to strengthen regional energy security and drive economic growth.

Of course, achieving these outcomes will require substantial investment and collaboration. The true value of this plan lies in its clear

articulation of the concrete actions needed for success, including securing the necessary funding.

We invite our development partners, the private sector, and the international community to join us in realizing this ambitious vision. Together, we can forge a sustainable and prosperous future for all Sierra Leoneans.

**H.E. JULIUS MAADA BIO**

President of Sierra Leone



# ACKNOWLEDGEMENT

The Sierra Leone Just Energy Transition and Green Growth Plan is the result of President Julius Maada Bio's bold leadership and commitment to sustainable economic development and climate action.

His Excellency has prioritized the country's energy transition as a key enabler of economic, social, and environmental progress, notably through the creation of the Presidential Initiative on Climate Change, Renewable Energy and Food Security (PI-CREF).

The PI-CREF and the Ministry of Energy (MoE) are responsible for identifying and implementing meaningful projects that will improve energy access and energy efficiency, underpinning green economic growth. The Energy Transition and Green Growth Plan was conceived as a critical initiative for mobilizing both national and international stakeholders to drive forward Sierra Leone's energy transition.

To ensure the plan's inclusivity and success, we applied a whole-of-government approach to its development. It has been an honour for us to chair the Inter-Ministerial Committee on Energy Transition, and we would like to thank the committee's members for their dedication toward co-creating this roadmap to a sustainable future. This includes the Ministry of Energy; Ministry of Agriculture; Ministry of Planning and Economic Development; Ministry of Trade and Industry; National Minerals Agency; Ministry of Mines and Natural Resources; Ministry of Fisheries; Ministry of Environment and Climate Change; Sierra Leone Road Safety Authority; Ministry of Transport and Aviation; Electricity Distribution and Supply Authority (EDSA); Electrical Generation and Transmission Company (EGTC); Ministry of Finance; Ministry of Gender and Children's Affairs; and the Ministry of Basic and Senior Secondary Education.

The plan also benefitted from countless inputs from partners in governmental agencies, sub-national governments, academia, development institutions and

civil society. We thank them for their contributions and recognize the active and invaluable support of Sustainable Energy for All (SEforALL) under the leadership of Damilola Ogunbiyi. I would like to thank the SEforALL team comprising of Alvin Jose, Ngozi Beckley-Lines, Ioannis Pappis, Iqlima Fuqoha, Alexandros Korkovelos, Alice Uwamaliya, Anant Wadhwa, Yogitha Miriyala, Naomi Tan, Rosemary Idem, Ava Strasser, Teresa Sesay, Charles Mankhwazi and Tamojit Chatterjee for the development of this report.

I wish to also acknowledge my team at PI-CREF for their indispensable support and Anthony Kamara, Director of Partnerships, Communications and Outreach for his critical role in coordinating the work of the Inter-Ministerial Committee in collaboration with SEforALL Country Manager, Ngozi Beckley-Lines.

Overall, this plan serves as a shining example of how meaningful change can be achieved through deep collaboration, and on that note, we look forward to continuing to work with the above-mentioned partners, and others, to implement the measures detailed in this plan.



**HON. KANDEH KOLLEH YUMKELLA**

Chairman, Presidential Initiative on Climate Change, Renewable Energy and Food Security and Energy Governance Coordination Group (EGCG)



**DR. ELDRRED TAYLOR**

Deputy Minister 1, Ministry of Energy

CHAPTER ONE

# EXECUTIVE SUMMARY



# THE PATH TO A GREEN GROWTH FUTURE FOR SIERRA LEONE



## KEY MESSAGES

- 01 A green economy includes powering education, healthcare, sustainable mining, green agro-food processing, and mobility; which can be **harmoniously powered by renewable and energy efficient equipment**.
- 02 An energy transition based on Low Carbon Development supports multiple public policy objectives, such as the **Feed Salone Strategy, National Development Plan, National Electrification and Clean Cooking Strategies** and **Nationally Determined Contribution (NDC)** for Sierra Leone.
- 03 A green growth future will see a **decline in the shares of biomass and oil**, and **increases in hydropower and electricity**; except in the industry sector where gas rises.
- 04 A green growth power infrastructure will require **440 MW of mini grids and grid reinforcements** for 100% electrification by 2040, **~4.5 GW of hydro- and solar-based grid power**, and **2.5 GW for T&D** by 2050.
- 05 Almost **11 million** people to be provided with **electricity for productive use** for a green growth future.
- 06 Sierra Leone's power sector, agriculture and industries will require a total capital investment of **~6.5 Bn USD up to 2040** to fully electrify and be on the track for green growth.
- 07 **Hydropower and transmission and distribution**, at **6 billion USD and 5.5 billion USD**, respectively, will be the most significant technology investments from 2020 to 2050.
- 08 A green growth focused energy transition will require **56% more investments**, with most of the costs stemming from the transport and power sector.
- 09 Sierra Leone's energy transition & green growth plan can **double the energy sector related jobs to 29,117 by 2050** compared to BAU.
- 10 A best-practice governance structure and action plan implementation through a **centrally coordinated framework** is key for green growth in Sierra Leone.

## A GREEN ECONOMY INCLUDES POWERING EDUCATION, HEALTHCARE, SUSTAINABLE MINING, AND OTHERS; WHICH CAN BE POWERED BY RENEWABLE AND ENERGY EFFICIENT EQUIPMENT



### ⚡ ENERGY

Sustainable energy sources can enhance economic development through consolidation, improvement and expansion of existing energy supply infrastructure, reaching the nation's ambition of **100% electrification and clean cooking by 2040**

### 💧 WATER & SANITATION

By powering water pumps, efficient irrigation and clean water supply could be enabled, supporting the target of **90% safe water by 2030**

### 🌱 AGRO-FOOD INDUSTRIES

Processing, storage, and transportation can be supported by secure energy, which reduces post-harvest losses and lowers operational costs to achieve the strategic objectives of the **Feed Salone strategy**

### 📖 EDUCATION

Reliable electricity will improve learning conditions and enable access to modern educational resources, **expanding free basic and senior secondary education, and to strengthen tertiary and higher education**

### 🚲 MOBILITY & ICT

Mobility can be enhanced through electric transportation, **lowering air pollution, and improving access to remote areas**. Reliable electricity enables internet access and telecommunications expansion, to reach 50% internet penetration rate by 2030.

### 🌍 NATIONALLY DETERMINED CONTRIBUTIONS

Sustainable energy can allow Sierra Leone to achieve its long-term NDC goals for mitigating emission levels to **5% by 2025, 10% by 2030, and 25% by 2050**.

### ⚔️ SUSTAINABLE EXTRACTIVE INDUSTRIES

Reduces the environmental impact of mining operations, lowers greenhouse gas emissions, and cuts fuel costs. This **improves operational efficiency and resource management** in the long term

### ❤️ HEALTHCARE

Sustainable energy can provide security of supply to the operation of equipment, and the storage of vaccines and medications, particularly in rural areas to support the **access to critical health services**.

# AN ENERGY TRANSITION BASED ON LOW CARBON DEVELOPMENT SUPPORTS MULTIPLE PUBLIC POLICY OBJECTIVES, SUCH AS THE FEED SALONE STRATEGY, NATIONAL DEVELOPMENT PLAN AND NATIONAL DETERMINED CONTRIBUTIONS

## THE BIG FIVE

## RELATED SDGs

## CROSS-CUTTING SDGs

## FOUNDATIONAL SDG

Feed Salone



Human Capital Development



Youth Employment Scheme **500,000 new jobs**



Technology and Infrastructure



Transforming the Public Service Architecture

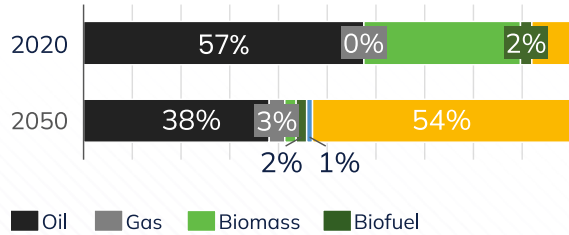




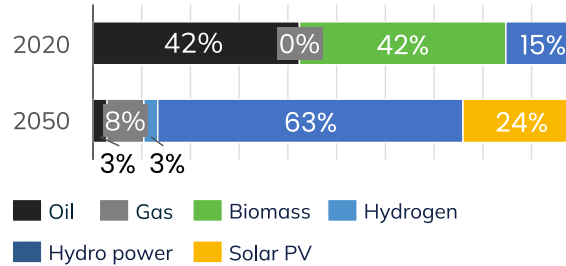
# A GREEN GROWTH FUTURE WILL SEE A DECLINE IN THE SHARES OF BIOMASS AND OIL, AND INCREASES IN HYDROPOWER AND ELECTRICITY; EXCEPT THE INDUSTRY SECTOR WHERE GAS RISES

## FUEL MIX IN PERCENTAGE

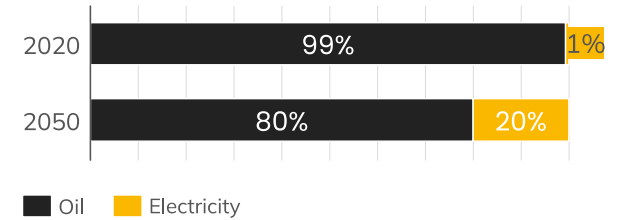
### OVERALL



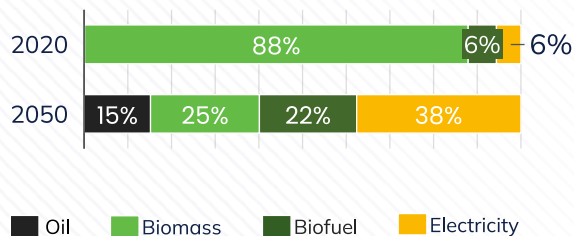
### POWER



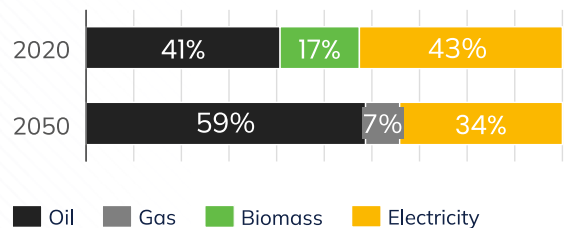
### AGRICULTURE



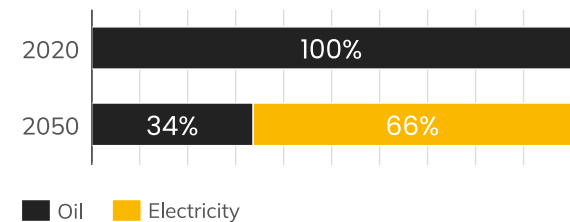
### COOKING



### INDUSTRY



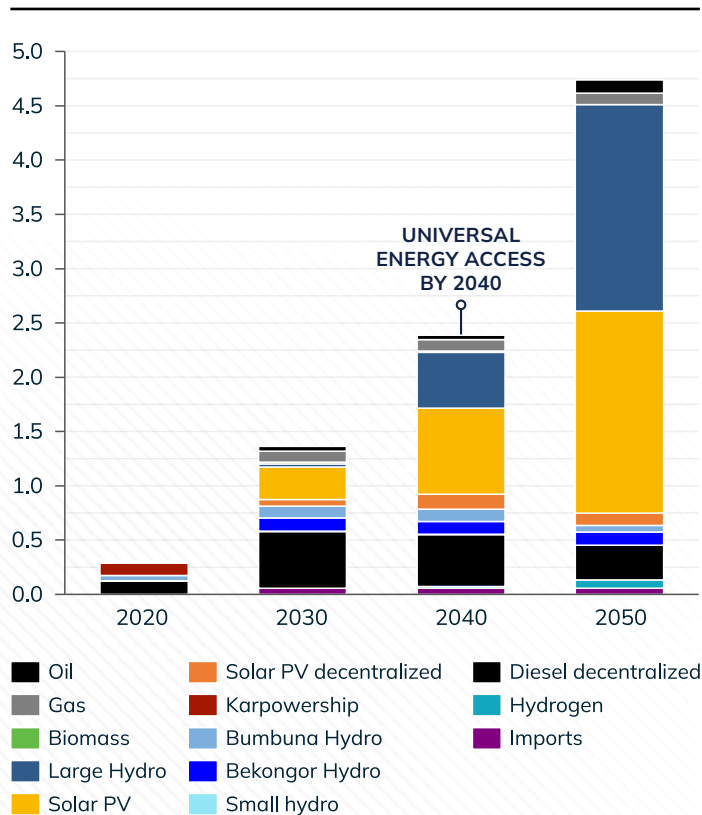
### TRANSPORT



Source: SEforALL analysis

# A GREEN GROWTH POWER INFRASTRUCTURE WILL REQUIRE 440 MW OF MINI GRIDS AND GRID STRENGTHENING FOR ACCESS, AND A GREEN GRID POWER OF ~4.5 GW AND 2.5 GW FOR T&D BY 2050

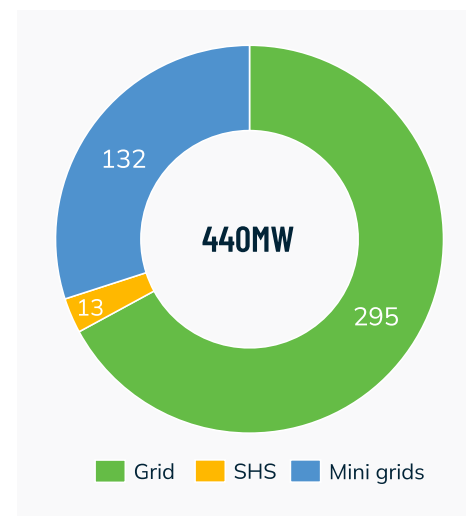
## INSTALLED CAPACITY GW



## ELECTRIFICATION BY 2040

Electricity access in residential, social infrastructure, and agriculture under green growth will require investments:

- 132 MW in hybrid solar-diesel mini-grids for settlements where rapid grid extension would take time
- 13 MW in solar home systems where grid extension is not feasible
- Densification of existing grid by 295 MW between 2024-2040 for electricity access of settlements near to grid.



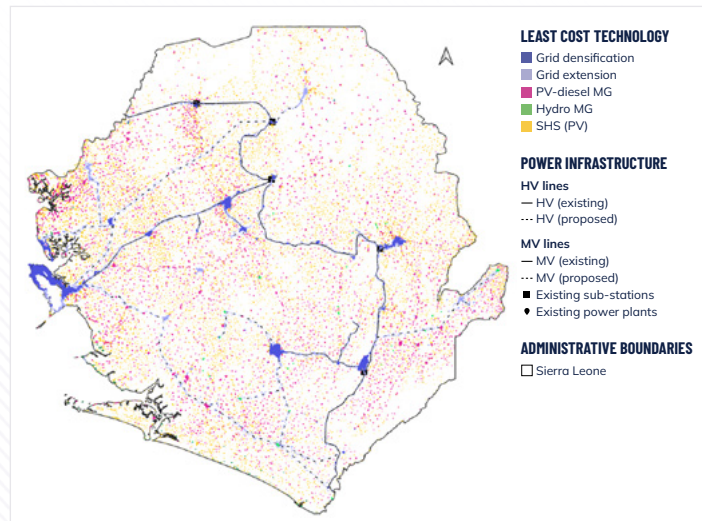
Note: decentralized solar PV and diesel includes stand-alone and minigrids  
 Sources: NODE ; OnSSET-SEforALL , MCC , Interviews with EDSA and Ministry of Energy

# ALMOST 11 MILLION PEOPLE TO BE PROVIDED WITH ELECTRICITY FOR PRODUCTIVE USE FOR A GREEN GROWTH FUTURE

## ELECTRIFICATION BY 2040

Full electrification will require additional transmission and distribution investments from 2020-2040:

- 197 MW for the residential and social-healthcare sectors
- 0.078 MW for agriculture and post-harvesting



## ELECTRIFICATION POTENTIAL

### POPULATION

- 21,076 settlements
- 1,132,680 households
- 10,821,000 people

### HEALTHCARE

- 1,052 health posts
- 331 health centres
- 53 hospitals

### EDUCATION

- 27,193 pre-primary and primary schools
- 1,298 junior and senior secondary schools






### AGRICULTURE

- 7.9 GWh for irrigation
- 316.5 GWh for post-harvest processing
- 0.2 GWh for fish processing



Sources: NODE ; OnSSET-SEforALL , MCC, Interviews with EDSA and Ministry of Energy

# SIERRA LEONE’S POWER SECTOR, AGRICULTURE AND INDUSTRIES WILL REQUIRE A TOTAL CAPITAL INVESTMENT OF USD ~6.5 BILLION UP TO 2040 TO FULLY ELECTRIFY AND BE ON TRACK FOR GREEN GROWTH

INVESTMENT, SELECTED PROJECTS		CUMULATIVE TOTAL INVESTMENT, USD Mn	
Sector	Project archetypes	2020-2040	2040-2050
 <b>Power</b>	Grids and mini-grids, renewables, battery storage, T&D (ex. residential)	4239	6647
 <b>Electricity access (distribution)</b>	Electricity access distribution costs for current and new connections	725	925
 <b>Industry &amp; Mining (distribution)</b>	Clean high-temperature heating processes	1375	760
 <b>Clean Cooking</b>	Clean cookstoves	88	61
 <b>Agriculture</b>	Generation including through mini-grid, diesel gen-sets and SHS, and distribution from grid	21	95
<b>Total</b>		<b>6,448</b>	<b>8,488</b>

## FINANCING A GREEN GROWTH PATHWAY

Sierra Leone will require approx. USD 6.5 billion up to 2040 and a cumulative total of USD 15 billion to achieve universal energy access and sustainably power various sectors to meet social and development targets in agriculture, industry and mining.




## FINANCIAL PARTNERSHIPS

Core finance providers and de-risking instruments from international institutions:

- Households and individuals
- Public institutions
- Green finance funds
- Private foundations

# HYDROPOWER, TRANSMISSION & DISTRIBUTION, AT 6 BILLION USD AND 5.5 BILLION USD, RESPECTIVELY, WILL BE THE MOST SIGNIFICANT TECHNOLOGY INVESTMENTS FROM 2020 TO 2050

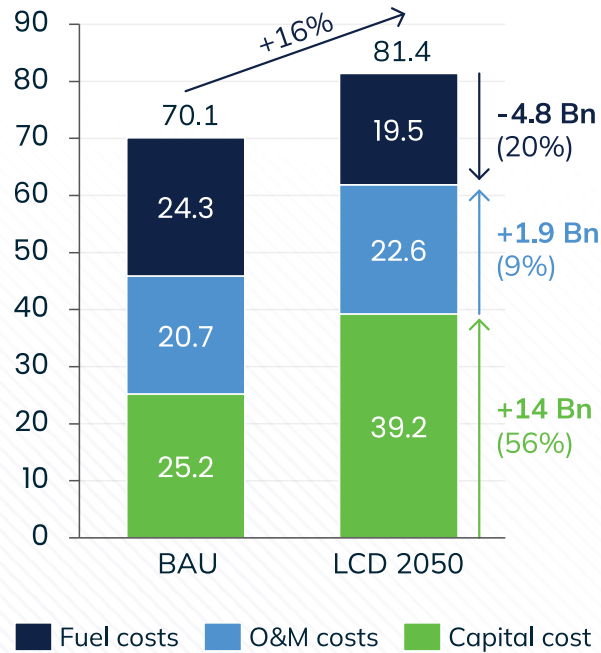
LARGEST CUMULATIVE TECHNOLOGY INVESTMENTS (2020-2050) IN KEY SECTORS M USD

 POWER	Large hydro	6,093
	Solar PV	1,481
	Transmission and distribution	5,498
 ELECTRICITY ACCESS	Solar home system	81
	Mini-grid hybrid and diesel systems	466
	Transmission and distribution	1,245
 CLEAN COOKING	Electric cookstoves	149

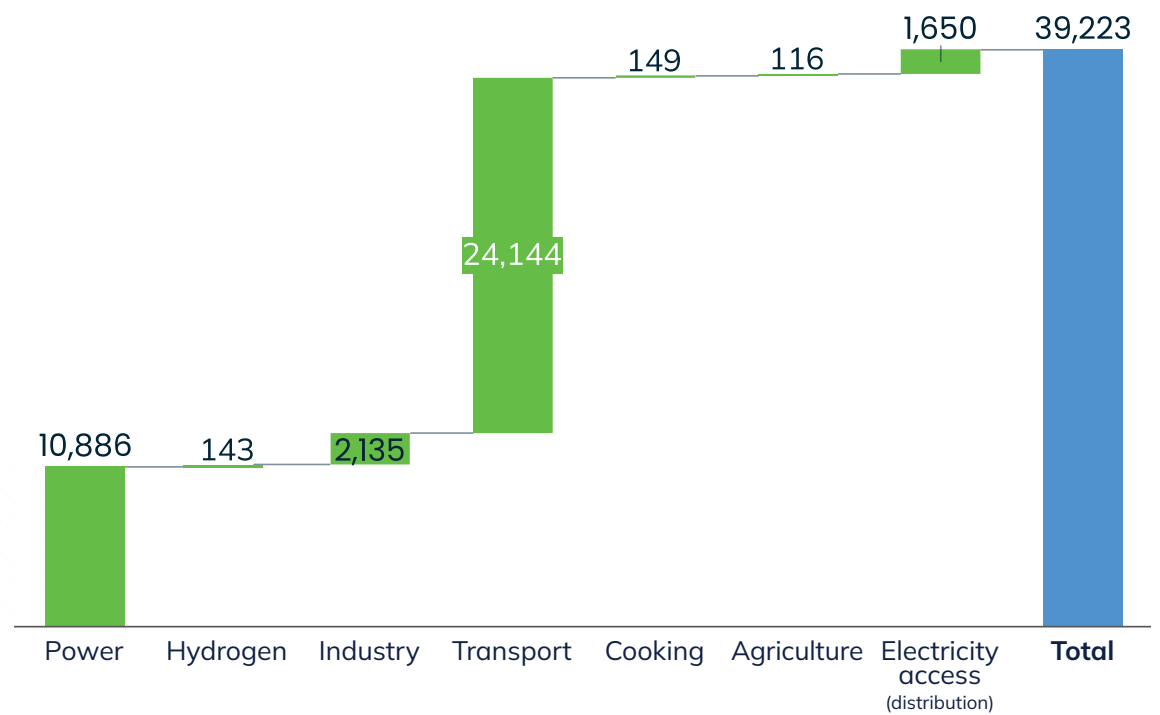


# A GREEN GROWTH FOCUSED ENERGY TRANSITION WILL REQUIRE 56% MORE INVESTMENTS, WITH MOST OF THE COSTS STEMMING FROM THE TRANSPORT AND POWER SECTORS

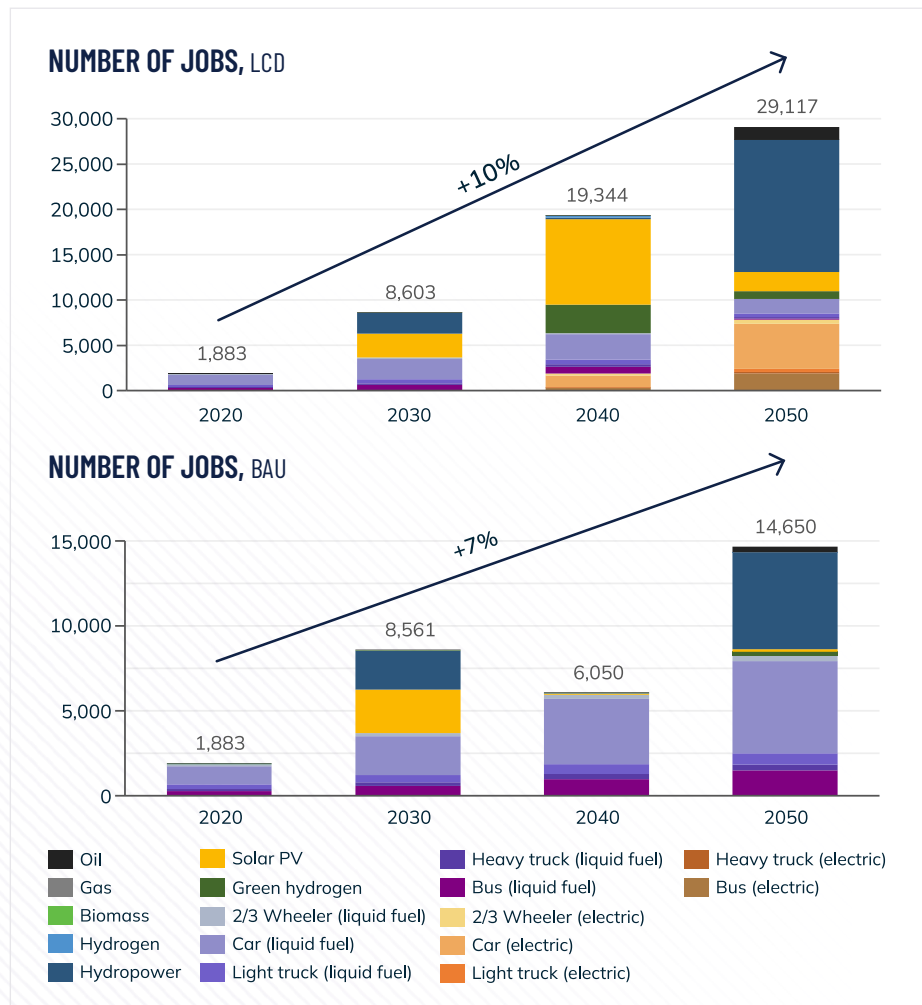
**CUMULATIVE SPENDING** BILLION USD, 2020-2050



**CUMULATIVE CAPITAL COSTS BY SECTOR** MILLION USD, 2020-2050



# SIERRA LEONE'S ENERGY TRANSITION & GREEN GROWTH PLAN CAN DOUBLE THE NUMBER OF ENERGY-SECTOR RELATED JOBS TO 29,117 BY 2050 COMPARED TO BAU

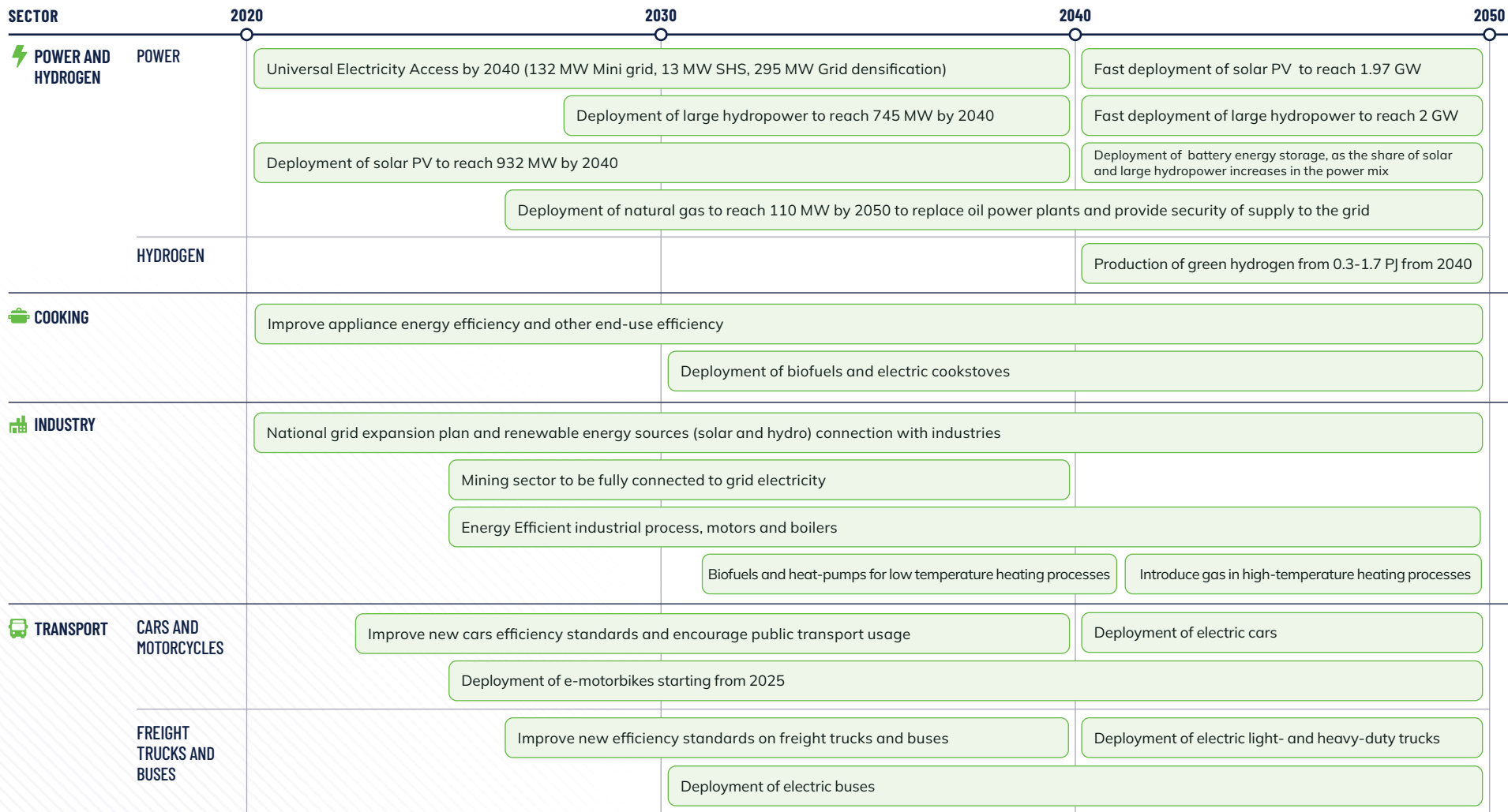


## OPPORTUNITIES FOR WOMEN AND YOUTH

- The shift towards solar, hydroelectric power and electric vehicles (EVs) needs a **skilled and educated workforce**.
- Specific opportunities for the **participation of women & youth** in the transition value chain.
- **Expansion of reliable grid access** for universal electricity access by 2040 will create employment opportunities for women & youth.
- Green growth plan identifies 7,156 potential sites for mini-grids, which can **leverage opportunities for local women & youth** for installation, maintenance and end-of-life management.



# A SET OF TECHNOLOGY TRANSITIONS SUPPORTED BY POLICY FRAMEWORKS WILL BE NEEDED TO ACHIEVE A GREEN GROWTH FUTURE





# A BEST-PRACTICE GOVERNANCE STRUCTURE AND THE IMPLEMENTATION OF AN ACTION PLAN THROUGH A CENTRALLY COORDINATED FRAMEWORK IS KEY FOR GREEN GROWTH IN SIERRA LEONE



## 01 ESTABLISH A CENTRALIZED CROSS-MINISTERIAL COORDINATION BODY (CCB)

- Empower the CCB with cross-ministerial authority to align policies and actions with the Ministry of Energy and other ministries
- Staff the CCB with experts in sustainable development, renewable energy and climate resilience

## 02 ESTABLISH A DEDICATED ENERGY PLANNING UNIT

- Create a dedicated energy planning unit within the Ministry of Energy with cross-sectoral coordination functions to sustainably build and retain modelling capacity in the long term
- Adequately staff the planning unit and support it with dedicated government funding

## 03 ENSURE PERIODIC UPDATE OF GREEN GROWTH PLAN (GGP) AND INTEGRATION IN LONG-TERM DEVELOPMENT TARGETS

- Set clear, measurable targets for renewable energy adoption, emissions reductions and sustainable resource management; align the strategy with Sierra Leone's Nationally Determined Contributions (NDCs) under the Paris Agreement
- Integrate green growth objectives into all sector-specific development plans
- Conduct a periodic review and update of GGP

## 04 FOSTER CAPACITY BUILDING AND PUBLIC AWARENESS

- Launch a nationwide green skills development programme targeting key sectors (e.g., agriculture, energy, construction)
- Integrate climate change and sustainable development into national education curricula
- Conduct regular public awareness campaigns to promote sustainable consumption and production patterns

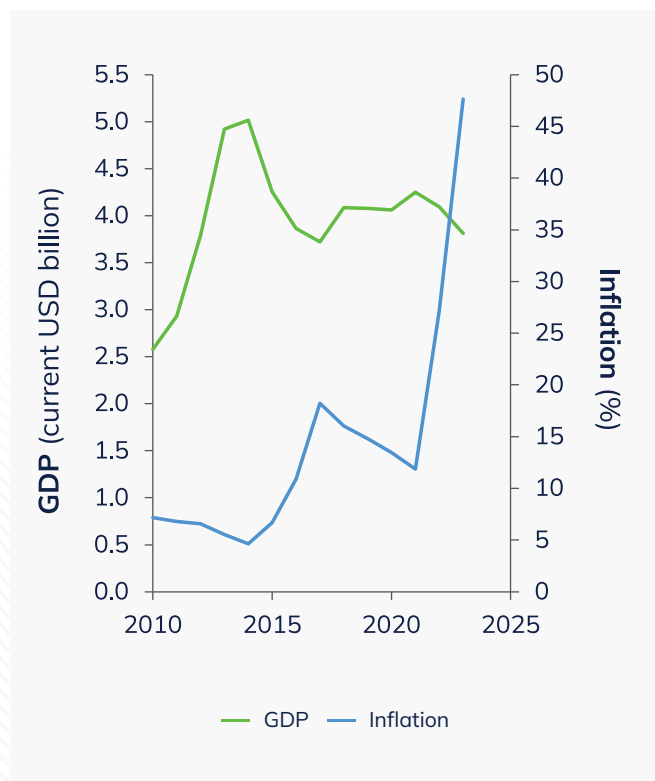
CHAPTER TWO

# CONTEXT

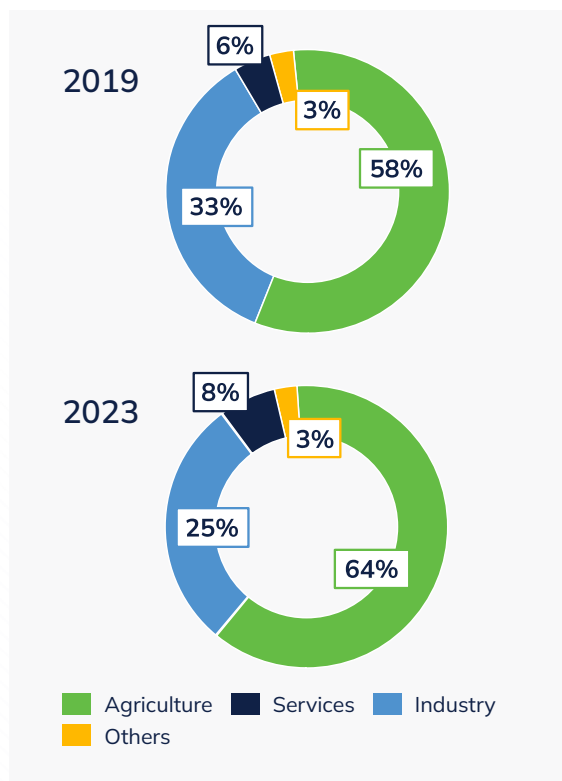


# SIERRA LEONE'S ECONOMY FACES CHALLENGES WITH HIGH INFLATION, BUT THERE IS SIGNIFICANT GDP GROWTH THAT COULD BE DRIVEN BY THE SUSTAINABLE MINING AND AGRICULTURE SECTORS

## HISTORICAL GDP AND INFLATION



## GDP SHARE BY SECTOR



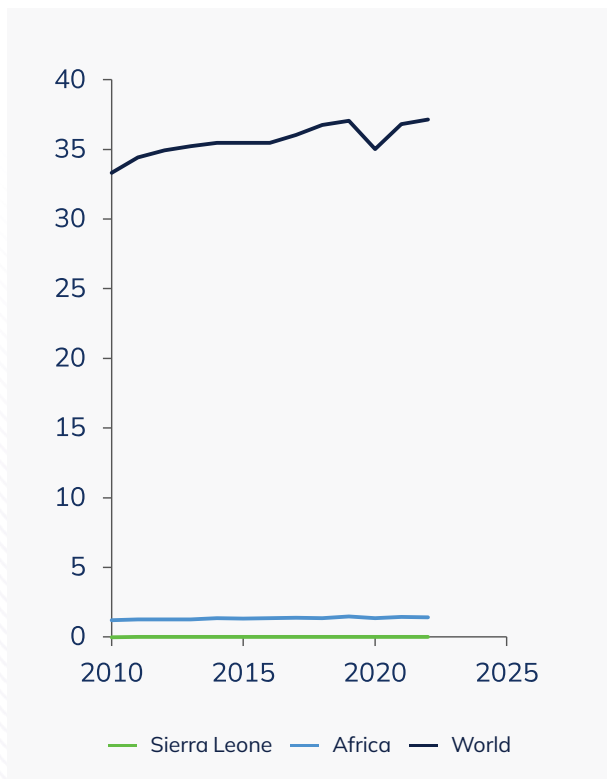
## KEY INSIGHTS

- GDP decelerated to USD 3.8 billion in 2023, driven by subdued aggregate demand and socio-political stability concerns.
- Since 2021, inflation has grown roughly 4 times to reach 47.6% in 2023. This is due to rising food and fuel prices, currency depreciation and ongoing fiscal dominance.
- Despite a decreasing GDP, the mining (industry) and agriculture sectors are prospering from the export of iron and increasing agricultural output.

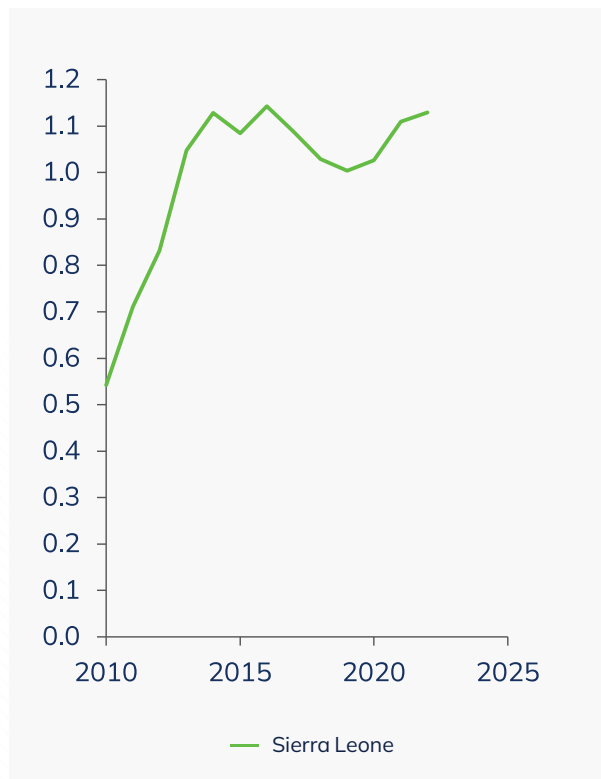
Sources: World Bank, Statistics Sierra Leone

# SIERRA LEONE IS ESTIMATED TO HAVE CONTRIBUTED 0.08% TO OVERALL AFRICAN EMISSIONS IN 2022; NONETHELESS IT CAN PLAY A KEY ROLE IN LOW-CARBON STRATEGIES

ANNUAL CO<sub>2</sub> EMISSIONS BILLION TONNES



ANNUAL CO<sub>2</sub> EMISSIONS MILLION TONNES



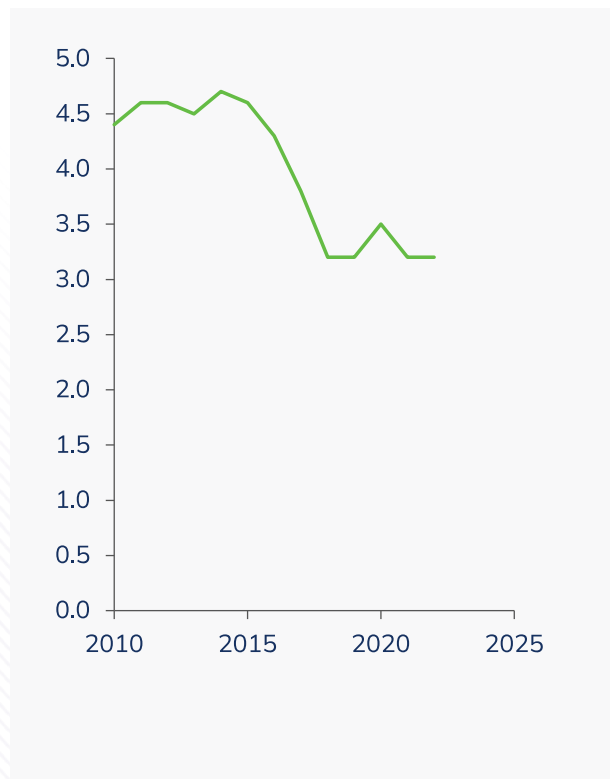
## KEY INSIGHTS

- Sierra Leone's contribution to global emissions and African emissions in 2022 is estimated to be **0.003%** and **0.08%**, respectively
- Emissions increased significantly from 2010-2014 through increasing urbanization and energy demand
- Despite its small contribution to emissions, Sierra Leone is vulnerable to climate impacts and can play a key role in low-carbon strategies

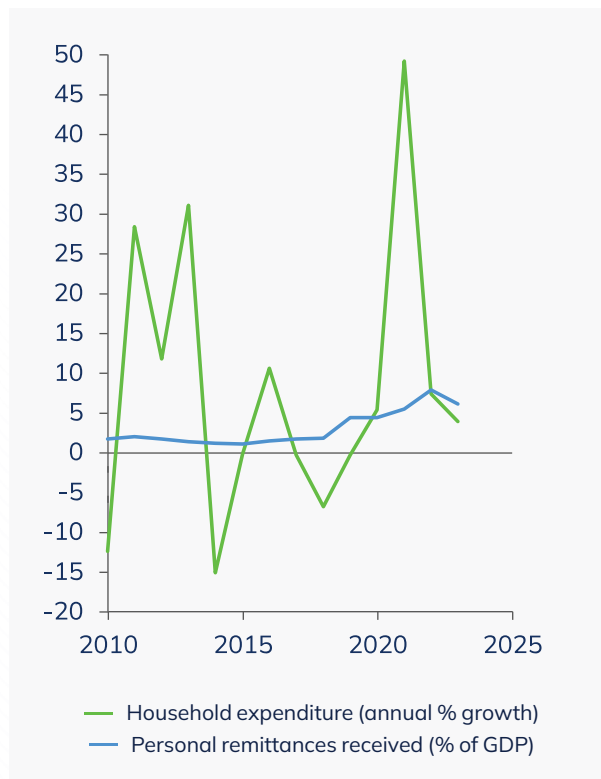
Sources: Our World in Data, 2023 (<https://ourworldindata.org/co2-emissions>)

# HOUSEHOLD EXPENDITURE AND REMITTANCES ARE KEY ECONOMIC DRIVERS, AND THERE IS A NEED TO INCREASE FORMAL EMPLOYMENT AND IMPROVE EASE OF DOING BUSINESS

**UNEMPLOYMENT % OF LABOUR FORCE**



**EXPENDITURE %**



**KEY INSIGHTS**

- The unemployment rate is roughly 3%, but underemployment and informal employment are widespread
- Household consumption is growing by approximately 4% annually, reflecting a significant driver of economic activity
- Personal remittances received are about 6% of GDP, and play a crucial role in supporting households and providing economic stability
- On the Ease of Doing Business Index, Sierra Leone ranks 163rd out of 190 countries

Sources: World Bank, 2023 (<https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS?locations=SL>, <https://data.worldbank.org/indicator/BX.TRF.PWKR.DT.GD.ZS?locations=SL>, <https://data.worldbank.org/indicator/NE.CON.PRVT.KD.ZG?locations=SL>)

# SIERRA LEONE FACES MULTIPLE CHALLENGES THAT MAY LIMIT SOCIO-ECONOMIC PROGRESS AND ACCESS TO ESSENTIAL SERVICES; LOW CARBON ENERGY SYSTEMS CAN HELP IN OVERCOMING THESE KEY BARRIERS



## EDUCATION

There is a net enrollment rate of **~98% for primary** school, but a low rate of **~42% for secondary** school. This may be due to factors such as poverty, inadequate energy infrastructure and teacher shortages.

## HEALTHCARE

Limited resources and infrastructure along with a lack of reliable electricity supply means there is a high maternal mortality rate of **~443 deaths per 100,000 live births** and only **~10 physicians per 100,000 people**.

## AGRICULTURE

**~75% of the population** is employed in the agriculture sector, which contributes to **~64% of the nation's GDP**. However, the sector faces low productivity due to lack of sustainable crop management, and energy and water inputs. The sector is also vulnerable to climate shocks.

## INDUSTRY

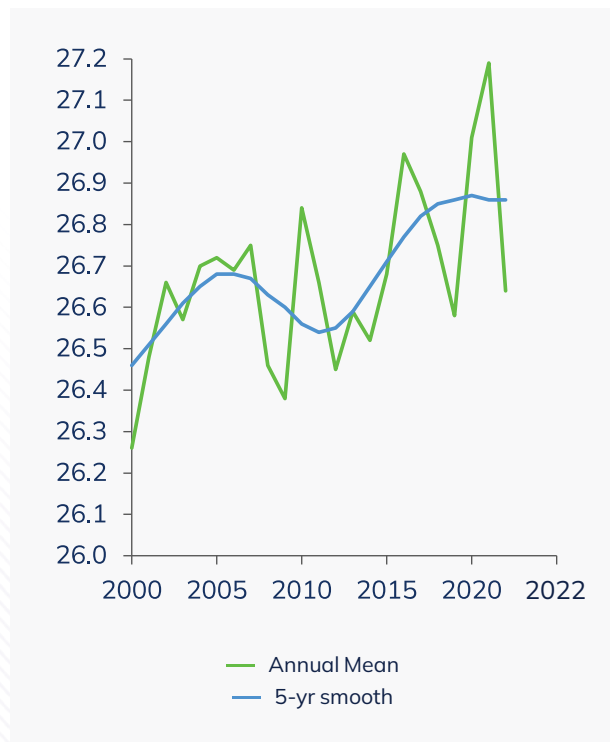
Dominated by mining and quarrying, the sector contributes **~67% of export earnings**. Key exports are diamonds, rutile and iron ore, but this is challenged by fluctuating commodity prices and inadequate energy infrastructure.

## MOBILITY

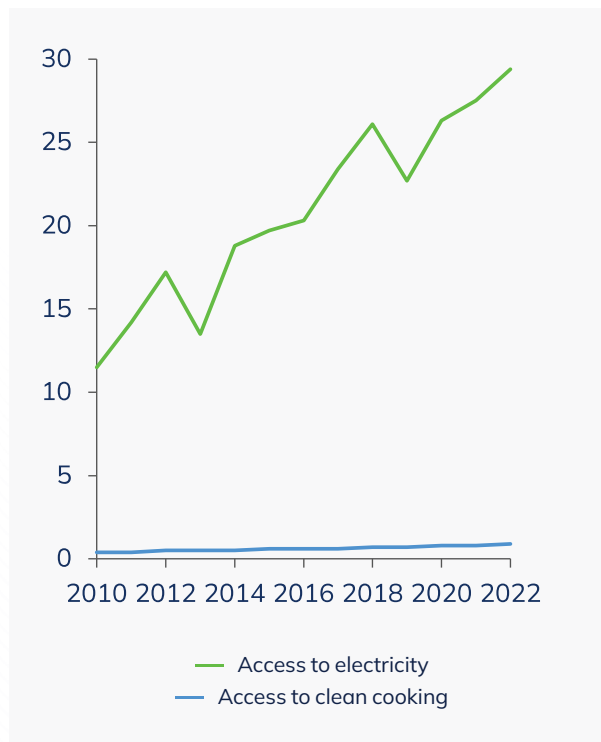
The sector is underdeveloped, with only **~9% of roads paved** and limited public transport options, which impacts economic activities and access to services across the country.

# THE NATION IS VULNERABLE TO CLIMATE CHANGE, WHICH CAN AFFECT AGRICULTURE PRODUCTION AS WELL AS ENERGY ACCESS

**OBSERVED AIR TEMPERATURE °C**



**ENERGY ACCESS % OF POPULATION**



**KEY INSIGHTS**

- The average temperature is rising, contributing to increased heatwaves and altering seasonal weather patterns, which can affect the public’s health and agriculture production
- **Only ~30% (2022)** of the population had access to electricity, with urban areas having better access than rural regions
- **Only ~1%** of the population has access to clean cooking, but traditional biomass fuel dominates the sector
- The energy mix is predominantly based on hydroelectric power and biomass

Sources: World Bank, IEA

# THERE IS AN OPPORTUNITY FOR A JUST AND EQUITABLE ENERGY TRANSITION IN LINE WITH THE 2024-2030 NATIONAL DEVELOPMENT PLAN OF SIERRA LEONE



## 📖 IMPROVING EDUCATION

**Reliable and accessible electricity enables** extended learning hours, access to digital resources and better classroom conditions, thereby strengthening the education sector.

## ❤️ IMPROVING HEALTHCARE

**Secure and clean power** ensures reduced air pollution, refrigeration for vaccines and uninterrupted clinical services for a responsive health care system.

## 🌿 IMPROVING FOOD SECURITY

**Sustainable energy can power irrigation systems**, storage facilities and processing units to increase agricultural productivity and reduce post-harvest losses, in line with the self-sufficient & secure plan by 2030 as per the national **Feed Salone Strategy**.

## 🧑‍🦯 EMPOWERING WOMEN, YOUTH & THE DISABLED

Reliable electricity can improve access to digital tools and communication, and **enhance opportunities for economic activities, jobs and health services for women, youth and the disabled**.

## 🌿 ENVIRONMENT, CLIMATE & BIODIVERSITY

Sustainable energy reduces reliance on biomass fuels, decreasing deforestation and greenhouse gas emissions, mitigating climate change, protecting natural habitats and **supporting the NDC commitments**.



CHAPTER THREE

# DRIVERS OF A GREEN GROWTH FUTURE



# AN ENERGY TRANSITION BASED ON LCD SUPPORTS MULTIPLE PUBLIC POLICY OBJECTIVES, SUCH AS THE FEED SALONE STRATEGY, THE NATIONAL DEVELOPMENT PLAN AND SIERRA LEONE'S NATIONALLY DETERMINED CONTRIBUTIONS (NDCs)

**THE BIG FIVE**

**RELATED SDGs**

**CROSS-CUTTING SDGs**

**FOUNDATIONAL SDG**

Feed Salone



Human Capital Development



Youth Employment Scheme **500,000 new jobs**



Technology and Infrastructure



Transforming the Public Service Architecture



# A GREEN ECONOMY MEANS POWERING EDUCATION, HEALTHCARE, SUSTAINABLE MINING AND OTHER INDUSTRIES WITH RENEWABLE AND ENERGY-EFFICIENT EQUIPMENT



## ⚡ ENERGY

Sustainable energy sources can enhance economic development through consolidation, improvement and expansion of existing energy supply infrastructure, reaching the nation’s ambition of **100% electrification and clean cooking by 2040**

## 🚲 MOBILITY & ICT

Mobility can be enhanced through electric transportation, **lowering air pollution**, and **improving access to remote areas**. Reliable electricity enables internet access and telecommunications expansion, to reach 50% internet penetration rate by 2030.

## 💧 WATER & SANITATION

By powering water pumps, efficient irrigation and clean water supply could be enabled, supporting the target of **90% safe water by 2030**

## 🌍 NATIONALLY DETERMINED CONTRIBUTIONS

Sustainable energy can allow Sierra Leone to achieve its long-term NDC goals for mitigating emission levels to **5% by 2025, 10% by 2030, and 25% by 2050**.

## 🌱 AGRO-FOOD INDUSTRIES

Processing, storage, and transportation can be supported by secure energy, which reduces post-harvest losses and lowers operational costs to achieve the strategic objectives of the **Feed Salone Strategy**

## ⚔️ SUSTAINABLE EXTRACTIVE INDUSTRIES

Reduces the environmental impact of mining operations, lowers greenhouse has emissions, and cuts fuel costs. This **improves operational efficiency and resource management** in the long term

## 📖 EDUCATION

Reliable electricity will improve learning conditions and enable access to modern educational resources, **expanding free basic and senior secondary education, and to strengthen tertiary and higher education**

## 🏥 HEALTHCARE

Sustainable energy can provide security of supply to the operation of equipment, and the storage of vaccines and medications, particularly in rural areas to support the **access to critical health services**.

# MULTIPLE PATHWAYS WERE EXPLORED TO ASSESS THE ENERGY TRANSITION & GREEN GROWTH FUTURE OF SIERRA LEONE

## **🕒 BUSINESS-AS-USUAL (BAU) SCENARIO**

- Universal electricity access is achieved by 2040, but sustainable energy sources may not be utilized or are not prioritized.
- The objective is to reach about USD 5,000/capita by 2050. Demand for energy and activity is based on the GDP per capita growth and population forecasted.
- The energy demand to achieve this GDP growth is met through technologies that are available at current costs and market maturity and are installed based on least-cost deployment.
- Energy Efficiency is not prioritized due to a lack of a robust action plan.
- Cooking demand is met but clean technologies are not prioritized.
- No carbon emission constraints.
- Mining sector not to be fully grid connected by 2030.
- Feed Salone Strategy is not considered.

## **🌱 FOUNDATIONS OF A GREEN GROWTH PATHWAY**

- **Universal electricity access and clean cooking are achieved by 2040 mainly through sustainable energy.**
- Human capital investments in **education and health would be powered through sustainable energy.**
- **A low carbon or net-zero emissions pathway** supported by accelerated adoption through **renewable energy** and **energy efficiency** throughout the key sectors: power, buildings, transport, industry and agriculture.
- **Macro-economic benefits such as debt relief/ fossil fuel imports avoided, GDP added and job creation** through sustainable energy technology mix in the next 2-3 decades.
- **Industrial growth** will be driven through sustainable energy sources to drive the **agro-food and sustainable extractive industries (mining).**
- **Potential for country to become a low-carbon electricity exporter** in the upcoming decades.



Green Growth scenarios that can be explored to assess the technology, investment needs and the cost-benefits:

### **LOW CARBON DEVELOPMENT SCENARIO (LCD 2050)**

- Same development objectives as BAU
- Aligned with **current policies** (Feed Salone Strategy, capacity expansion)
- Mining sector to be fully grid connected by 2030

### **PARIS-ALIGNED DEVELOPMENT SCENARIO (PAD 2050)**

- Same development objectives as LCD 2050
- **Net-zero emissions goal by 2050** with opportunities to peak emissions

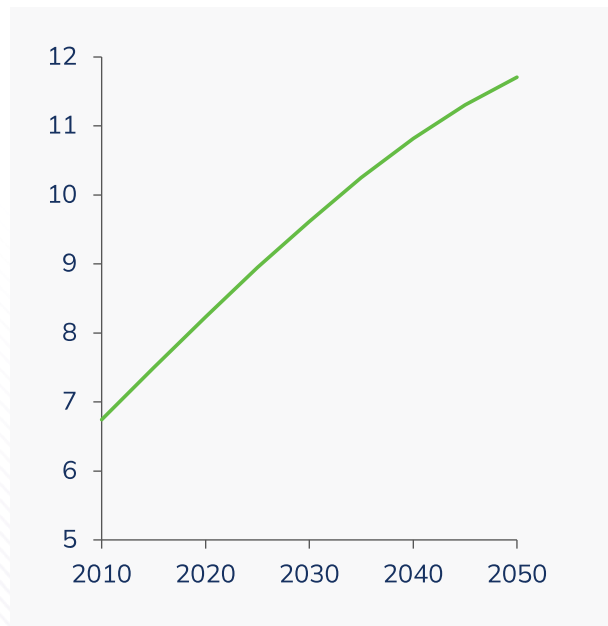
### **ACCELERATED PARIS-ALIGNED DEVELOPMENT SCENARIO (APAD 2040)**

- Same development objectives as LCD 2050
- **Accelerated net-zero emissions goal by 2040** with opportunities to peak emissions earlier

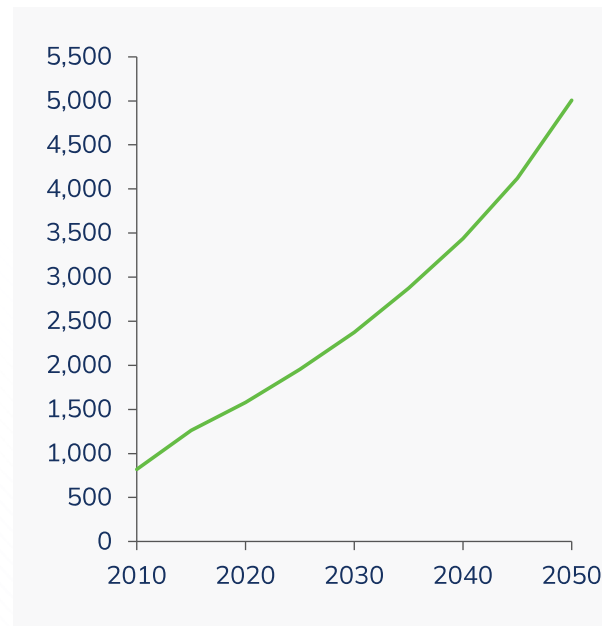
Source: SEforALL analysis

# ENERGY DEMAND AND EMISSIONS WILL BE DRIVEN BY POPULATION AND ECONOMIC GROWTH

**POPULATION GROWTH** MILLION



**GDP PER CAPITA GROWTH** USD/CAPITA



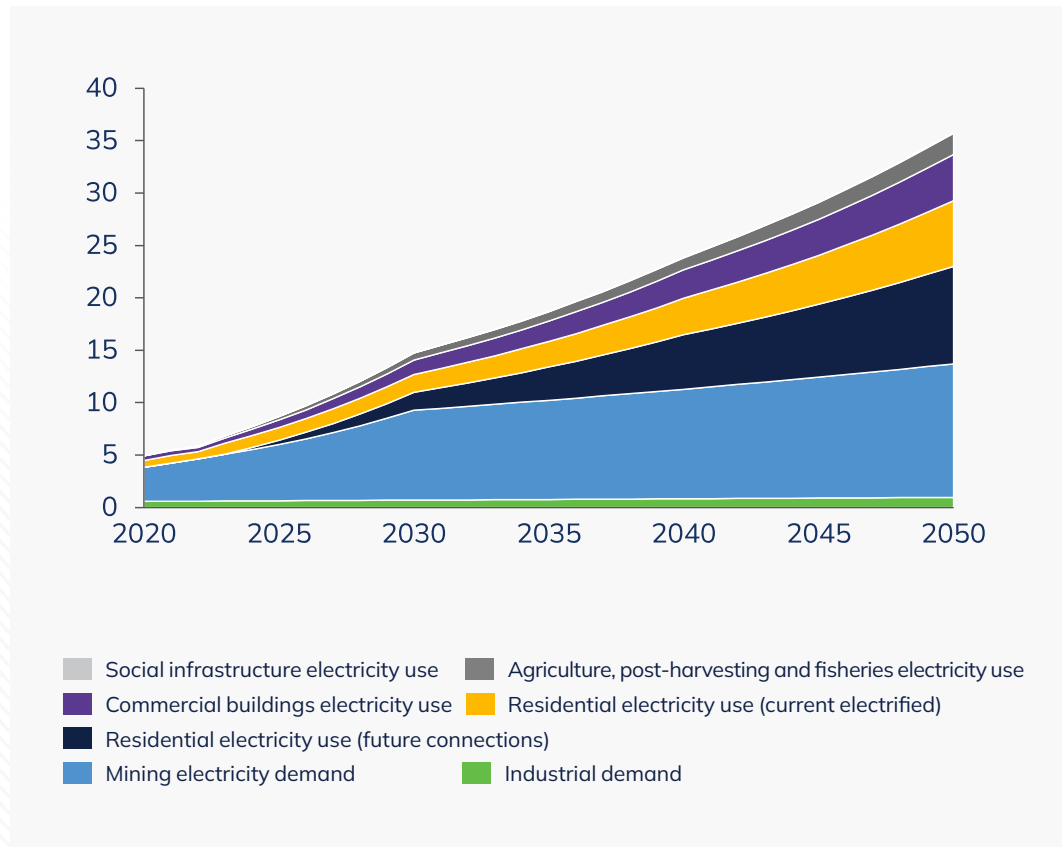
**KEY INSIGHTS**

- Sierra Leone is expected to reach around USD 5,000 per capita by 2050 to move from being a least developed country\* to a lower- middle income developing country.
- GDP per capita and population is expected to keep growing steadily and increase the energy per capita demand
- The growth will be aligned with the SSP1 scenario considering Sierra Leone’s current macroeconomic context

Sources: IIASA, SSP1. GDP|PPP/capita, USD 2015  
 \*Country classification as per UN definition

# ELECTRICITY DEMAND IS EXPECTED TO INCREASE, DRIVEN BY NEW CONNECTIONS FOR UNDERSERVED REGIONS AND RISING DEMAND FROM COMMERCIAL BUILDINGS, MINING AND AGRO-FOOD PROCESSING INDUSTRIES

## ELECTRICITY DEMAND FOR ALL SECTORS PETAJOULES/PJ







## KEY INSIGHTS

- **Electricity demand** growth is driven by GDP growth to achieve US\$ 5000 per capita and is **expected to grow by 7 times by 2050**.
- **Mining sector takes the major share of electricity demand**, driven by demand towards the mineral extraction process and exports.
- **Residential electricity demand takes the second largest**

## UNDERLYING ASSUMPTIONS

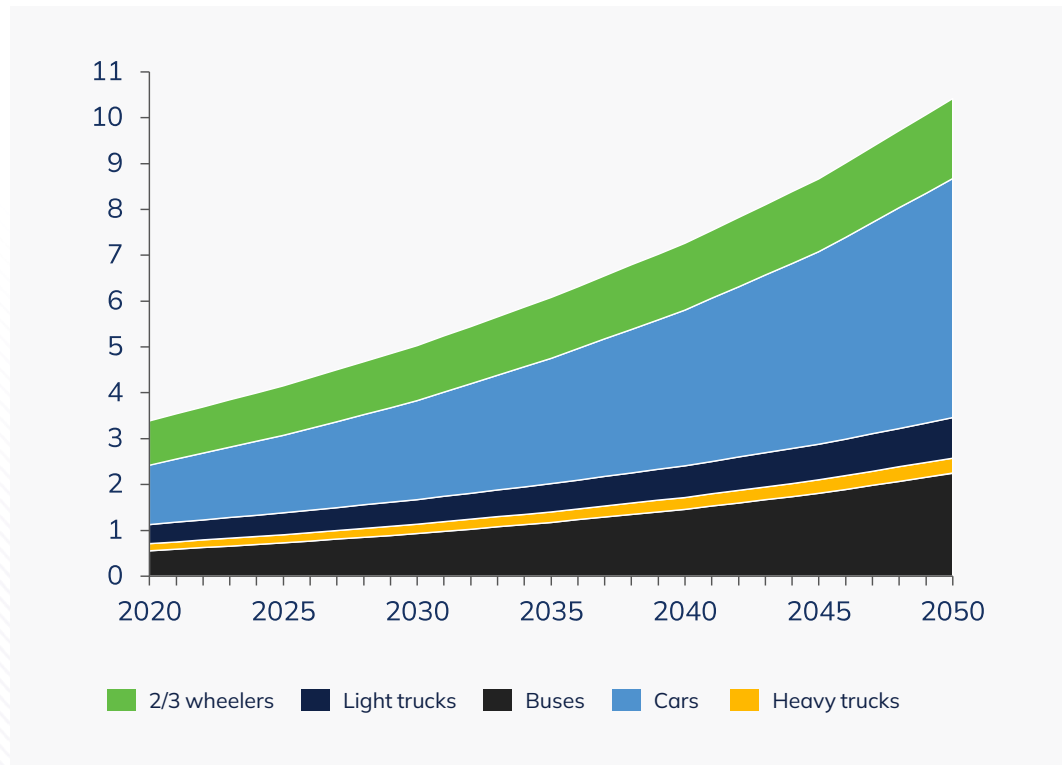
- For this economic growth, the future electricity connections in urban households are assumed to consume on average 780 kWh/year/household (tier 3), and those in rural households are assumed to consume on average 226 kWh/year/household (tier 2) by 2040.
- For current electricity connections, urban household demand is expected to be 1,812 kWh/year/household (tier 4), and rural demand is assumed to be 699 kWh/year/household (tier 3) by 2040.

# ENERGY ACCESS DEMAND IS EXPECTED TO INCREASE IN THE LCD SCENARIO, MAINLY DRIVEN BY POST-HARVEST PROCESSING IN THE AGRICULTURE SECTOR, AND IN THE RESIDENTIAL AND SOCIAL INFRASTRUCTURE SECTORS

2020	 AGRICULTURE	 SOCIAL INFRASTRUCTURE	 RESIDENTIAL
2025	<ul style="list-style-type: none"> <li>• With BAU, demand is projected to be just <b>2.7 GWh</b> in 2028.</li> <li>• With LCD, demand rises significantly, reaching an estimated <b>166.8 GWh</b> annually by 2028 to meet the <b>Feed Salone Strategy goals</b>.</li> <li>• This significant increase is driven primarily by the needs of post-harvest processing facilities, which increase from <b>1.9 GWh under BAU to 162.5 GWh under LCD</b>.</li> <li>• Agriculture electricity needs are projected to reach <b>324.7 GWh by 2040</b>:                             <ul style="list-style-type: none"> <li>• <b>7.9 GWh</b> for irrigation</li> <li>• <b>316.5 GWh</b> for post-harvest processing</li> <li>• <b>0.2 GWh</b> for fish processing</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• With BAU and LCD, electricity demand is projected to be <b>13.4 GWh in 2040</b> <ul style="list-style-type: none"> <li>• 5.7 kWh/day/facility for <b>health posts</b></li> <li>• 13.9 kWh/day/facility for <b>health centres</b></li> <li>• 37 kWh/day/facility for <b>hospitals</b></li> <li>• 2 kWh/day/facility for <b>pre- &amp; primary schools</b></li> <li>• 7.7 kWh/day/facility for <b>junior &amp; secondary schools</b></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• With BAU and LCD, electricity demand for <b>current electrified households</b> is projected to be <b>971 GWh in 2040</b></li> <li>• With BAU and LCD, electricity demand for <b>new customers</b> (future household connections) is projected to be <b>1,429 GWh in the same year</b></li> </ul>
2030			
2035			
2040			
2045			
2050			
			

# ROAD TRANSPORT-RELATED ACTIVITY IS EXPECTED TO TRIPLE, MAINLY DRIVEN BY NEW CARS AS OWNERSHIP INCREASES WITH THE COUNTRY'S GROWTH IN GDP

**ROAD TRANSPORT DEMAND PER MODE** BILLION VEHICLE KILOMETER/B-VKM



## KEY INSIGHTS

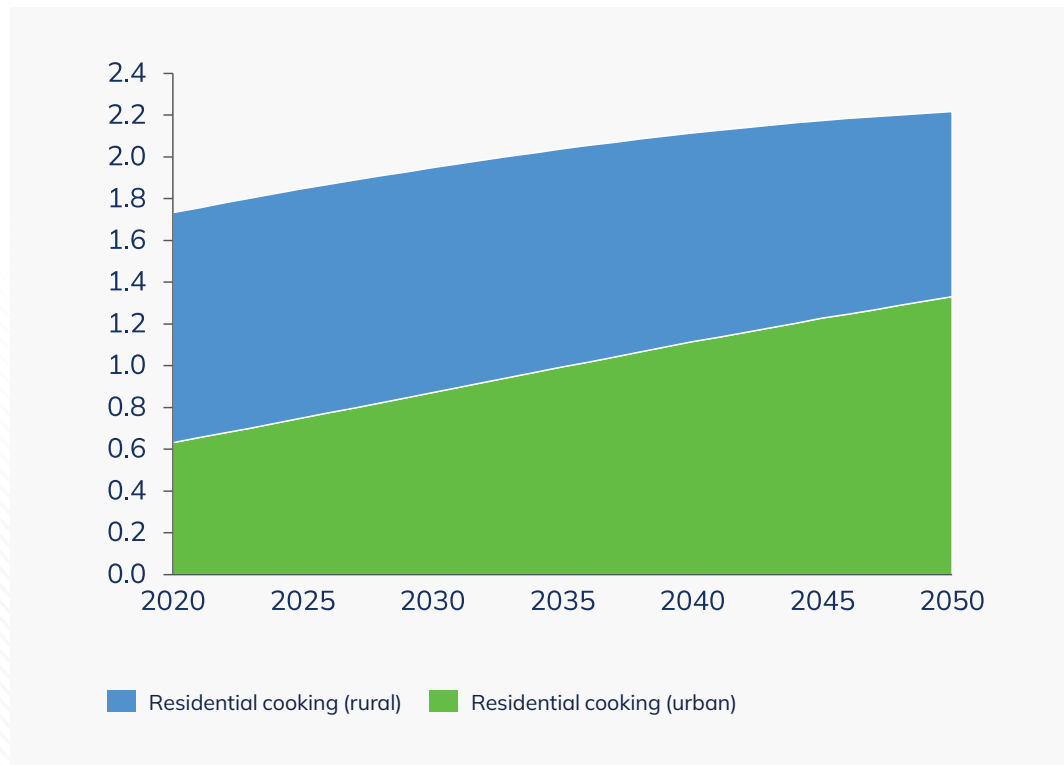
- An increase in demand in the road transport sector is linked to GDP growth, which is expected to **grow by 3 times by 2050**.
- Private car ownership accounts for the largest demand in the transport sector, driven by increased ownership as disposable income increases.
- There is also a significant increase in public transport (buses) with around 8 times growth by 2050.
- Any increase in industrialization and commerce will increase the need for freight trucking in the country.

Sources: Sierra Leone Road Safety Authority (2020) and SEforALL analysis



# COOKING DEMAND IS EXPECTED TO INCREASE IN LINE WITH AN INCREASE IN THE POPULATION

## COOKING DEMAND PJ



## KEY INSIGHTS

- An increase in demand in the cooking sector is linked to population growth in urban and rural areas, which is expected to grow by 1.3 times by 2050.
- Overall rural cooking demand decreases due to rural migration to urban areas.
- In 2020, traditional biomass and biofuels are the main cooking fuels in urban areas, at 76% and 23%, respectively.
- Rural areas are served by 99% traditional biomass due to the affordability issue connected to the higher costs of other fuels.

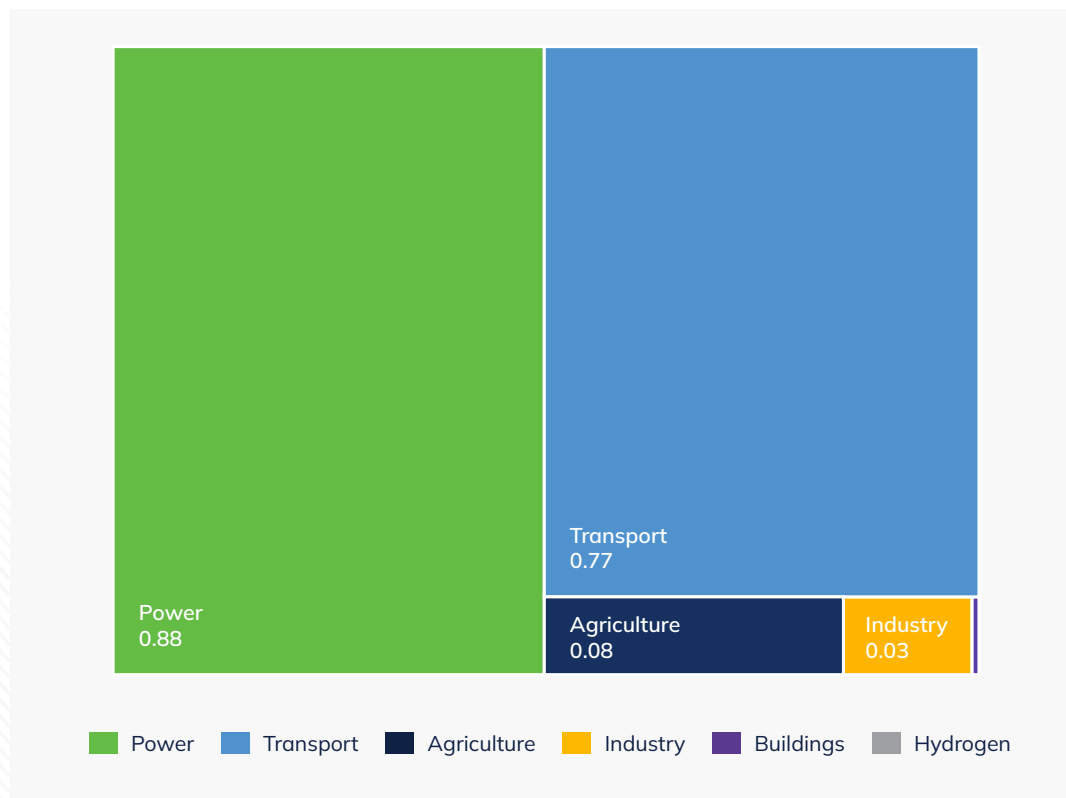
CHAPTER FOUR

# GREENHOUSE GAS EMISSIONS



# POWER AND TRANSPORT CONTRIBUTED TO MOST OF THE ENERGY-RELATED CO<sub>2</sub> EMISSIONS IN 2020, AT ROUGHLY 94%

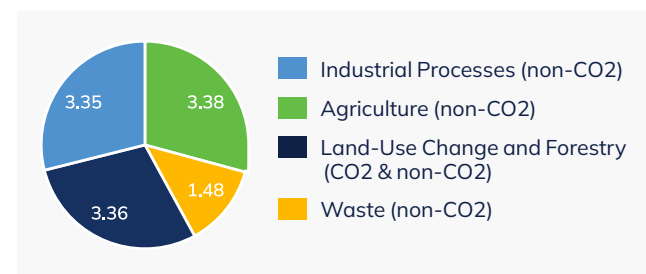
GREENHOUSE GAS EMISSIONS PER SECTOR, 2020 MT CO<sub>2</sub>E



## KEY INSIGHTS

- 1.8 Mt CO<sub>2</sub>e come from energy-related emissions, with around 94% of from power and transport sectors alone.
- 11.6 Mt CO<sub>2</sub>e come from non-energy including both CO<sub>2</sub> and non-CO<sub>2</sub> emissions, mainly livestock, managed soils, waste, and LUCF – out of scope of this plan.
- LULUCF emissions, almost composed of only CO<sub>2</sub> emissions, have a strong linkage with deforestation due to biomass use for cooking in buildings.

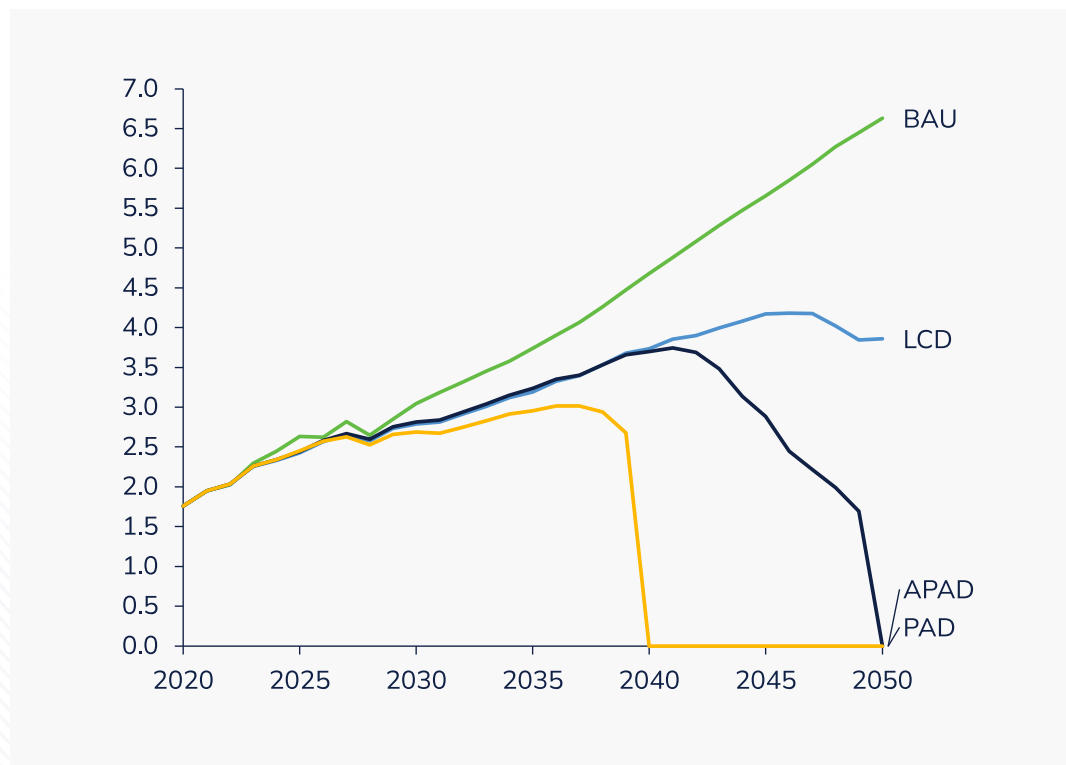
OUT OF SCOPE/NOT MODELLED EMISSIONS MT CO<sub>2</sub>E



Source: SeforALL analysis, [Climate Watch Historical Emissions](#)

# CO<sub>2</sub> EMISSIONS WILL GROW BY 3.7X FROM 2020 TO 2050 IN THE BAU SCENARIO, AND A LOW CARBON DEVELOPMENT TRAJECTORY WOULD ABATE EMISSIONS BY 41%

## CO<sub>2</sub> EMISSIONS TRAJECTORY MT CO<sub>2</sub>E



## KEY INSIGHTS

- **Total CO<sub>2</sub>** emissions will grow from 1.8 Mt in 2020 to 6.6 Mt (**BAU**) and 3.9 Mt (**LCD**) in 2050. The emissions peak in 2046.
- The higher share of renewable energy in the power sector and sustainable technologies in the end-use sectors decrease emissions in **LCD** compared to BAU.
- In **PAD (2050)**, emissions need to peak by 2040 and then reach to 0 emissions by 2050 through increasing RET deployment
- In **APAD (2040)**, emissions need to peak by 2036 and start declining after reaching to 0 by 2040, due to higher penetration of electric cars and RET.

## UNDERLYING ASSUMPTIONS

- No diesel stand-alone investments are allowed in LCD, PAD, APAD from 2030 onwards.
- The mining sector will be fully grid connected by 2030 in LCD, PAD, APAD
- Electric cars will penetrate the mix in LCD, PAD, APAD
- Agriculture production will grow by 7% annually in the future in LCD, PAD, APAD

Source: SEforALL analysis, [Climate Watch Historical Emissions](#)

## THE LOW CARBON DEVELOPMENT SCENARIO ALIGNS WITH THE CURRENT NATIONAL POLICIES AND PAVES A PRACTICAL AND SUSTAINABLE FUTURE FOR SIERRA LEONE



### THE LOW CARBON DEVELOPMENT (LCD 2050) SCENARIO HAS MULTIPLE BENEFITS:



The LCD 2050 builds on Sierra Leone's existing energy policies and commitments, such as the **Feed Salone Strategy, National Development Plan**, the **mining sector to be fully grid connected by 2030**, and other major strategies for the energy sector such as **national electrification** and **clean cooking strategy** and ongoing energy sector investments.



The LCD **supports economic growth** while shifting to low-carbon energy sources, as well as **promoting energy access** and the transition technologies would **support higher NDC goals**.



The LCD encourages renewable energy and the modernization of energy infrastructure and allows a smooth **peak of emissions by 2040** and decline towards 2050 for **cumulative 41 % of emissions reductions** from the energy sector.



The LCD considers both **environmental** and **socio-economic factors**, allowing a smooth, adaptable, and just transition without significant short-term economic impacts compared to PAD and APAD scenarios.

CHAPTER FIVE

# BUSINESS AS USUAL SCENARIO



# SIERRA LEONE’S POWER SECTOR FACES VARIOUS CHALLENGES, BUT ALSO OPPORTUNITIES, DRIVEN BY A SERIES OF POLICY REFORMS AIMED AT ENHANCING ENERGY ACCESS AND SUSTAINABILITY

## UNDER BAU, SIERRA LEONE FACES VARIOUS CHALLENGES ASSOCIATED WITH THE ENERGY SECTOR

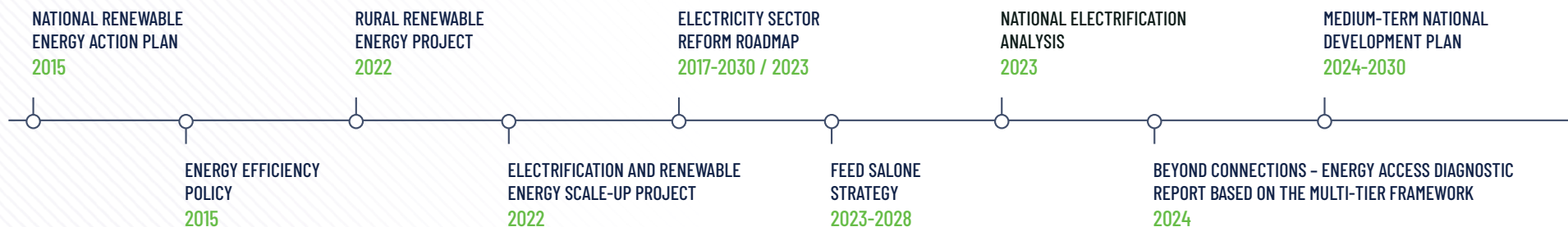
- |  |  |
|--|--|
| <p><b>01</b> Low electricity access levels (35% in 2023)</p>   | <p><b>03</b> Non-existent fossil fuel reserves</p>   |
| <p><b>02</b> High transmission and distribution losses (45% in 2023) leading to an unreliable grid</p> | <p><b>04</b> Not enough power capacity to meet the growing energy demand especially in the mining sector</p> |

## SUSTAINABLE ENERGY IS IMPERATIVE FOR SIERRA LEONE TO ACHIEVE:

- Universal electricity access by 2040
- Growing electricity demand (10 TWh in 2050)
- Energy security from global oil/gas price shocks

This will be key to reaching US\$ 5,000 per capita by 2050, that would be primarily driven by its industrial growth, particularly by the agro-food industries and a sustainable mining sector.

## THE GOVERNMENT HAS IMPLEMENTED VARIOUS POLICY REFORMS TO PROMOTE RENEWABLES AND ENERGY EFFICIENCY :



# THE CHALLENGES AND OPPORTUNITIES IN SIERRA LEONE'S POWER SECTOR HAVE ATTRACTED SUPPORT FROM SEVERAL INTERNATIONAL DONORS AND FINANCIAL INSTITUTIONS



## CHALLENGES

- Significant portion of electricity is generated from oil which is expensive and subject to international price fluctuations affecting the country's energy security.
- Untapped renewable potential due to financial resources and infrastructure challenges.
- Limited funding for infrastructure development and maintenance and high operational costs.
- National grid is underdeveloped with 46% distribution losses, especially in rural areas where electricity access is around 16% (2024), making grid expansion and rural electrification a challenge.

## OPPORTUNITIES

- Significant Hydropower potential (3.8 GW)
- Good solar radiation (1.8 GW) suitable particularly in remote and off-grid areas
- Onshore wind potential (131 MW)
- Biomass potential (587 MW)

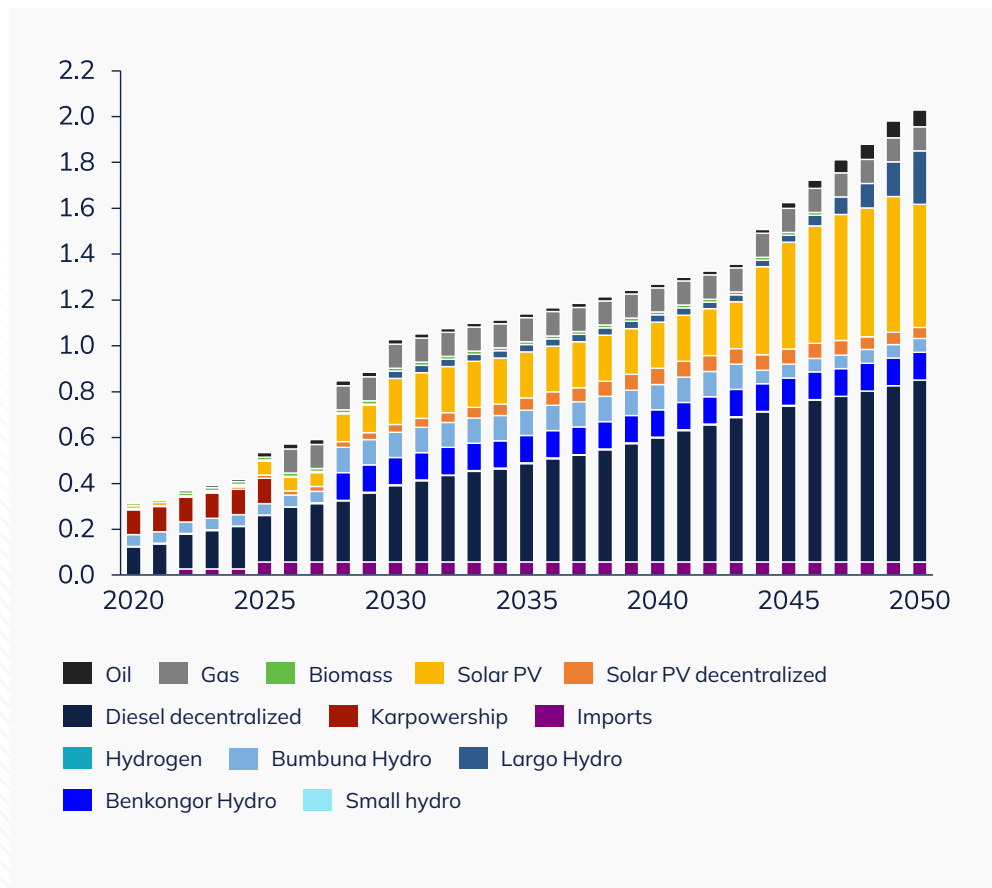
## INTERNATIONAL SUPPORT

- Several international donors, including the Millennium Challenge Corporation (MCC), the United States Agency for International Development (USAID), the U.S. International Development Finance Corporation (DFC), Power Africa, the Foreign, Commonwealth and Development Office (UK FCDO), the World Bank, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the African Development Bank, the Japan International Cooperation Agency (JICA) and the European Union, are supporting various projects to improve the power sector.
- These projects focus on expanding the grid, promoting renewable energy, and enhancing the overall regulatory framework to attract private investment. There is a strong focus on increasing the share of renewable energy in Sierra Leone's power generation mix. The government aims to improve access through off-grid and mini-grid solutions, particularly in rural areas.



# UNDER BAU, DIESEL DECENTRALIZED AND SOLAR PV SYSTEMS ARE EXPECTED TO DOMINATE THE CAPACITY MIX BY 2050 AT 41% AND 23% RESPECTIVELY

## INSTALLED CAPACITY MIX GW



## KEY INSIGHTS

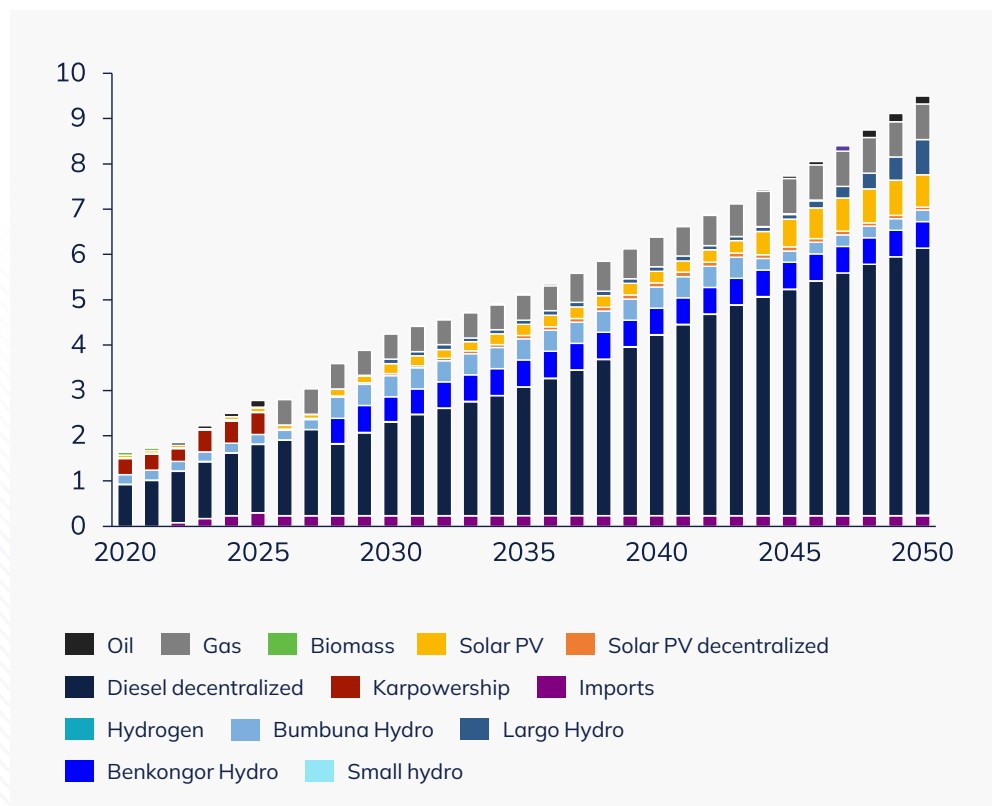
- Power **installed capacity** increases to 2 GW from 0.3 GW in 2020
- In 2020, 0.19 GW of the capacity is grid-connected while 0.12 GW is diesel decentralized
- **Renewable energy technology** share increases from 23% in 2020 to 51% in 2050
- Solar & Hydro the main RET. **Solar** was less than 1% in 2020, increases to 30% and **Hydropower** from 18% in 2020 increases to 21% by 2050.
- **Bumbuna and Benkongor** hydropower plants will be the main hydropower resources
- **Karpowership** (Heavy Fuel Oil) is phased out by 2026 and replaced by natural gas (110 MW)
- **Diesel decentralized** technologies will be around 790 MW (41%) by 2050 due to their relatively low capital costs
- **Electricity imports** are maintained (57 MW)

## UNDERLYING ASSUMPTIONS

- Investments in diesel decentralized technologies are allowed until 2050 but Solar PV increases due to price competitiveness.
- The mining sector will not be connected to the grid by 2030.

# UNDER BAU, FOR POWER GENERATION DUE TO LACK OF RELIABLE GRID, DECENTRALIZED DIESEL WOULD BE THE PREFERRED OPTION REACHING AND IT WOULD BE 63% OF THE TOTAL POWER GENERATION MIX BY 2050

## POWER GENERATION MIX TWh



## KEY INSIGHTS

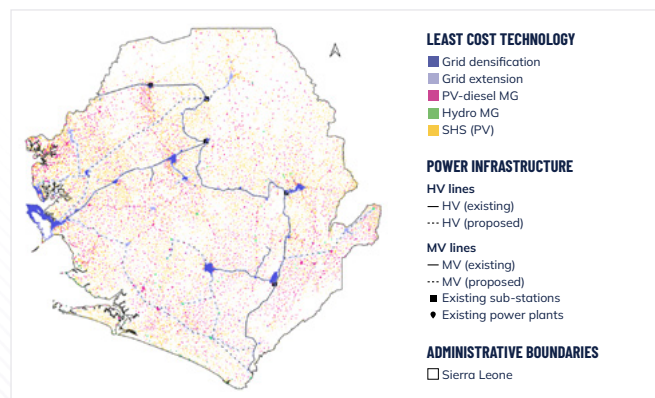
- **Electricity generation** increases to 9.3 TWh from 1.6 TWh in 2020.
- In 2020, grid-connected technologies supply less than 1 TWh, while 0.9 TWh comes from diesel stand alone. In 2050, diesel stand alone generates 6 TWh (63%) by 2050.
- Renewable energy technology share increases to 26% in 2050 from 18% in 2020.
- Solar PV utility represents 7.6% and decentralized solar 0.7% in 2050.
- Hydropower from 14% in 2020 increases to 18% in 2050.
- Natural gas-based generation will replace Karpowership from 2026 onwards.
- The country will be dependent heavily on fossil fuel imports (diesel, gas) in the future if decarbonization strategies are not in place.
- No exports expected. Electricity imports will be 0.24 TWh annually.

## UNDERLYING ASSUMPTIONS

- Government's future power plants signed projects in pipeline are considered as committed investments
- Grid extension and improvement is not significant

# UNDER BAU, ELECTRICITY ACCESS BY 2040 FOR UNELECTRIFIED POPULATION AND SOCIAL INFRASTRUCTURE COULD BE ACHIEVED THROUGH A MIX OF RENEWABLE/ FOSSIL FUEL MINI-GRID SYSTEMS AND RISING EXISTING DEMAND THROUGH GRID DENSIFICATION AND EXTENSION

## FULL ELECTRICITY ACCESS BY 2040



## GRID CONNECTIONS

### POPULATION

Total population of 10,821,000:

- 6,861,737 by grid densification
- 1,916,117 by grid extension
- 297,068 by solar home systems
- 1,746,077 by hybrid mini-grid

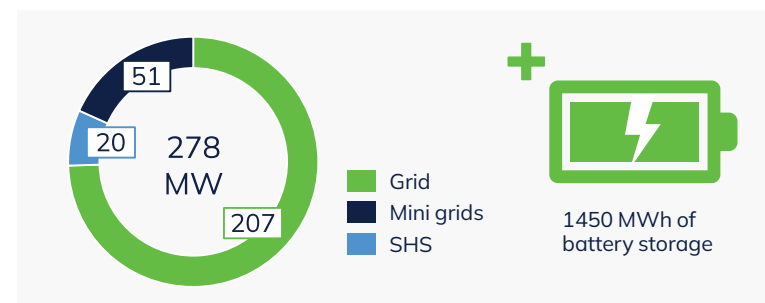
### HOUSEHOLD

Total household connection of 1,132,680:

- 479,292 by grid densification
- 307,423 by grid extension
- 51,527 by solar home systems
- 294,437 by hybrid mini-grid

## KEY INSIGHTS

- The future residential electricity demand of the unelectrified population is expected to be higher than the current electrified population due to low electricity access levels, thus strategic energy planning is essential to identify the least-cost power mix, environmentally friendly and resilient.
- Fully electrification in residential and social infrastructure will require investments of 51 MW in hybrid solar-diesel mini-grids, 20 MW in solar home systems and the grid will need to be expanded by 207.1 MW between 2024-2040.



Sources: NODE ; OnSSET-SEforALL , MCC, Interviews with EDSA and Ministry of Energy

# UNDER BAU, INDUSTRIAL DEVELOPMENT FACES SEVERAL CHALLENGES BUT THERE IS POTENTIAL FOR GROWTH WITH IMPROVEMENTS IN ENERGY INFRASTRUCTURE

## 3 KEY INDUSTRIES

**01 MINING**  
diamond, iron ore, rutile, zircon, titanium, bauxite, gold



**02 AGRO-PROCESSING**  
rice, cassava, coffee, cocoa, palm oil, peanuts, fish



**03 MANUFACTURING**  
food and beverage production, textiles, and construction materials



## MAIN CHALLENGES IN MANUFACTURING SECTOR

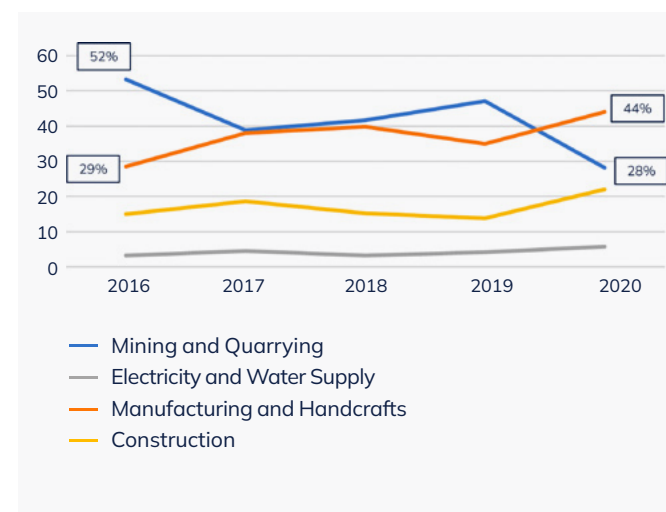
### ENERGY ACCESS ISSUE

### UNDERDEVELOPED BASIC INDUSTRIES (IRON, STEEL, PETROCHEMICALS)

### LIMITED ACCESS TO FINANCE

- Frequent power outages leads to heavy reliance on diesel generators resulting less energy-efficient processes, high fuel costs, and significant carbon emissions
- Lack of sufficient domestic manufacturing capacity results the country imports a significant amount of machinery, equipment, and spare parts
- Limited institutional support to attract investment in fostering local industry growth which can create new jobs

## CONTRIBUTION OF ACTIVITIES TO INDUSTRIAL OUTPUT IN SIERRA LEONE %

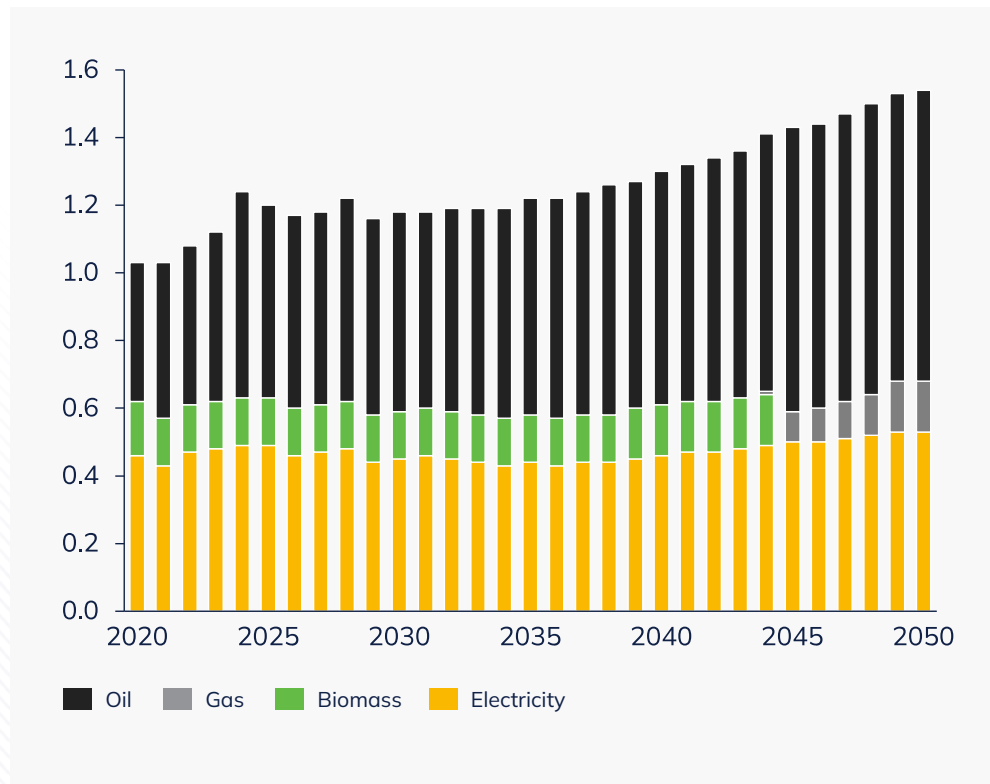


With a positive trend in manufacturing activities from 2016 to 2020 within the industrial sector, there are significant opportunities for further growth, particularly through improvements in energy infrastructure and strategic policy reforms

Source: Final Industrial Policy Report for Sierra Leone, Government of Sierra Leone (2021)

# OIL IS THE MAIN FUEL SOURCE IN INDUSTRIAL PROCESSES DUE TO ITS PRICE COMPETITIVENESS FOLLOWED BY ELECTRICITY

## TOTAL FUEL CONSUMPTION FOR THE INDUSTRIAL SECTOR PJ



## KEY INSIGHTS

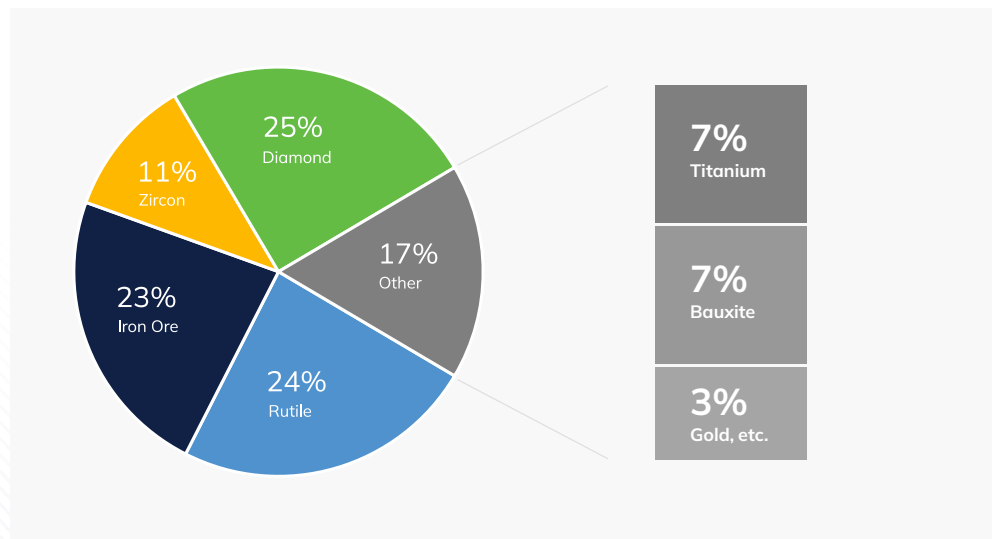
- Energy demand in other industry grows by 50% by 2050 driven by the economic growth
- Oil remains as the main fuel source in the industrial fuel consumption mix due to its price competitiveness
- Electricity remains as the second primary fuel, used for lighting and appliances (such as motors and drives) in other industry operations

## UNDERLYING ASSUMPTIONS

- Other industry includes textiles, food and beverages, tobacco, consumer goods, industrial machinery & equipment, electronics, motor vehicle parts, pharmaceuticals, and building materials
- Given the type of industries, the sector mainly (80%) require low-to-medium heat processes

# MINING IS THE BACKBONE OF SIERRA LEONE'S ECONOMY, BUT SEVERAL CHALLENGES ARE HINDERING ITS GROWTH POTENTIAL

## MINING PRODUCTION IN 2021



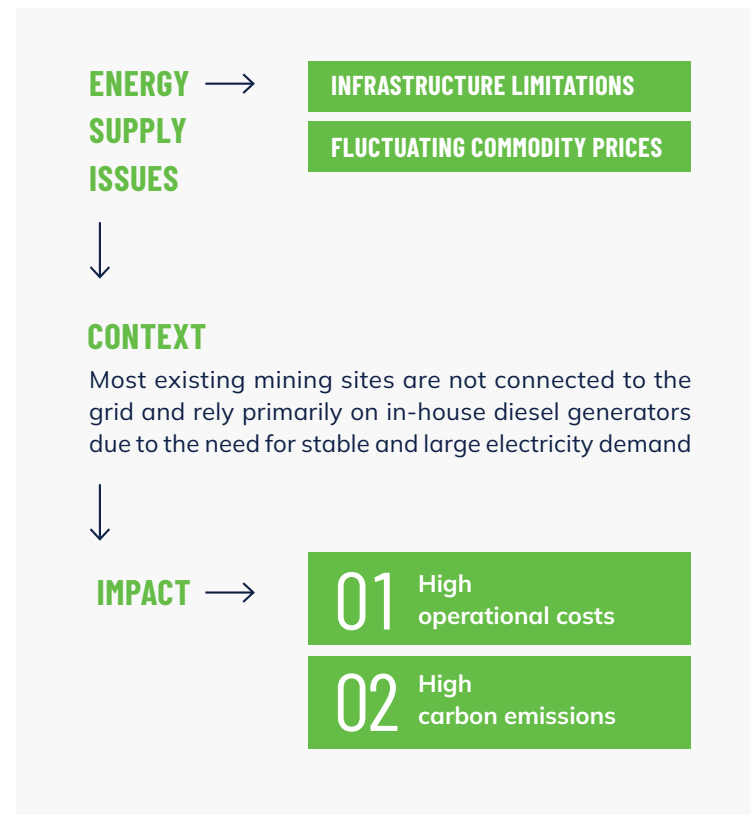
01

Mining is valued at approx. 670 M USD in total production in 2021

02

In 2021, it accounts for 67% of the country's total exports; equal to approx. 580 M USD

## MAIN CHALLENGES AFFECTING ITS GROWTH POTENTIAL



Source: Sierra Leone Extractive Industries Transparency Initiative Reports 2020-2021

# ADOPTING SUSTAINABLE MINING PRACTICES IS ESSENTIAL FOR DRIVING A GREEN GROWTH ECONOMY IN SIERRA LEONE

## SUSTAINABLE MINING PRINCIPLES



## SUSTAINABLE MINING CRITERIA

01

Develop and harmonize **sustainable mining standard**

02

Enact **policies and incentives:**

- Support green infrastructure through mining revenues
- Enforce stringent environmental impact assessments by incorporating international sustainable mining guidelines (e.g., Initiative for Responsible Mining Assurance or ISO 14001 on environmental management systems) for favourable exports
- Promote the adoption of cleaner and more efficient technologies through offering incentives, such as tax breaks or subsidies for companies that invest in green mining innovations

03

Awareness raising and **capacity building for mining communities and locals** to accept the integration of new technologies into mining processes

04

Establish the necessary **infrastructure at the academic levels** to train people and familiarize them with new technologies and their benefits

05

Improve **technical capacity in artisanal and small-scale mining sites**

# ADOPTING SUSTAINABLE MINING PRACTICES IS ESSENTIAL FOR DRIVING A GREEN GROWTH ECONOMY IN SIERRA LEONE

## SEVERAL DECARBONIZATION LEVERS FOR MINES

👉 KEY INTERVENTIONS	📷 TECHNOLOGY READINESS		
Change processes to improve energy efficiency	█	█	█
Switch to lower-carbon electricity source	█	█	█
Electrify gas appliances (e.g., pumps, heaters)	█	█	█
Electrify trucks	█	█	█
Use more fuel-efficient diesel engines	█	█	█
Switch fuel from diesel to hydrogen	█	█	█



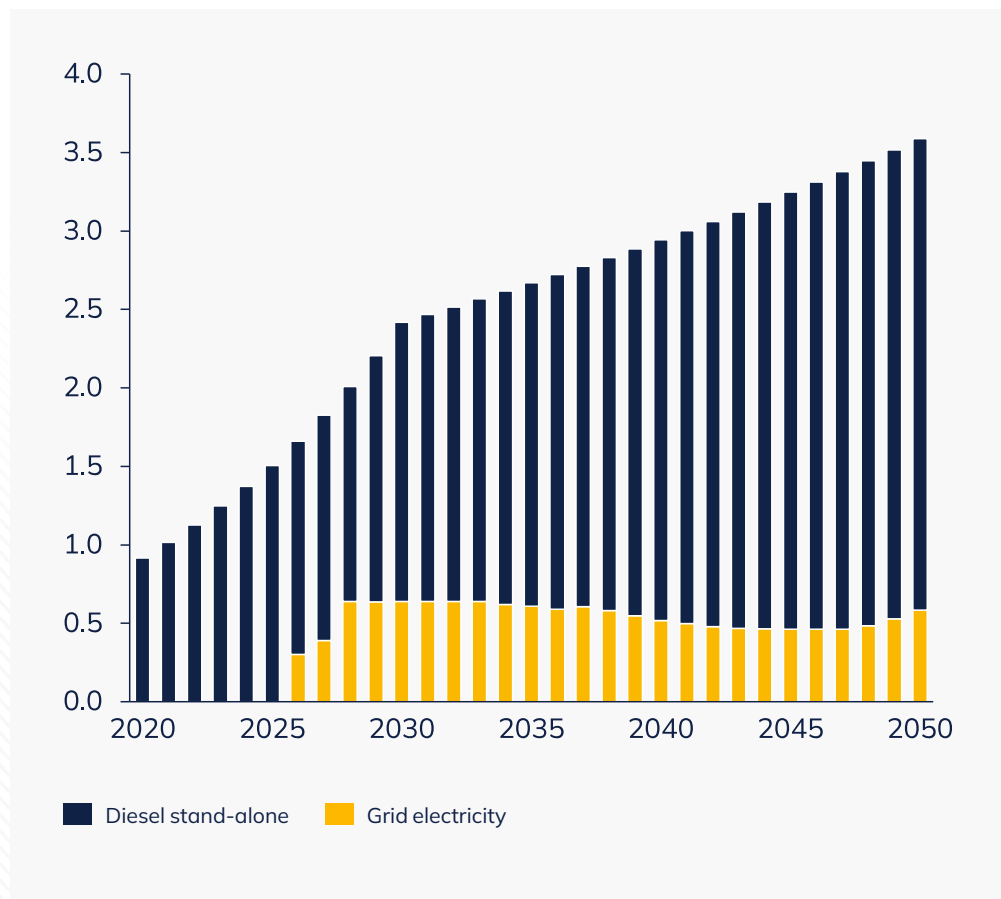
Onsite solar PV at Fekola gold mine in Mali, B2Gold Mining Company. [Link to source](#)

Source: [Climate risk and decarbonization: What every mining CEO needs to know, McKinsey \(2020\)](#)



# UNDER BAU, DIESEL STAND ALONE REMAINS THE MAJOR ELECTRICITY SUPPLY FOR MINING UNTIL 2050

TOTAL ELECTRICITY GENERATION FOR THE MINING SECTOR TWh



## KEY INSIGHTS

- The rapid 10% annual growth of electricity demand between 2020 and 2030, driven by increased minerals production and expansion plans by mining companies.
- Diesel stand alone remains the major electricity supply for mining until 2050 if the sector is not connected to the grid.

## UNDERLYING ASSUMPTIONS

- Most existing mining sites are fueled by diesel stand alone generator, only one site (Octea Mining) that is currently connected to the grid
- The mining demand captures only upstream process as no further plans yet in down-streaming the mining industry
- Mining achieves the target of universal access to the grid by 2030
- There could be depleted resources, assuming 2% annual growth beyond 2030

# AGRICULTURE AND FISHERIES IN SIERRA LEONE FACE UNDERLYING CHALLENGES, INCLUDING RELIANCE ON IMPORTED FOOD AND WIDESPREAD UNDERNOURISHMENT

## KEY FIGURES

57%

The sector accounts for the country's GDP

70%

Women's role and contribution in the labour force

65%

Households rely on the sector for their main source of livelihood

15%

Areas under cultivation – of the total of 5.4 million hectares



## MAJOR PRODUCTS



### FOOD CROPS

rice, cassava



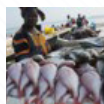
### CASH CROPS

palm kernels, cocoa, coffee



### HORTICULTURE

vegetables, fruits



### FISHERIES

## UNDERLYING ASSUMPTIONS

01

In 2021, it was reported that **80%** of food consumed in the country was **imported** (US The International Trade of Administration)

02

In 2020, **27%** of population is **undernourished** (The World Bank)



# THE FEED SALONE STRATEGY REPRESENTS A TRANSFORMATIVE INITIATIVE FOR SIERRA LEONE'S AGRICULTURAL SECTOR

## 5 KEY TARGETS

- 01 **Import substitution** of key food items - targeting a *yearly reduction of 25%* on food imports for rice, maize & soybean, onion
- 02 **Boosting export** earnings from agriculture – targeting a *yearly increase of 50%* on exports for cash crops: cocoa, coffee, cashew
- 03 **Job creation** and income generation for women and youth – *creating at least 35,000 formal jobs* from high-value horticulture crops: tomatoes, peppers
- 04 **Alleviating hunger and malnutrition** – *targeting a chronic hunger cut by 50%* with key value chains: pulses, orange flesh, sweet potatoes, cassava, and aquaculture
- 05 **Significantly improve climate resilience** – *adopting sustainable and climate-smart agriculture techniques* with cocoa and cashew as the prioritized value chains





Source: <https://feedsalone.gov.sl/>

## INTERVENTIONS THROUGH 6 STRATEGIC PILLARS

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### MECHANIZATION AND IRRIGATION

Expanding rice production areas by tractors and mechanized services

---

### SEED AND INPUT SYSTEM

Using research to ensure high-quality inputs for optimal yields

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### AGGREGATION, PROCESSES, AND MARKET LINKAGES

Streamlining processes to maximize profitability

---

### AGRICULTURAL FINANCE

Tailoring financial instruments and solutions for the sector's needs

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### AG-TECH AND CLIMATE SMART AGRICULTURE

Leveraging technology, promoting research and digitalization, and building robust data systems

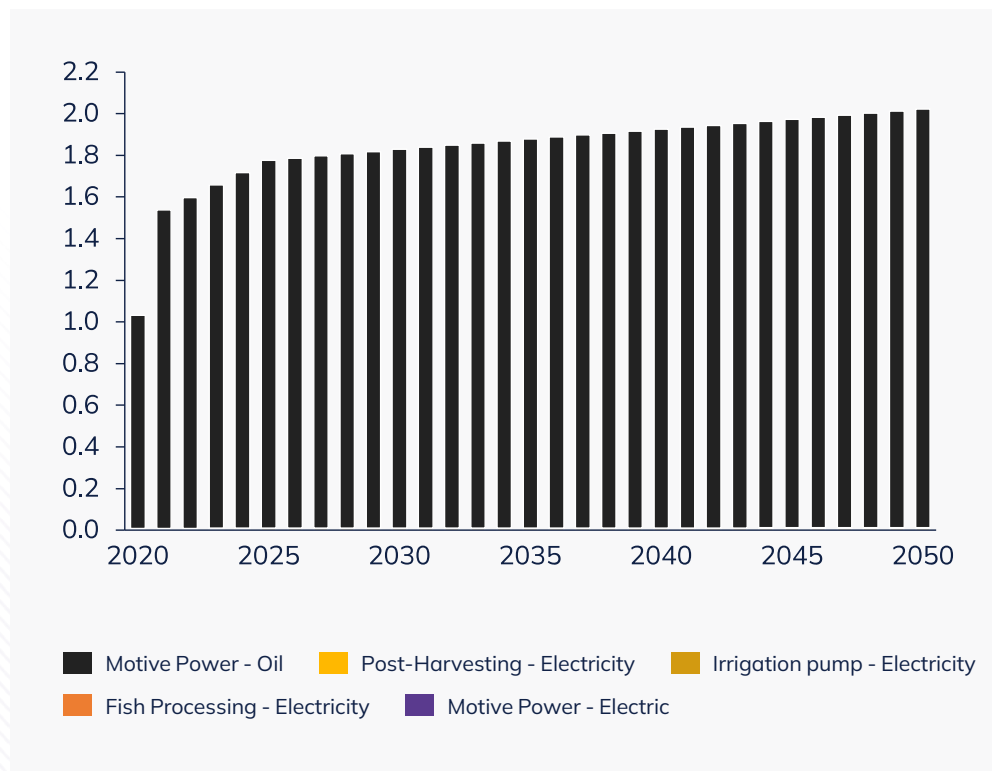
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### EMPOWERMENT OF WOMEN AND YOUTH

Ensuring their roles in agriculture development are reflected and elevated

# UNDER BAU, THE AGRICULTURAL FUEL DEMAND IS EXPECTED TO BE FROM OIL FOR MOTIVE POWER UNTIL 2050

## TOTAL FUEL CONSUMPTION FOR THE AGRICULTURE SECTOR PJ



## KEY INSIGHTS

- Energy needs in agriculture is projected to rise by 75% by 2030 and continue to increase steadily by 0.5% per year.
- Motive power retains the major share and continues to be fueled by oil due to its competitive price.

## UNDERLYING ASSUMPTIONS

- Agriculture demand grows along with the increase production to alleviate hunger and malnutrition by 2030 as per SDGs 1 and 2.
- The fuel mix in agriculture continues to follow the current trend with 99% share is oil.
- The projected demand for fisheries is expected to meet an average consumption of 32.3 kg of fish per capita<sup>1</sup>.

1 (FAO Fish stat, 2013)

# TRADITIONAL BIOMASS FOR COOKING AND LOW ADOPTION OF CLEANER TECHNOLOGIES IN THE BUILDINGS SECTOR

## COOKING SECTOR OVERVIEW



Currently, **~35% of the population have access to electricity**, although this number drops to ~6% in rural areas.



Around **71% of the population rely on traditional biomass** for cooking (3-stone stoves)

1% have access to cleaner cookstoves, all of whom reside in urban or peri-urban areas



### Type of access:

- 20% of households are connected to the national grid,
- 0.6% via mini-grids
- 15% via off-grid (SHS, solar lanterns, solar lighting products)

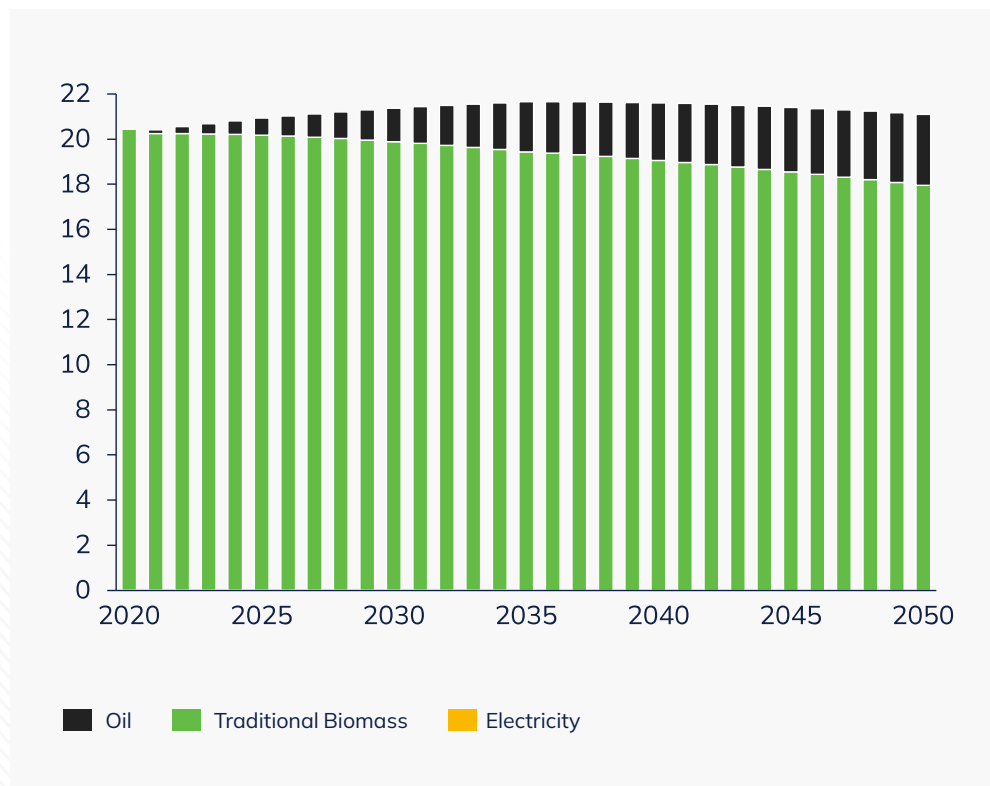
## KEY FACTOR BEHIND THE LOW ADOPTION OF CLEANER TECHNOLOGIES

- Lack of grid expansion to rural areas
- High electricity tariff
- Lack of locally produced stoves
- Weak purchasing power of households
- Rising cooking fuels
- Lack of awareness of socio-economic and health benefits of clean cooking
- Limited implementation and enforcement of legal energy efficiency regulations



# TRADITIONAL BIOMASS IS THE MAJOR FUEL UTILIZED DUE TO THE LACK OF ACCESS TO CLEAN COOKING

## TOTAL FUEL CONSUMPTION FOR THE COOKING SECTOR PJ



## KEY INSIGHTS

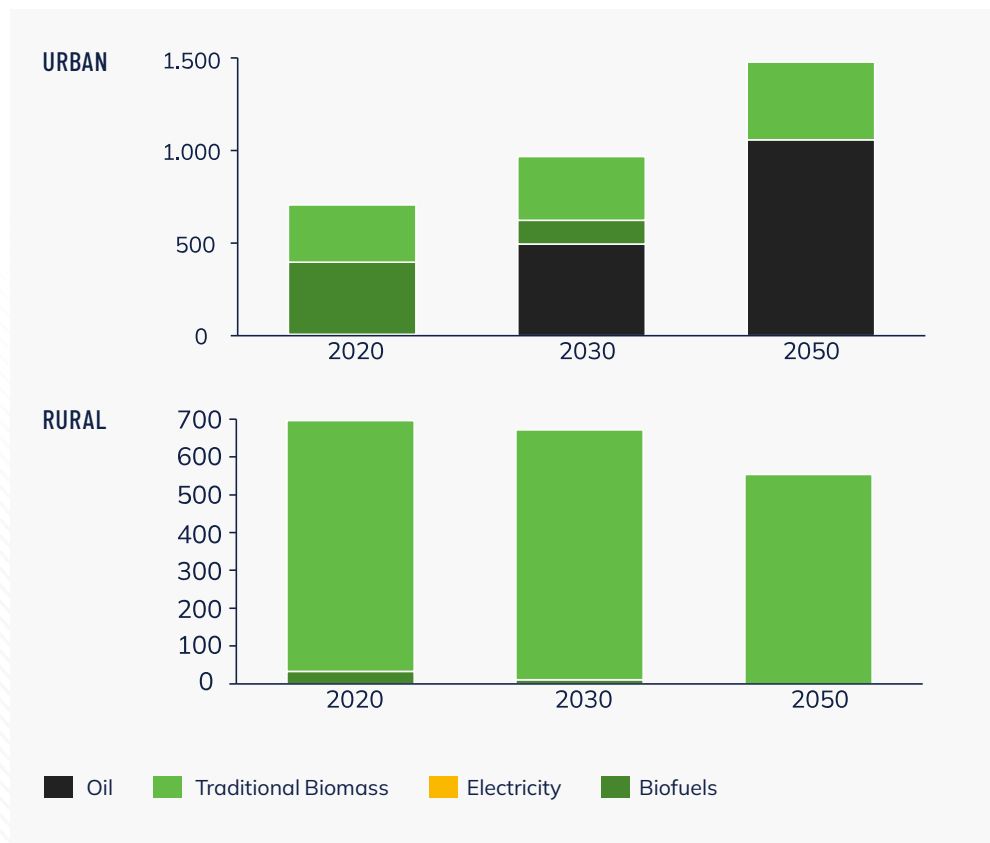
- Around **71% of the population** rely on **traditional biomass** for cooking (3-stone stoves). 1% have access to cleaner cookstoves, all of whom reside in urban or peri-urban areas.
- Without the introduction of enabling environment and infrastructure, electricity consumption remains limited, and primarily in the major urban areas.
- Biomass takes the lion’s share and accounts for ~85% of total consumption by 2050.
- LPG sees a steady growth of 18% p.a. and is primarily used in the urban cooking sector.

## UNDERLYING DRIVERS

- Lack of enabling policies and incentives to switch to more efficient technologies, which would decrease fuel consumption.
- Reliable infrastructure to enable LPG distribution nationally.
- Financial and policy incentives for LPG market development.

# UNDER BAU, CLEAN COOKING IS LIMITED IN SIERRA LEONE AND CHARACTERIZED BY A HEAVY RELIANCE ON FOSSIL FUEL AND BIOMASS

## COOKING STOVE DEMAND MILLION UNITS



## KEY INSIGHTS

- As GDP per capita increases, so does demand for LPG stove, which accounts for 72% of total demand by 2050 (or 1M households) in urban households.
- In rural households, cooking demand is constituted by traditional biomass, as high costs and lack of infrastructure for cleaner stoves limits their adoption.
- Cooking demand in rural areas declines by 25%, as urban migration pushes households out of rural settings.

## UNDERLYING DRIVERS

- Lack of enabling policies and incentives to switch to more efficient technologies, which would decrease fuel consumption.
- Reliable infrastructure to enable LPG distribution nationally.
- Financial and policy incentives for LPG market development.



# THE TRANSPORT SECTOR IS CRUCIAL FOR VARIOUS SOCIAL REASONS, HOWEVER, IT IS HEAVILY RELIANT ON IMPORTED FOSSIL FUELS

## TRANSPORT SECTOR OVERVIEW



Crucial for connecting people, goods, and services, facilitating trade, education, and healthcare



Road transport is the main mode, with a network of 11,300 km



Poor road conditions lead to inefficiencies and high transportation costs



Highly dependent on diesel and petrol, which account for >95% of energy consumption



Current energy usage is dominated by private and commercial road vehicles, including trucks, buses, motorcycles, and cars



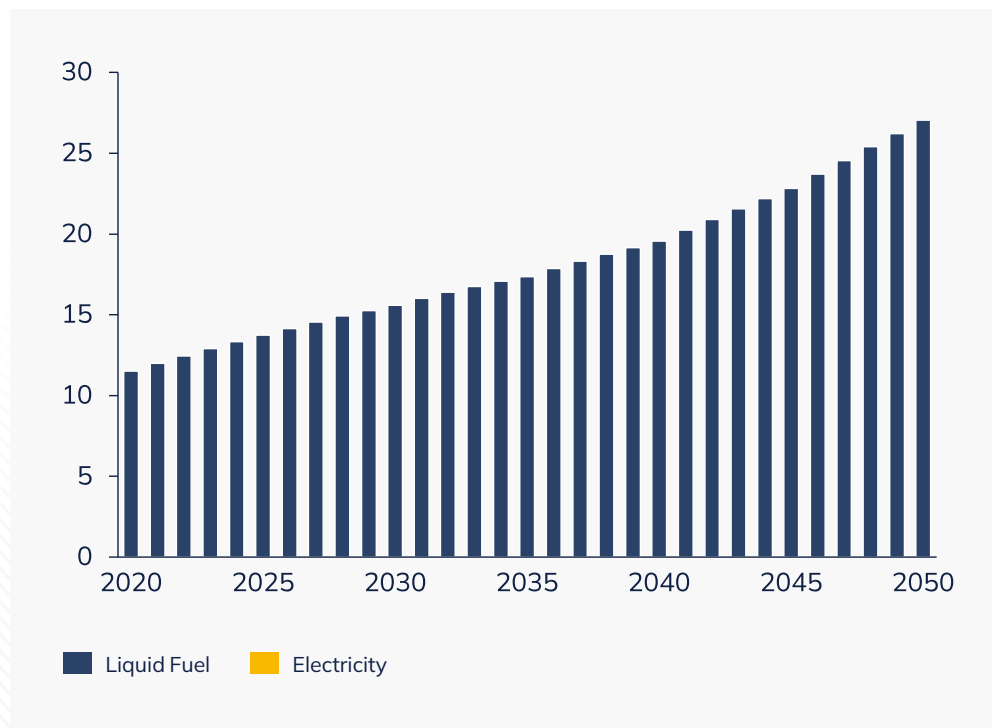
## EXISTING CHALLENGES

- The sector’s heavy reliance on imported fossil fuels makes it vulnerable to fluctuations in international oil prices, adversely affecting transportation costs and overall economic activities.
- Poor road conditions and insufficient infrastructure, especially in rural areas, limit the sector’s efficiency and increase fuel consumption.
- While there has been growing global emphasis on electric vehicles (EVs) to reduce carbon emissions, Sierra Leone lacks the necessary infrastructure for EV adoption, such as charging stations and reliable power supply.



# TRANSPORT SECTOR'S RELIANCE ON LIQUID FUELS DRIVES RISING EMISSIONS AND INCREASING CONSUMPTION THROUGH 2050

## TOTAL FUEL CONSUMPTION FOR THE TRANSPORT SECTOR PJ



## KEY INSIGHTS

- The transport sector continues to heavily rely on liquid fuel, with demand steadily rising through 2050 under the BAU scenario.
- Minimal uptake of electricity as a fuel source suggests the absence of a shift towards renewable energy.
- The dominance of liquid fuels implies significant growth in CO2 emissions and air pollution.

## UNDERLYING ASSUMPTIONS

- The scenario assumes no new policies or incentives to promote alternative fuels.
- Investments in the electrification of the transport sector remain limited.
- Transport fuel demand increases with economic growth but without sustainability initiatives.

CHAPTER SIX

# LOW CARBON DEVELOPMENT SCENARIO



# LOW CARBON DEVELOPMENT SCENARIO FORMS THE BASIS OF THE SIERRA LEONE ENERGY TRANSITION & GREEN GROWTH PLAN

Green Growth scenarios that can be explored to assess the technology, investment needs and the cost-benefits:

## LOW CARBON DEVELOPMENT SCENARIO (LCD 2050)

- Same development objectives as BAU
- Aligned with **current policies** (Feed Salone Strategy, mining sector to be grid-connected, capacity expansion)



## LOW CARBON DEVELOPMENT SCENARIO (LCD 2050)

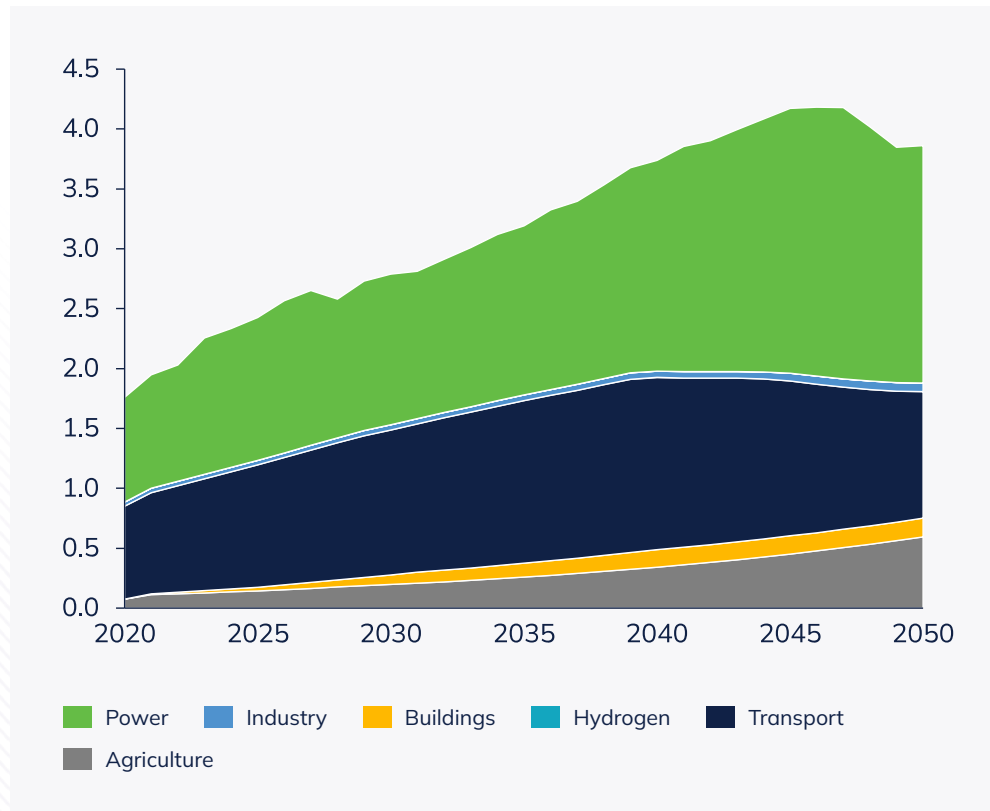
The following policies were considered:

- The mining sector to be fully grid connected by 2030
- No diesel stand-alone investments are allowed from 2030 onwards for the different sectors
- The Feed Salone Strategic objectives achieved by the Agriculture sector
- Total installed capacity to be at least 1 GW by 2030
- Electricity access of 100% to be achieved by 2040
- 100% Clean Cooking access in urban households by 2040



# UNDER LCD, EMISSIONS ARE EXPECTED TO PEAK IN 2045 AT OVER 4 MILLION TONNES, WITH THE POWER SECTOR CONTRIBUTING TO ALMOST HALF OF ANNUAL CO<sub>2</sub> EMISSIONS

ANNUAL CO<sub>2</sub> EMISSIONS MILLION TONNES



## KEY INSIGHTS

- Total CO<sub>2</sub> emissions are expected to rise steadily from 2020 to 2050, **peaking in 2045 at over 4 million tonnes.**
- The power sector consistently contributes the largest share of emissions, accounting for 47% in 2040 and increasing to **51% by 2050.**
- Transport emissions increase over time, becoming the second-largest contributor by **2050 at 27%** of total emissions.
- Other sectors such as agriculture, buildings, industry and hydrogen remain smaller contributors to overall emissions, with relatively flat growth trajectories.

CHAPTER SIX

# LOW CARBON DEVELOPMENT SCENARIO

POWER



# LCD SCENARIO DRIVES RENEWABLES GROWTH, REDUCES EMISSIONS, AND ENSURES ENERGY SECURITY BY 2050 COMPARED TO BAU

	LCD	BAU
<b>Installed capacity</b>	Reaches 4.7 GW by 2050 (73% renewables), driven by large hydropower (2.1 GW) and solar PV (1.97 GW)	Only reaches 2 GW (26% renewables) with heavy reliance on diesel (790 MW) and natural gas (110 MW)
<b>Grid expansion and universal electricity access</b>	Expands grid to 2.5 GW by 2050, with full electrification of residential and commercial buildings, social infrastructure, mining, and agricultural sectors by 2040, with mini-grids (132 MW) and solar home systems (13 MW)	Expands grid capacity by only a fourth (0.64 GW) by 2050, with mini-grids (51 MW) and solar home systems (20 MW)
<b>Emissions and security</b>	Reduces carbon emissions and dependence on oil imports	Higher emissions and vulnerability to oil price fluctuations

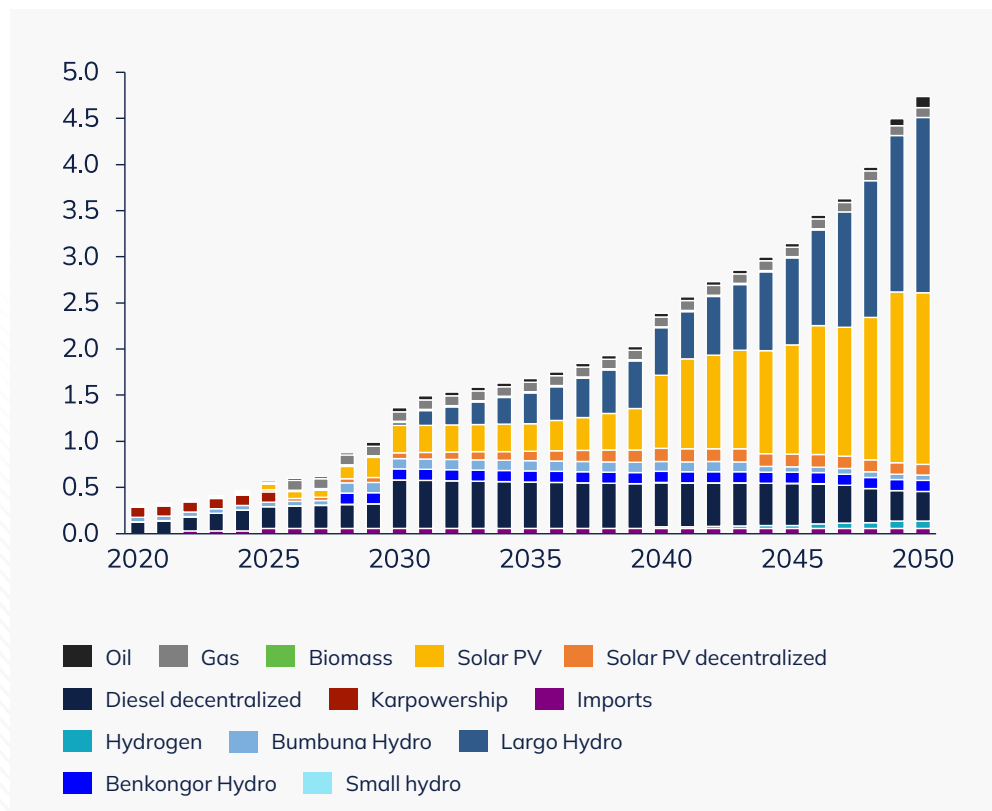


- Sierra Leone’s energy consumption may increase as sectors like mining become grid connected and there is a thriving agro-food industry.
- The country could reduce energy consumption and emissions through energy efficiency measures, lowering overall system costs.
- Renewable energy primarily driven by hydropower and solar PV could support a green and cost-effective grid supply.
- Electrification and green growth industries can be powered through mini-grids and with grid scale clean energy technologies reducing need for expensive fossil fuel-based assets.



# POWER | INSTALLED CAPACITY MIX (GW) - DRIVEN BY A HIGH SHARE OF HYDROPOWER & SOLAR

## INSTALLED CAPACITY MIX GW



## KEY INSIGHTS

- Installed capacity increases to 4.5 GW in 2050, from 0.31 GW in 2020.
- In 2020, 0.19 GW of the capacity is grid-connected while 0.12 GW is diesel decentralized.
- **RET (Hydro & Solar) share increases from 23% in 2020 to 89% in 2050.**
- Solar was less than 1% in 2020, increases to 43%. Hydropower from 18% in 2020 increases to 44% in 2050.
- Karpowership (HFO) is phased out by 2026 and replaced by natural gas (110 MW).
- Electricity **imports** are maintained (57 MW).
- **The transmission & distribution network will reach to 2.5 GW by 2050.**

## UNDERLYING ASSUMPTIONS

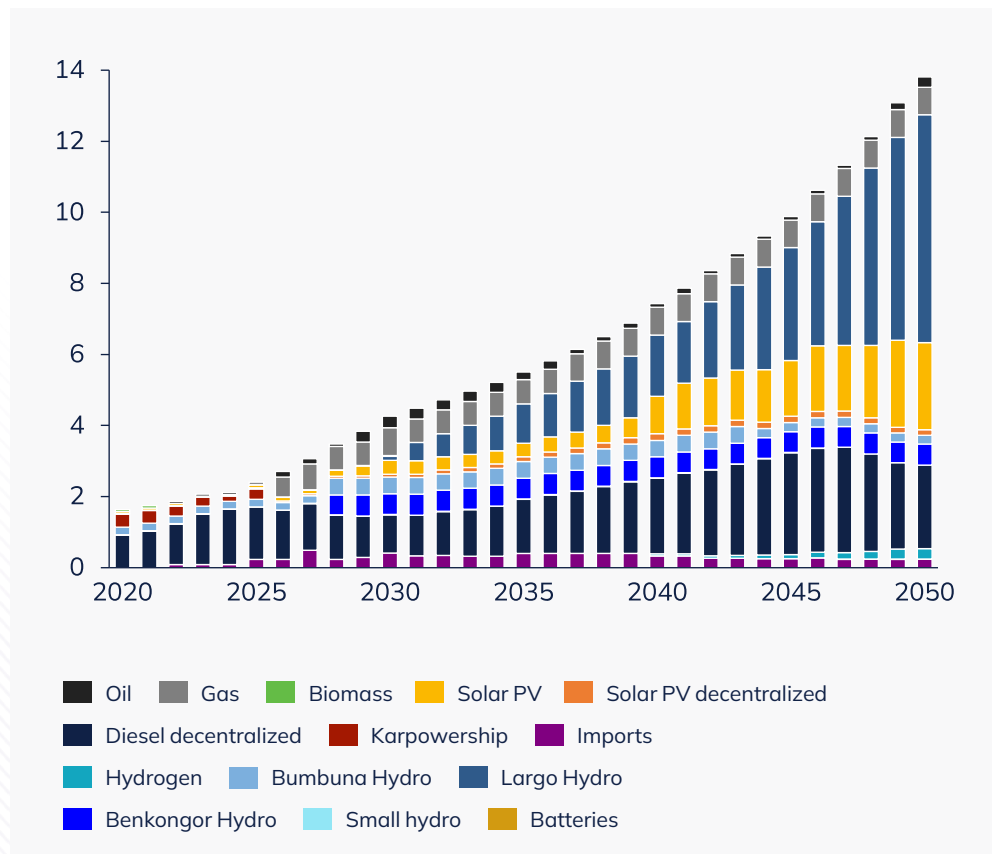
- Mining sector will be connected to the grid for green growth.
- Diesel stand-alone investments are not allowed from 2031 onwards.

Note: Results are based on data from August 2024 and would be subject to regular updates.



# POWER | GENERATION MIX (TWh)

## POWER GENERATION MIX TWh



## KEY INSIGHTS

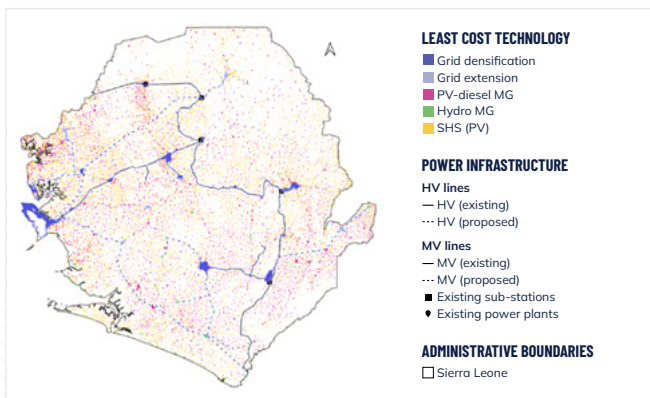
- Electricity generation increases to 14 TWh in 2050, from 1.6 TWh in 2020.
- In 2020, **grid-connected** technologies supply less than 1 TWh while 0.9 TWh comes from diesel stand-alone. In 2050, diesel stand-alone will generate 2 TWh (17%) by 2050.
- **Renewable energy technology share** increases to 73% in 2050 from 18% in 2020.
- **Solar PV** represents 19% of the power generation mix in 2050.
- **Hydropower** from 14% in 2020 increases to 53% in 2050.
- Hydropower projects will be the backbone of energy systems to be decarbonized.
- **Natural gas** will replace Karpowership from 2026 onwards.
- **Oil** power plants will provide security of supply together with green hydrogen.
- Electricity **imports** will be 0.24 TWh annually.

## UNDERLYING ASSUMPTIONS

- Government’s future power plants signed projects in pipeline are considered as committed investments.
- In LCD mining sector will be fully grid connected by 2030.

# ELECTRICITY ACCESS BY 2040 FOR UNELECTRIFIED POPULATION COULD BE ACHIEVED THROUGH A HIGHER CAPACITY MIX OF RENEWABLE/FOSSIL FUEL (HYBRID) SYSTEMS AND FUTURE DEMAND MET THROUGH GRID EXPANSION FOR GREEN GROWTH

## FULL ELECTRICITY ACCESS BY 2040



## GRID CONNECTIONS

### POPULATION

Total population of 10,821,000:

- 6,861,737 by grid densification
- 1,916,117 by grid extension
- 297,068 by solar home systems
- 1,746,077 by hybrid mini-grid

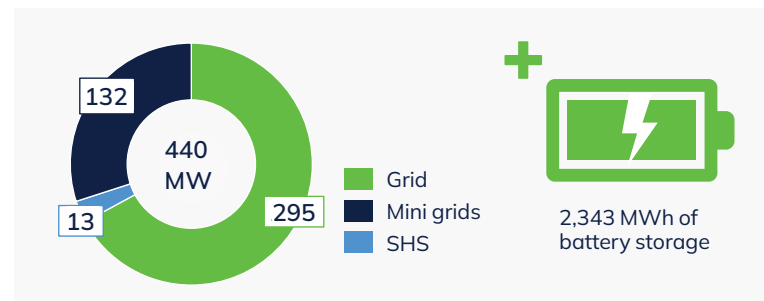
### HOUSEHOLD

Total household connection of 1,132,680:

- 479,292 by grid densification
- 307,423 by grid extension
- 51,527 by solar home systems
- 294,437 by hybrid mini-grid

## KEY INSIGHTS

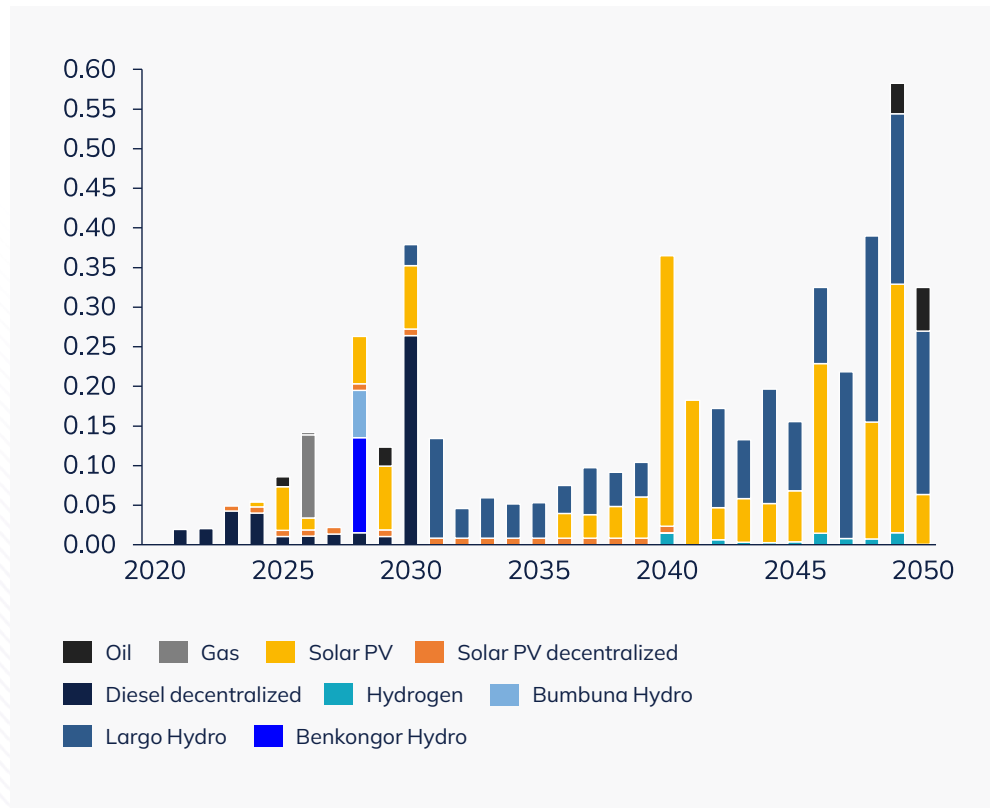
- Full electrification in residential, social infrastructure and agriculture will require investments of 132 MW in hybrid solar-diesel mini-grids, 13 MW in solar home systems and the grid will need to be expanded by 295 MW between 2024-2040.



Sources: NODE ; OnSSET-SEforALL , MCC, Interviews with EDSA and Ministry of Energy

# POWER | NEW CAPACITY MIX (GW) - HYDROPOWER & SOLAR TO DECARBONIZE THE ENERGY SECTOR

## INSTALLED CAPACITY MIX GW



## KEY INSIGHTS

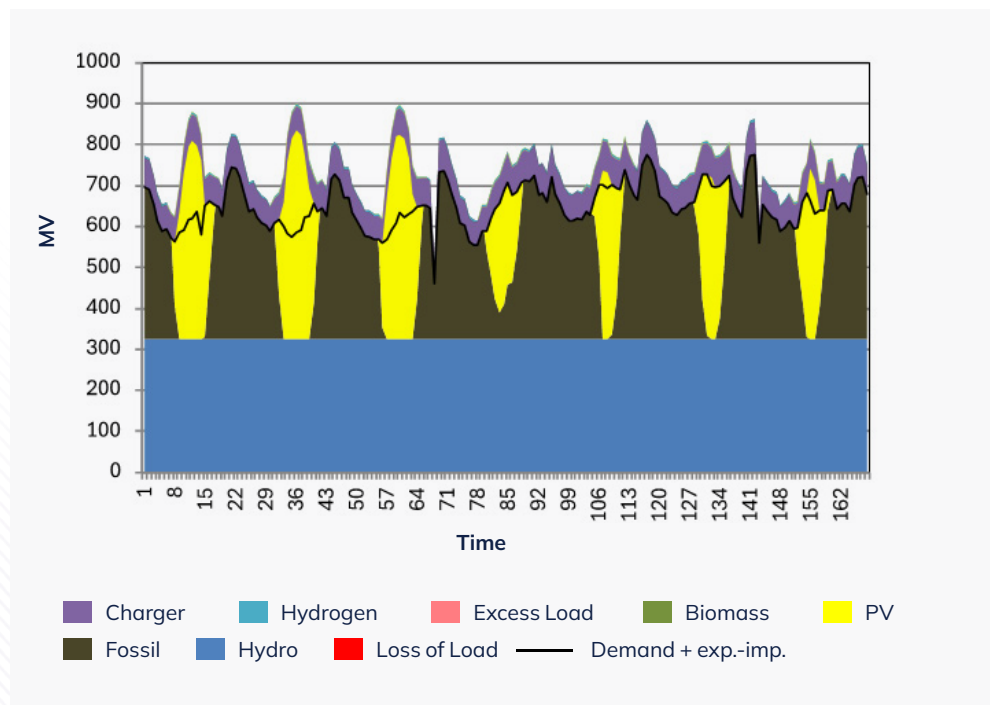
- **Solar PV** investments of 2 GW will be needed during 2020-2050.
- Bumbuna (50 MW) & Benkongor (120 MW) hydropower will be installed in 2028.
- **Hydropower** investments (in addition to Bumbuna, Benkogor) are needed of 1.9 GW during 2024-2050.
- **Diesel SA** investments of 450 MW are needed in 2024-2050 and oil power plants of 130 MW.
- **Green hydrogen** investments of 78 MW.

## UNDERLYING ASSUMPTIONS

- Investments in diesel stand-alone technologies are not allowed from 2030 onwards.
- RET potential in the country is restricted. Large hydropower potential of 3.5 GW.

# POWER | POWER SYSTEM FLEXIBILITY IN 2040 (MW) – HYDROPOWER TO BE THE BASE LOAD, WITH MINIMAL AMOUNTS OF CURTAILMENT

## POWER SYSTEM FLEXIBILITY MW



VRE share (% of annual demand)	64.47
Loss of load (% of annual demand)	0
Curtailement (% of VRE gen.)	4.3

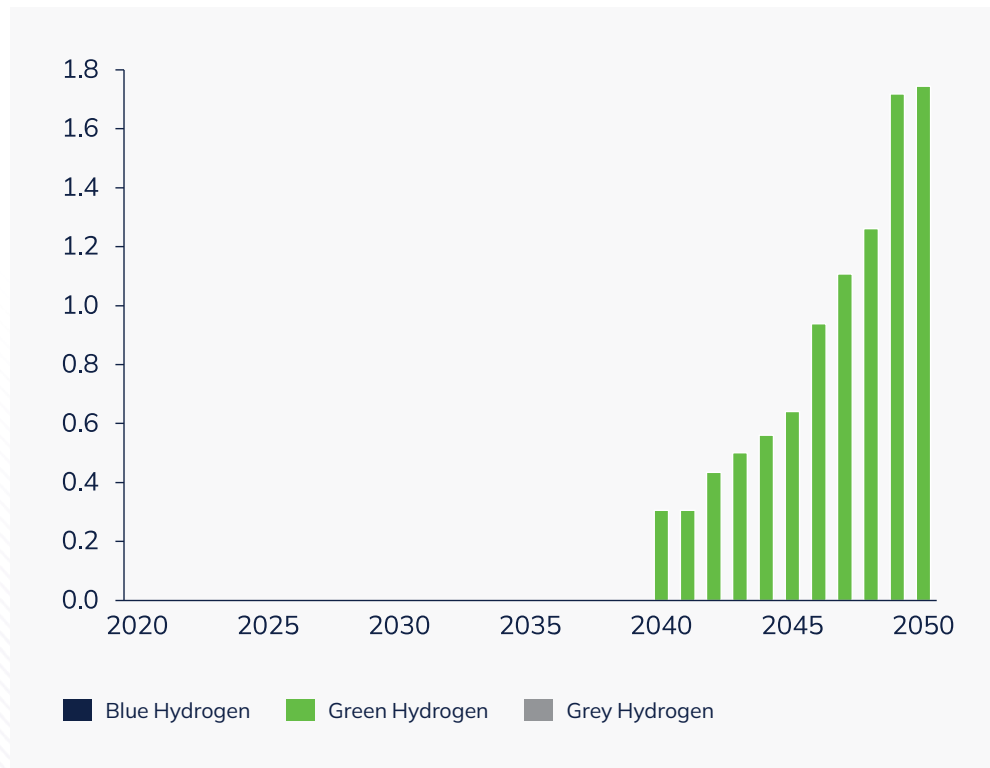
## KEY INSIGHTS

- Hydropower is the base load of the system in 2040, with solar being the peak load.
- Electric vehicles in the mix (charger) will address most of the curtailment from increasing solar.
- Curtailement in 2040 will be minimal at 4.3% of VRE generation.
- Loss of load is not expected in 2040.



# POWER | NEW CAPACITY MIX (PJ) - GREEN HYDROGEN THE WAY FORWARD

## PRODUCTION MIX PJ



## KEY INSIGHTS

- **Green hydrogen** is produced in LCD to decarbonize the energy sector and provide security of supply.
- The country could reduce its dependency on fossil fuel imports in the future by producing green hydrogen from 2040. This would increase resilience against global energy price volatility and supply disruptions.
- Green hydrogen can add another layer of energy diversity, complementing other renewables, and reducing the reliance on a single type of energy source.
- Establishing a domestic hydrogen economy can create new industries, supply chains, and jobs in sectors like hydrogen production, storage, distribution, and applications in transport and industry.

## UNDERLYING ASSUMPTIONS

- There is enough RET potential to generate green hydrogen.
- The cost of electrolyzers along with storing and transportation becomes globally cost effective
- Green hydrogen could be used for decarbonizing sectors in the future like heavy industry (steel, cement) and transportation (aviation, shipping, long-haul trucking), where electrification is challenging.

CHAPTER SIX

# LOW CARBON DEVELOPMENT SCENARIO

**MINING**



# TRANSITIONING FROM DIESEL TO GRID ELECTRICITY IN MINING BY 2030

## DEMAND AND CHALLENGES



Electricity demand in the mining sector for BAU and LCD is projected to rise from **0.9 TWh in 2020 to 2.5 TWh in 2030**, driven by mining sector expansion.



Mining operations have a heavy reliance on diesel-powered generation (diamonds, rutile, iron ore).



The National Minerals Agency of Sierra Leone reported that one of the largest iron ore companies consumed approximately 55 GWh of electricity annually, all generated from diesel.



## SUSTAINABLE TRANSITION

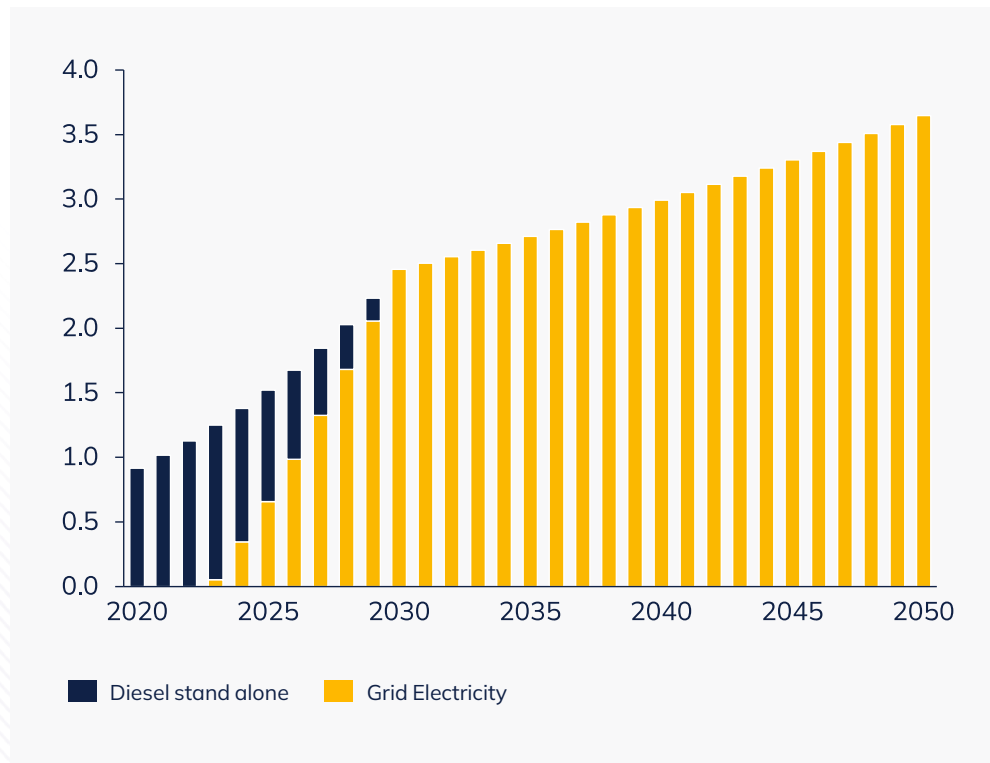
- Focuses on improving sustainability while reducing operational costs in the mining sector.
- Potential of full grid connectivity to mining sites by 2030, for instance utilizing with the first connection via the CLSG\* interconnection line in 2023.
- The transition from diesel generators to grid-sourced electricity is gradual, with an increasing share of renewables in the grid.
- Investment is concentrated on grid expansion and the deployment of renewable energy technologies to ensure sustainable mining operations.
- Growing interest from mining companies to invest in renewable energy solutions, such as solar PV with battery storage and hydroelectric power.

\*Note: CLSG stands for Côte d'Ivoire, Liberia, Sierra Leone and Guinea



# UNDER LOW CARBON DEVELOPMENT, MINING SECTOR COULD BE FULLY INTEGRATED TO GRID-SOURCED ELECTRICITY BY 2030

TOTAL ELECTRICITY GENERATION FOR THE MINING SECTOR TWH



## KEY INSIGHTS

- The rapid 10% annual growth of electricity demand between 2020 and 2030, driven by increased minerals production and expansion plans by mining companies.
- Mining is expected to be fully connected to the grid by 2030.

## UNDERLYING ASSUMPTIONS

- Most existing mining sites are fueled by diesel stand alone generator, only one site (Octea Mining) that is currently connected to the grid.
- The mining demand captures only upstream process as no further plans yet in down-streaming the mining industry.
- Mining achieves the target of universal access to the grid by 2030.
- Due to depleted resources, assuming 2% annual growth beyond 2030.



CHAPTER SIX

# LOW CARBON DEVELOPMENT SCENARIO

AGRICULTURE  
& FISHERIES



# ELECTRICITY ACCESS AND RELIABLE SUPPLY IS KEY TO THE FEED SALONE STRATEGY, AND SUSTAINABLE ENERGY POWERING AGRICULTURAL GROWTH AND POST-HARVEST PROCESSING TO ENSURE FOOD SECURITY BY 2030

## DEMAND IN AGRICULTURE

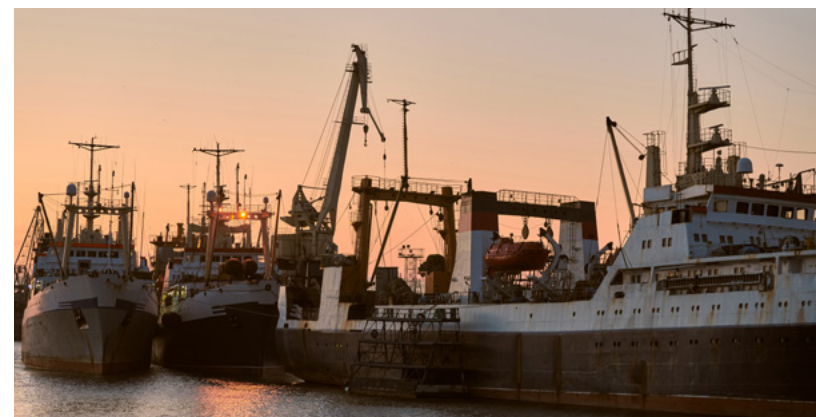
- Energy needs in agriculture and fisheries will grow to support the goal of eradicating undernourishment by 2030, aligning with SDG 2 – Zero Hunger.
- The **Feed Salone Strategy**, which outlines the most recent agricultural policies and targets is considered
- To meet the Feed Salone objectives, agricultural production is expected to grow by 12% annually from 2020 to 2028, leading to an estimated energy demand of 3.0 PJ by 2028.
- Increased energy demand in agriculture is driven by targeted yield improvements and the development of post-harvest processing facilities for key products, such as the Tormabum Rice Industrial Complex in Bonthe District.

## DEMAND IN FISHERIES

- In fisheries, energy demand is projected to rise due to an increase in production from 202,000 tonnes in 2020 to over 300,000 tonnes by 2030, a consistent trend across both BAU and LCD scenarios.
- The Ministry of Fisheries aims to attract more investment in commercial fisheries infrastructure, with planned power capacity expansions from 10 MW in 2020 to 23.2 MW by 2030.

## ELECTRICITY DEMAND GROWTH

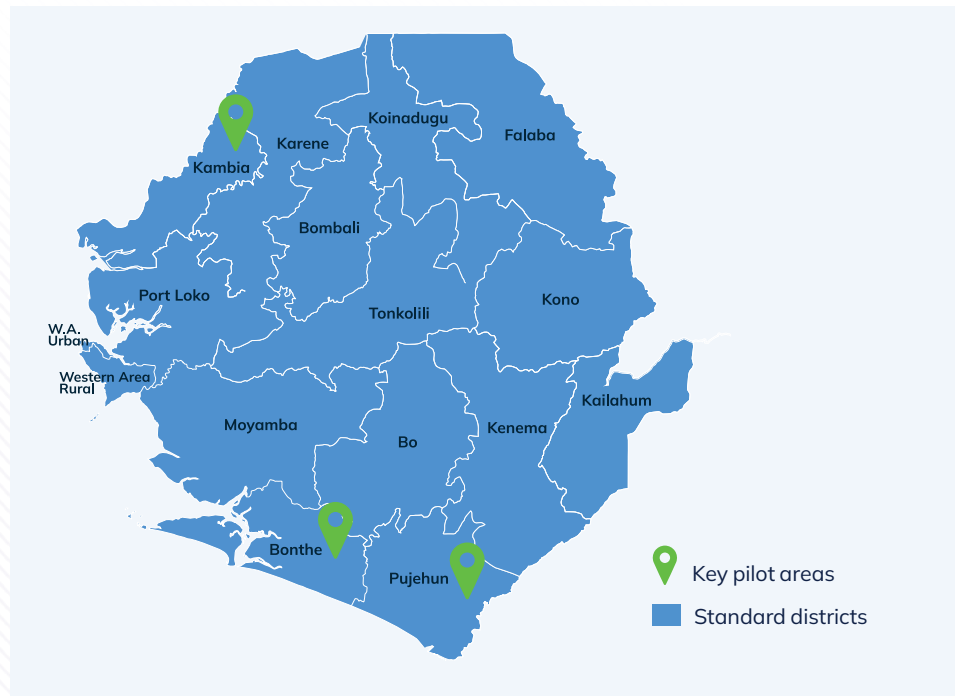
- The Feed Salone strategy would need substantial increase in electricity demand to support post-harvest facilities.
- The agriculture power capacity needs are expected to rise from 300 kW in 2020 to 36 MW by 2028 to achieve Feed Salone objectives.
- Based on a least-cost optimization analysis, this electricity demand is primarily met by decentralized technologies: diesel generators (63%), mini-grid solar (32%), and a mix of solar home systems and mini-grid diesel (5%).
- Grid electricity is expected to become more viable in the 2040s as grid expansion progresses and costs decrease.



# ALMOST ALL DISTRICTS FROM THE FEED SALONE STRATEGY WERE ASSESSED, AS WELL AS KEY PILOT ZONES THAT COVERED FOOD, CASH, AND HORTICULTURE CROPS, LIVESTOCK, AND FISHERIES

## DISTRICTS COVERED

- The agricultural analysis was based on each district’s agriculture product, and it included **almost all the districts mentioned in the Feed Salone Strategy**.
- **There are also some pilot zones** for Feed Salone implementation, which are Bonthe, Pujehun, and Kambia.

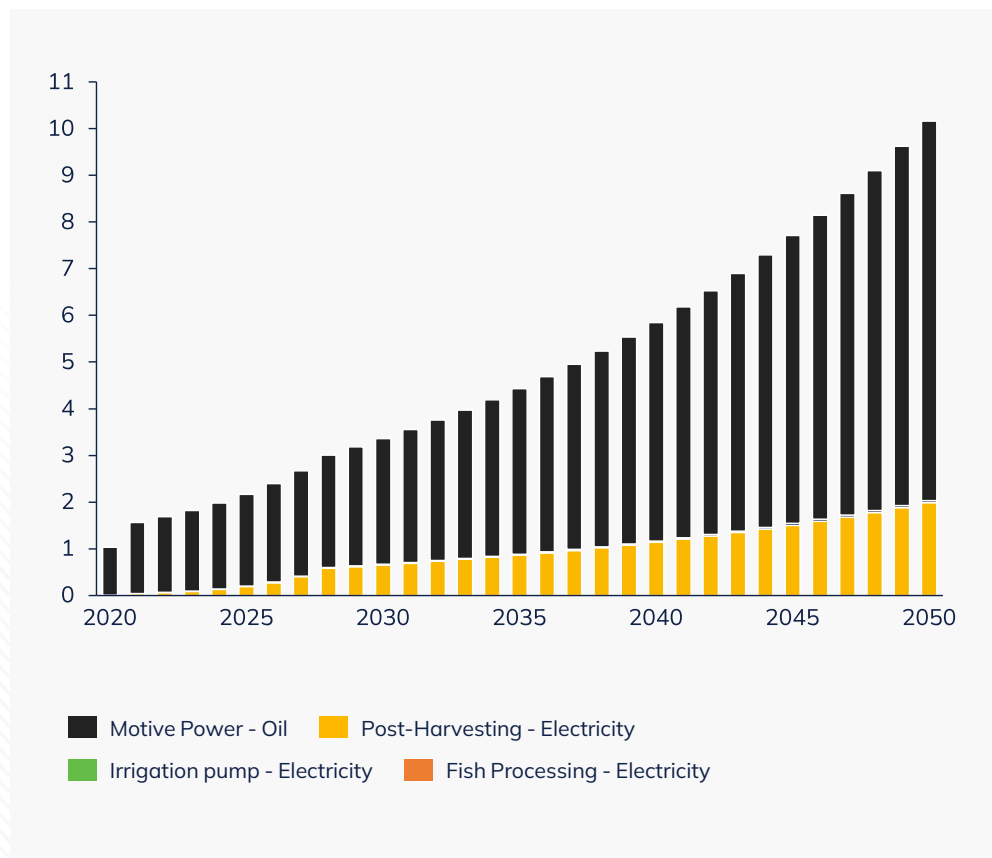


## COMMODITIES COVERED

FOOD CROPS	Rice	Maize	Sweet Potatoes	Cassava		
	CASH CROPS	Cocoa	Coffee	Nuts	Pulse	
		HORTICULTURE CROPS	Onion	Tomato	Oranges & Others	Peppers & Others
			LIVESTOCK		FISHERIES	

# ENERGY DEMAND IN AGRICULTURE IS TRIPLED BY 2030 TO ACHIEVE FEED SALONE GOALS, AND INCREASES TENFOLD BY 2050

## FUEL CONSUMPTION PJ



## KEY INSIGHTS

- To meet the Feed Salone objectives by 2028, the energy requirement is projected to triple compared to the current level as more post-harvesting facilities come into operation.
- Motive power retains the major share and continues to be fueled by oil due to its competitive price under LCD.

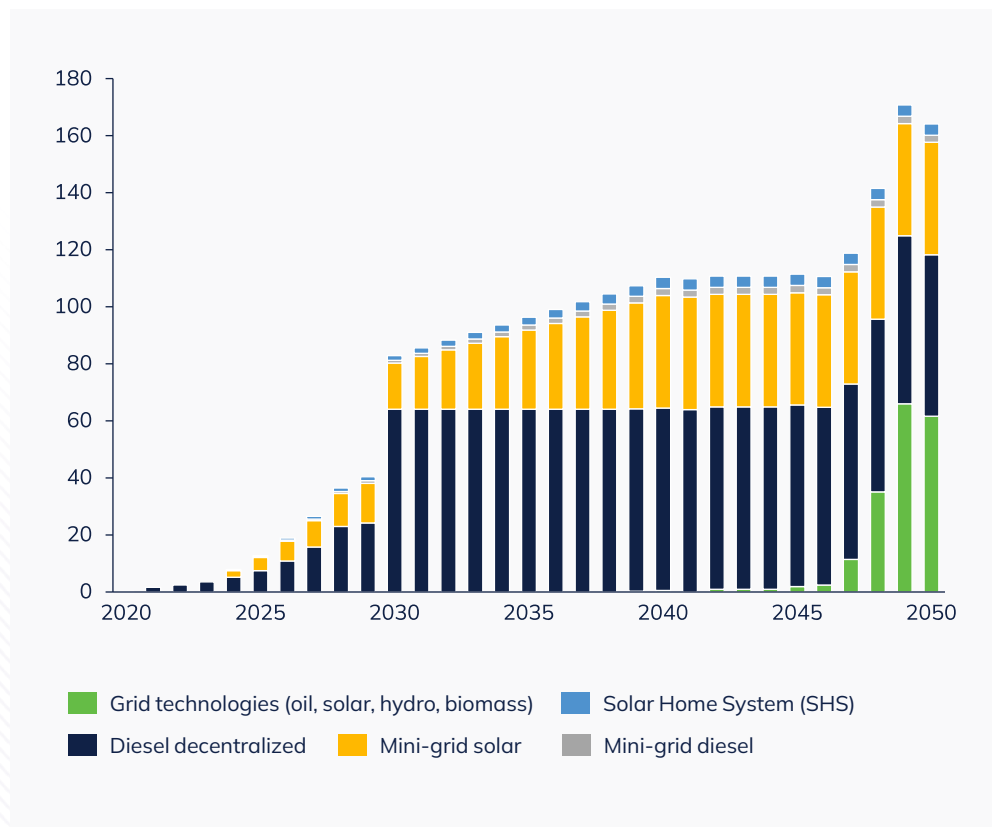
## UNDERLYING ASSUMPTIONS

- Agriculture demand grows along with the increase production to alleviate hunger and malnutrition by 2030 as per Feed Salone objective.
- Agriculture production is projected to grow by 5.7% p.a. in over the long term, based on the historical trend in Kenya’s agriculture sector growth over the past 5 years.
- The projected demand for fisheries is expected to meet an average consumption of 32.3 kg of fish per capita<sup>2</sup>.

<sup>2</sup> (FAO Fish stat, 2013)

# POWER CAPACITY NEEDS IN AGRICULTURE TO REACH 36 MW BY 2028 FOR FEED SALONE, AND FURTHER RISE TO 164 MW BY 2050 AS GRID REPLACES DIESEL STAND ALONE

## CAPACITY NEEDED FOR ELECTRICITY CONSUMPTION MW



## KEY INSIGHTS

- To achieve the Feed Salone objectives, the electricity requirement increases from 0.3 MW in 2020 to 36 MW in 2028, with approx. 60% supplied by diesel stand alone and the remaining supplied by mini-grid technologies (solar, diesel, and SHS).
- Investment in diesel stand alone generators increases by 2030 and remain constant thereafter, while investment in the grid increases between 2045 and 2050.
- By 2028, electricity demand in key **Feed Salone pilot zones is projected to reach 5.3 GWh in Kambia, 4.5 GWh in Bonthe, and 4.4 GWh in Pujehun annually**. Other districts' consumption will range from 0.7 to 7.6 GWh, bringing the total estimated electricity demand for agricultural purposes to approximately 52.8 GWh per year.

## UNDERLYING ASSUMPTIONS

- Electrification in the agriculture sector is captured as the future connection in the geospatial electrification analysis.

CHAPTER SIX

# LOW CARBON DEVELOPMENT SCENARIO **COOKING**



**CLEAN COOKING WOULD BE CRITICAL FOR LOW CARBON DEVELOPMENT, REDUCING AIR POLLUTION AND ALLEVIATING ADVERSE IMPACT ON:**



**01** Sierra Leone has seen ~50% growth in electrified population over the last decade. However, the progress is still slow when it comes access to clean cooking, where currently 1% of total population has access to clean cooking.

**02** The government has put in place measures to increase access to energy, including the development of a Clean Cooking Strategy and Action Plan, and establishment of a Clean Cooking Delivery Unit embedded within the Presidential Initiative on Climate Change, Renewable Energy and Food Security.

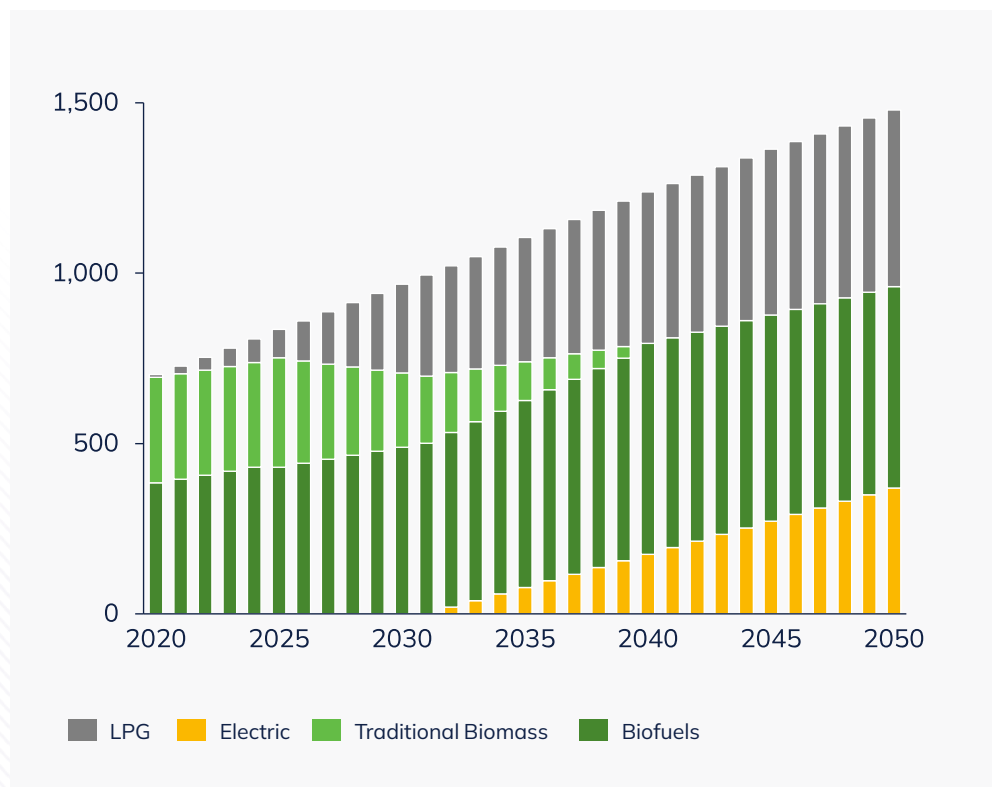
**03** This Green Growth and Energy Transition Plan reflects the two main cooking targets by 2030 of the government of Sierra Leone:

- increasing the use of clean and modern fuels and technologies to an adoption rate of 25% as an alternative to wood fuel.
- aiming for all households to have access to energy-saving cooking solutions.

**04** A clean cooking future would be based on main underlying assumptions of GDP per capita growth, universal access to electrification, existing enabling policies, and improved infrastructure.

# DEMAND FOR COOKING STOVES IN URBAN AREAS DOUBLES, DRIVEN BY BIOFUELS, LPG AND E-COOKING

URBAN COOKING TECHNOLOGY MIX '000 UNITS



## KEY INSIGHTS

- By 2040, the country is expected to reach universal access to modern cooking solutions in urban areas.
- By 2050 total demand for clean cooking solutions will double, due to the increased population growth and urbanization.
- In line with the national targets stated in Sierra Leone’s Clean Cooking Energy Compact for 2030, demand for LPG stoves increases to 27%, with biofuel stoves also playing an important role, alone accounting for 51% of total demand.
- Electric cooking will also play a role in providing modern cooking access to urban areas accounting for 25% of the technology mix by 2050. Demand of biofuels stove decrease by 15% over time, due to the rise of e-Cooking from the 2030’s.

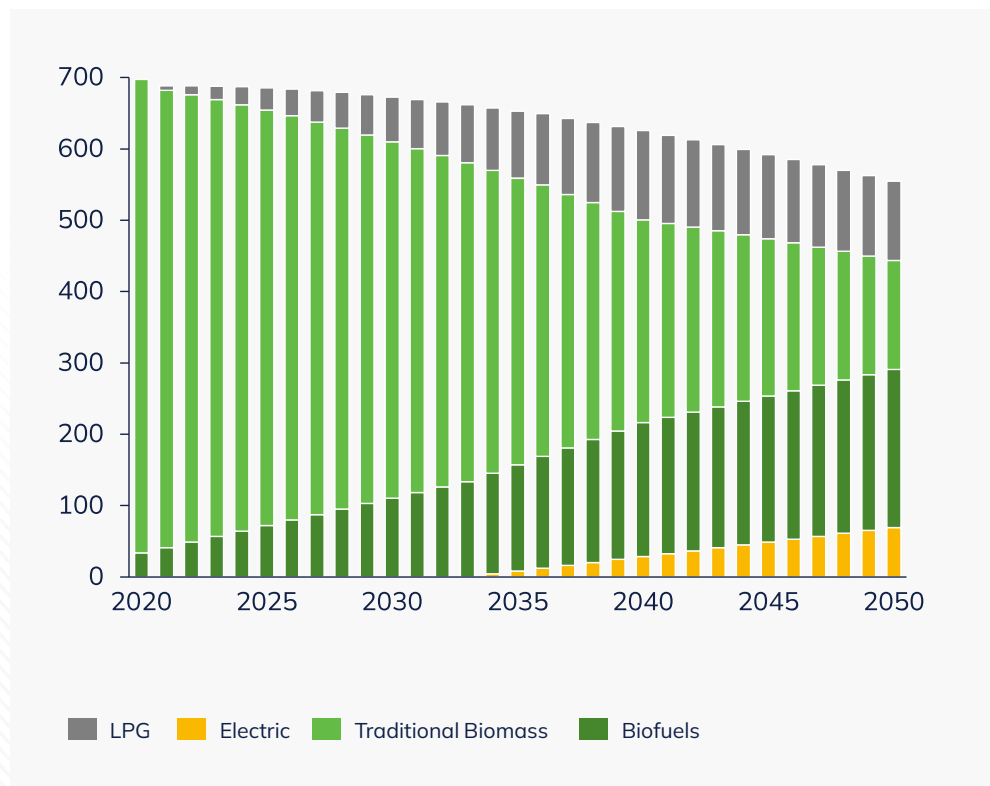
## UNDERLYING ASSUMPTIONS

- Reliable infrastructure and supply chains to enable uptake of modern cooking solutions.
- Universal electrification by 2040, with a grid that can support the increased demand load from e-cooking and improved consumer perception.
- Financial and policy incentives for cleaner cookstoves market development, with a focus on biofuel stoves.



# IN RURAL AREAS, TRADITIONAL BIOMASS WOULD STILL BE RELIED ON 2050 ALTHOUGH ITS SHARE WOULD BE REDUCED SIGNIFICANTLY

**RURAL COOKING TECHNOLOGY MIX** '000 UNITS



## KEY INSIGHTS

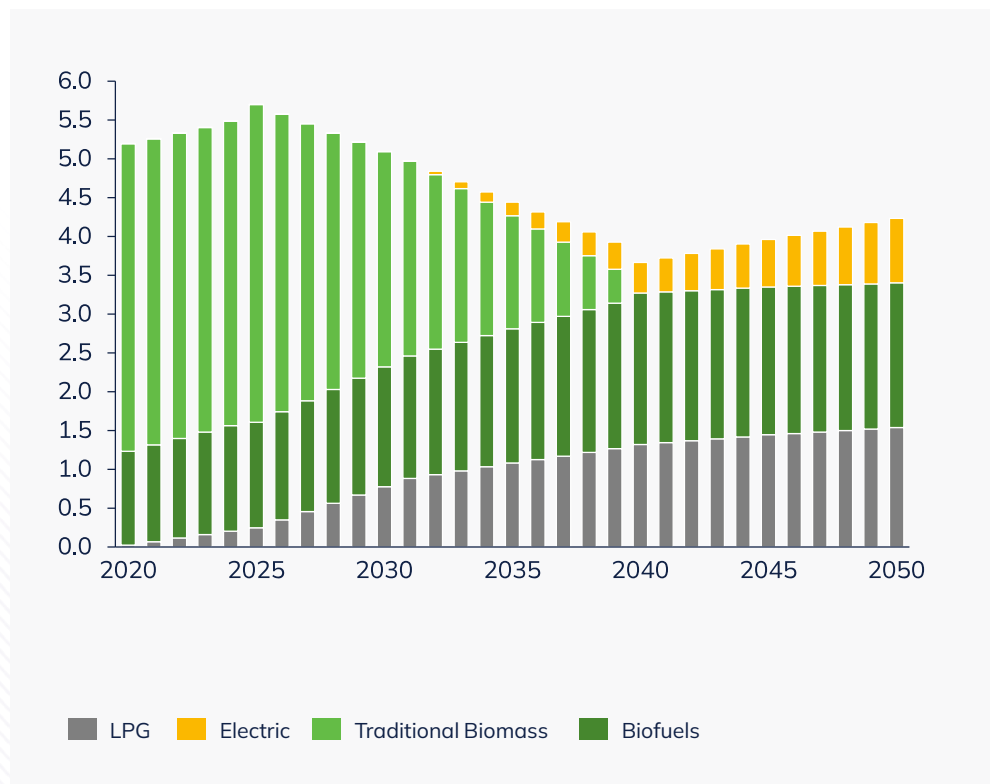
- Demand for traditional biomass stoves will see an overall decline of 77% between 2020-50 and will remain the primary stove type for the next two decades.
- By 2050, biofuel stoves will meet the bulk of total demand (40%, serving 221,000 households), followed by LPG (20%, serving 110,000 households).
- As universal electrification is reached in 2040, demand for e-stove will rise in rural areas, accounting for 12% by 2050.
- By 2050, total demand for cookstoves in rural areas will decrease by 20% because of urbanization.

## UNDERLYING ASSUMPTIONS

- Universal electrification by 2040.
- Financial and policy incentives for improved cookstoves market development, including improved biomass and LPG.
- Reliable infrastructure and supply chains to enable uptake of modern cooking solutions.

# BIOFUELS, LPG AND ELECTRIC COOKING TECHNOLOGIES WILL REDUCE RELIANCE ON TRADITIONAL BIOMASS

## URBAN COOKING FUEL CONSUMPTION PJ



## KEY INSIGHTS

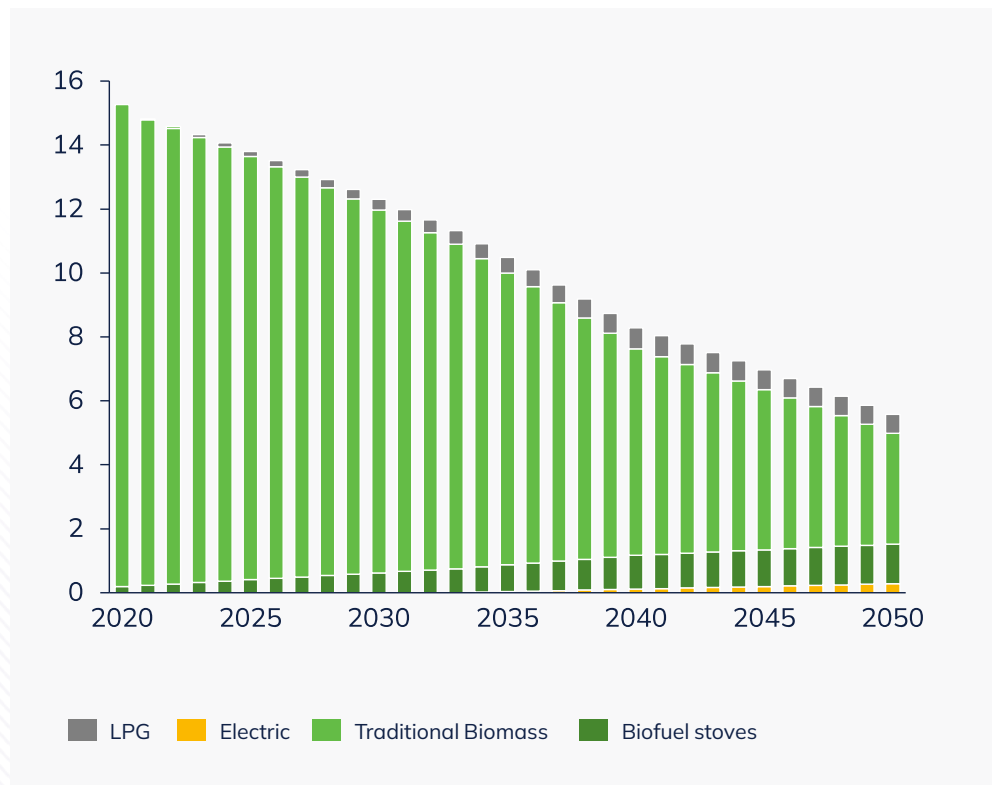
- Modern cooking fuels and technologies will play a key role to phase out traditional biomass, with consumption growing to 44% for biofuels and 35% for LPG by 2050.
- Traditional biomass will be replaced with biofuels, LPG and electric cooking in urban areas and phased out in 2040.
- Total fuel consumption will decrease by 17% over time, as more efficient stoves enter the market.

## UNDERLYING ASSUMPTIONS

- As efficient and modern cooking technologies with higher fuel efficiencies enter the market, fuel consumption decreases.
- Reliable infrastructure and supply chains to enable uptake of modern cooking solutions.
- Financial and policy incentives for clean cooking market development.

# THE USE OF TRADITIONAL BIOMASS AS A FUEL SOURCE SIGNIFICANTLY REDUCES BY 2050 ALTHOUGH IT RETAINS A SIGNIFICANT PORTION OF THE FUEL DEMAND IN RURAL AREAS

## RURAL COOKING FUEL CONSUMPTION PJ



## KEY INSIGHTS

- The share of usage of traditional biomass as a fuel source remains high in 2050 in rural areas, accounting up for 60% of total fuel consumption by 2050. This is mainly due to inefficient biomass stoves still being used by ~27% of the rural population in 2050.
- Total fuel consumption decreases by 64% as households migrate towards urban areas.

## UNDERLYING ASSUMPTIONS

- As improved cookstoves with higher fuel efficiencies enter the market, fuel consumption significantly decreases.
- Rural households decrease over time due to increased urbanization (UN projects 40% of total population living in rural areas by 2050).
- Financial and policy incentives for improved cookstoves market development.
- Reliable infrastructure and supply chains to enable uptake of modern cooking solutions.

CHAPTER SIX

# LOW CARBON DEVELOPMENT SCENARIO

INDUSTRY



# MANUFACTURING SECTOR CONTINUES TO RELY ON OIL FOR THERMAL ENERGY, WITH ELECTRICITY PLAYING A CRUCIAL ROLE IN ENSURING SMOOTH OPERATIONS

## DEMAND IN INDUSTRY

- Both the BAU and LCD follow a similar trajectory, as decarbonizing the industrial sector would not be a priority.
- The manufacturing sector will continue to rely primarily on oil, followed by biomass, which will later be replaced by gas to align with a low-carbon pathway.
- Total energy consumption in the manufacturing sector was 1.03 PJ in 2020 and is projected to grow to 1.50 PJ by 2050.

## FUEL TRANSITION

- Low-temperature heat (LTH) processes:
  - » Roughly 80% of industries are small—scale, needing LTH for production.
  - » Under the current trend, oil fuel (70%) dominates and followed by biomass.
  - » Biomass use will be phased out by 2045, leaving oil as the primary source until 2050.
  - » The thermal energy for LTH is expected to increase from 0.46 PJ in 2020 to 0.78 in 2050.
- High-temperature heat (HTH) processes:
  - » Gas is projected to gradually replace oil and biomass by 2045.

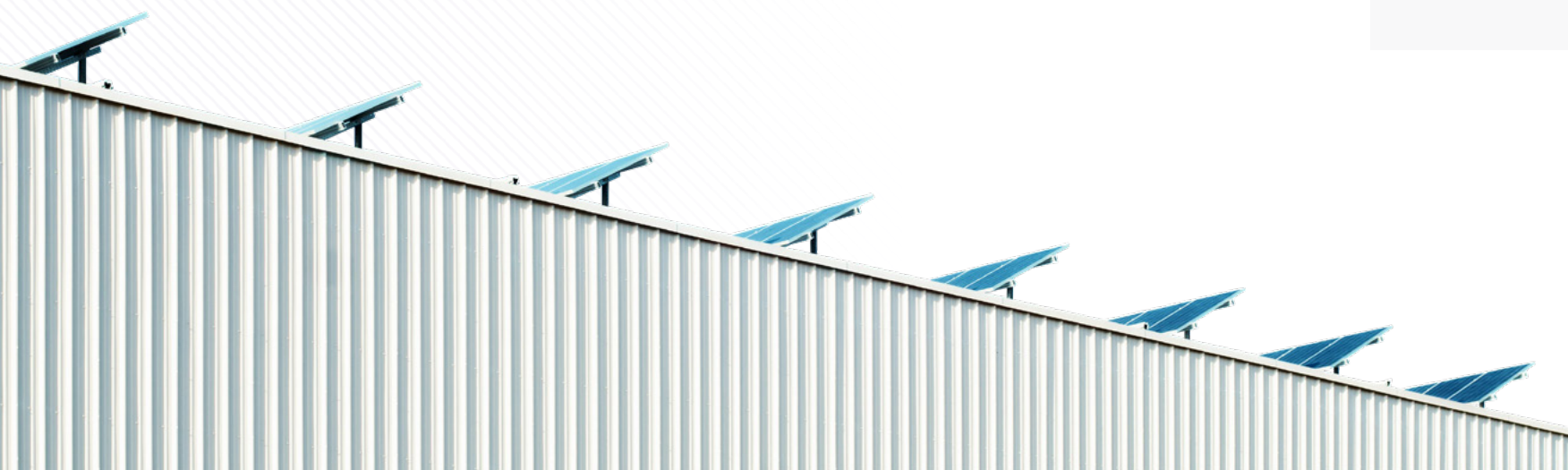
## OPPORTUNITIES



Explore available clean heat technologies in the market that are cost competitive.

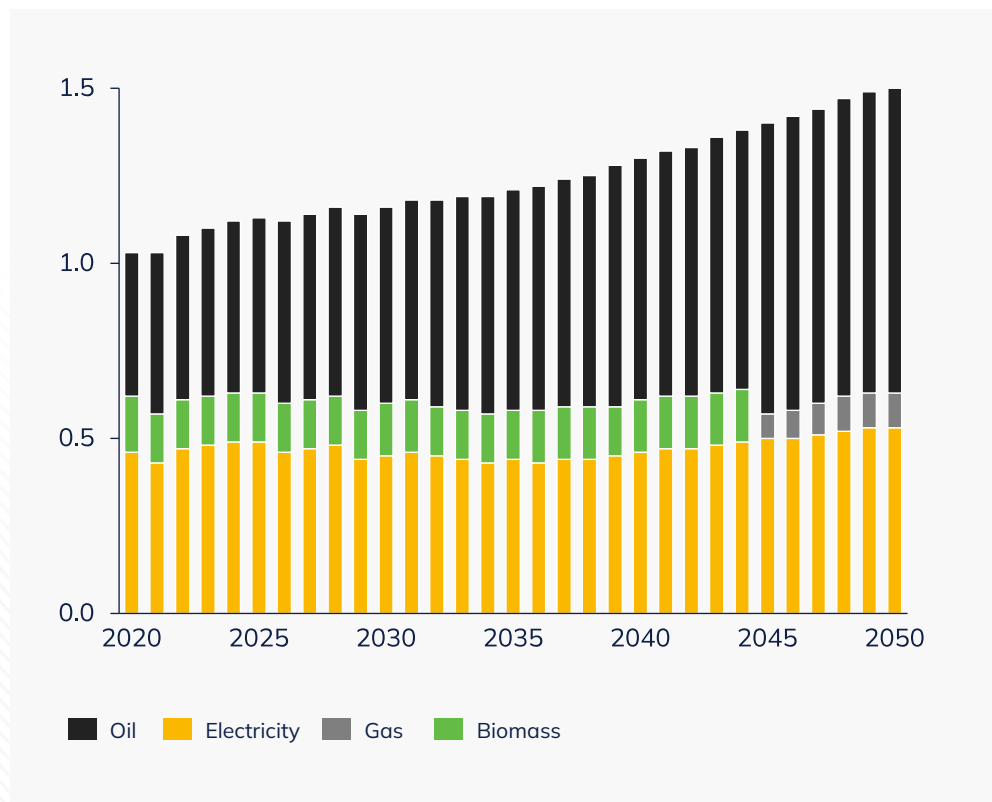


Since electricity remains a key energy source for industry, ensuring reliable grid access and low distribution losses to industrial areas could unlock opportunities for industrial growth and help drive a low-carbon economy.



# MANUFACTURING SECTOR CONTINUES TO GROW BUT STILL RELIES PRIMARILY ON OIL FOR PROCESS HEAT AND ELECTRICITY FOR OPERATIONS

## TOTAL FUEL CONSUMPTION PJ



## KEY INSIGHTS

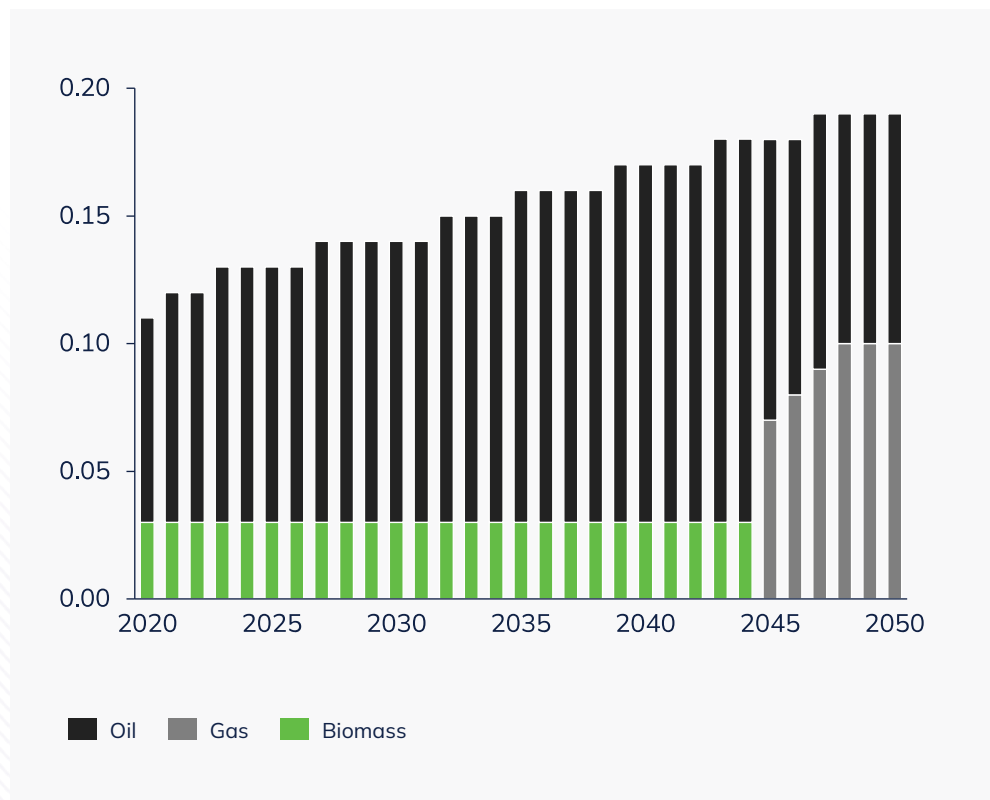
- Energy demand in other industry grows by 50% by 2050 driven by the economic growth.
- Oil remains as the main fuel source in the industrial fuel consumption mix due to its price competitiveness.
- Electricity remains as the second primary fuel, used for lighting and appliances in other industry operations.

## UNDERLYING ASSUMPTIONS

- Other industry includes textiles, food and beverages, tobacco, consumer goods, industrial machinery & equipment, electronics, motor vehicle parts, pharmaceuticals, and building materials.
- Given the type of industries, the sector mainly (80%) require low-to-medium heat processes.

# OIL AND BIOMASS REMAIN KEY HEAT SOURCES IN HIGH-TEMPERATURE HEATING PROCESS UNTIL GRADUAL REPLACEMENT BY GAS POST-2045

## HIGH-TEMPERATURE HEATING PROCESS GENERATION MIX PJ



## KEY INSIGHTS

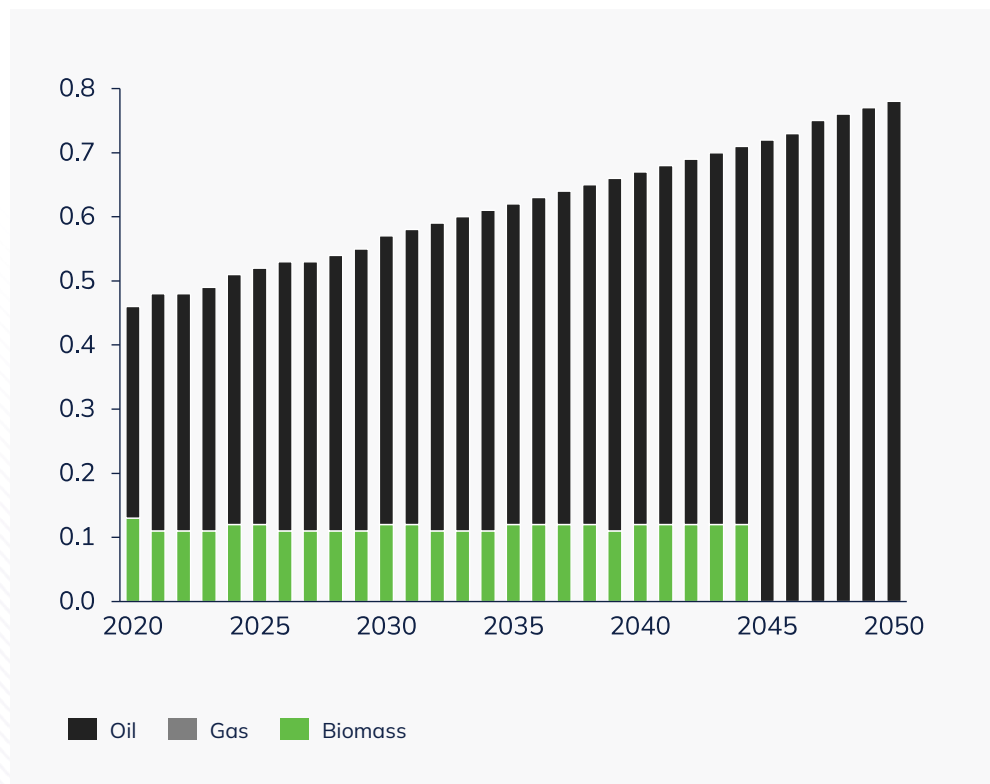
- High-temperature heating processes require substantial energy inputs, primarily sourced from oil and with a smaller portion from biomass since the processes involve high-temperature steam or direct heating.
- The heating fuel mix is expected to remain relatively constant until the mid-2040s, at which point gas gradually starts to replace oil and phase out biomass.

## UNDERLYING ASSUMPTIONS

- High-temperature heating processes requiring above 500deg C, include building materials (bricks and ceramics) production, industrial furnaces, pulp and paper production.
- Oil price remains competitive under both BAU and LCD 2050 scenarios.
- Gas infrastructure will be established between 2025-2030 that supports the industrial decarbonization.
- Other alternative solutions like electric arc furnaces, CCS, and hydrogen remain costly to be deployed in the country.

# OIL REMAINS TO BE THE PRIMARY HEAT SOURCE FOR LOW-TEMPERATURE HEATING PROCESS, WITH BIOMASS BEING PHASED OUT BY 2045

## LOW-TEMPERATURE HEATING PROCESS GENERATION MIX PJ



## KEY INSIGHTS

- Oil remains the primary source in the low-temperature heating (LTH) fuel consumption mix over the long-term.
- Usage of biomass is phased out by 2045.

## UNDERLYING ASSUMPTIONS

- Low-temperature heating processes include food processing, textile manufacturing, brewing and beverages, pulp and paper, and pharmaceutical industries.
- Oil price remains competitive under both BAU and LCD 2050 scenarios.
- Other alternative solutions like heat pump, CCS, and hydrogen remain costly to be deployed in the country.



CHAPTER SIX

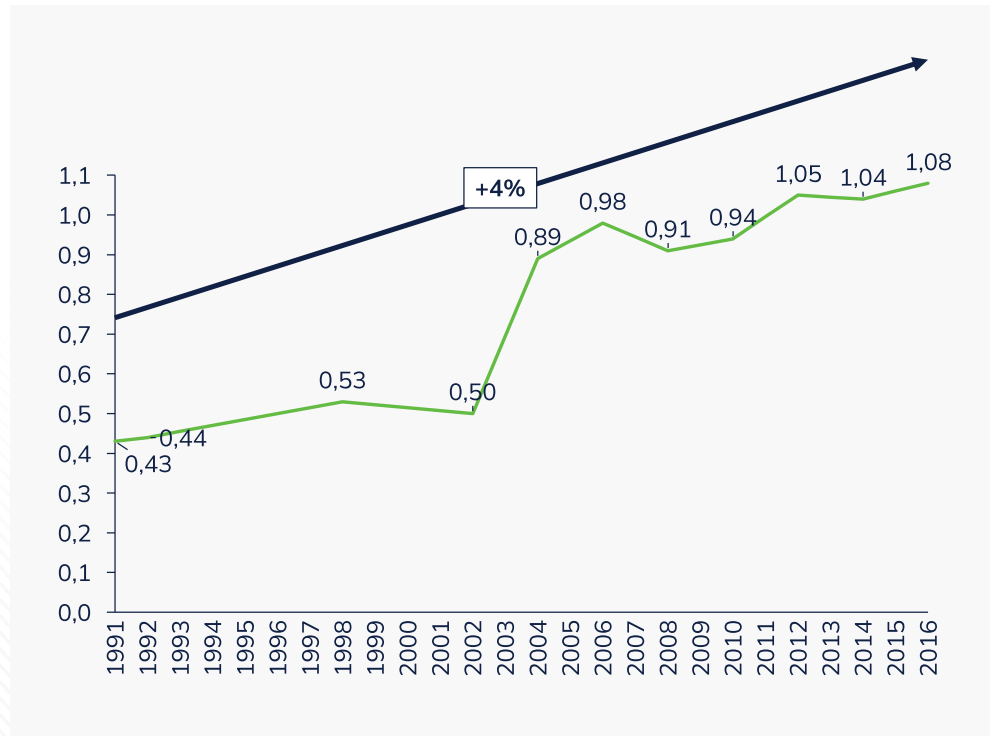
# LOW CARBON DEVELOPMENT SCENARIO

TRANSPORT



# TRANSPORT | FUEL PRICE TREND

**PUMP PRICE FOR DIESEL FUEL IN SIERRA LEONE** US\$ PER LITER



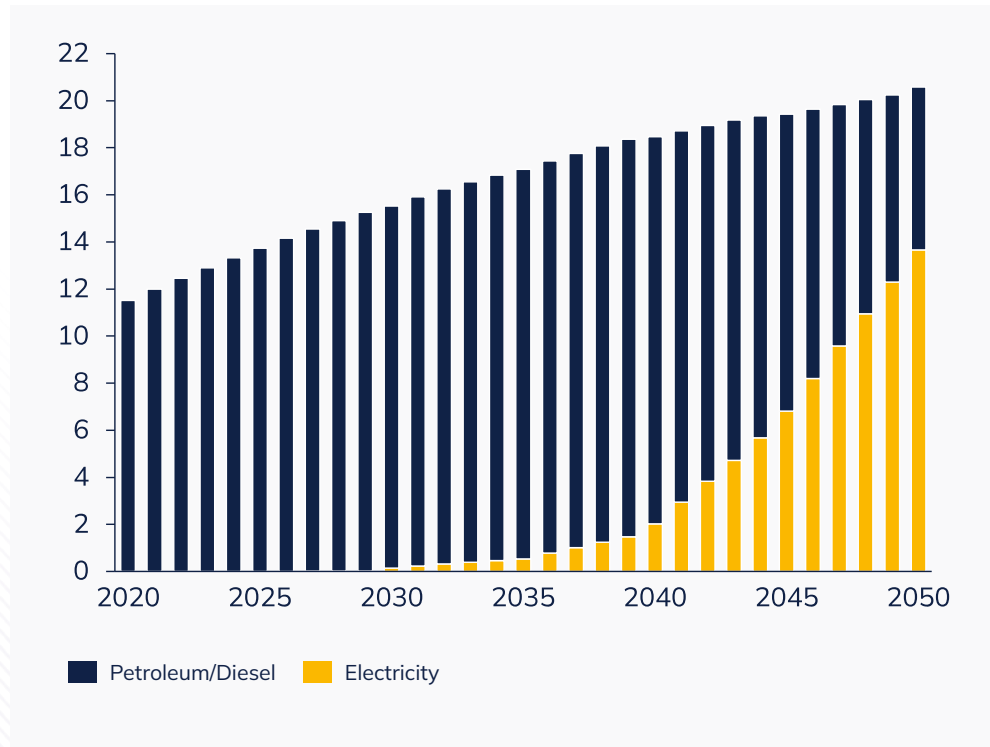
## KEY INSIGHTS

- A steady increase in diesel prices in Sierra Leone from 1991 to 2016. This upward trend suggests rising operational costs for the transport sector, potentially affecting public transportation fares and the overall cost of goods due to increased shipping and distribution expenses.
- Rising fuel prices often contribute to inflationary pressures within the economy. As fuel prices increase, transportation and production costs also rise, leading to higher prices for goods and services, affecting the general cost of living in Sierra Leone.
- Sierra Leone imports most of its fuel, making the economy vulnerable to global oil price fluctuations. The transportation sector, which heavily relies on diesel, may experience increased costs, affecting the pricing structure for goods, especially in rural areas where transport infrastructure is less developed.

Source: World Bank

# TRANSPORT | FUEL DEMAND (PJ)

## FUEL DEMAND PJ



## KEY INSIGHTS

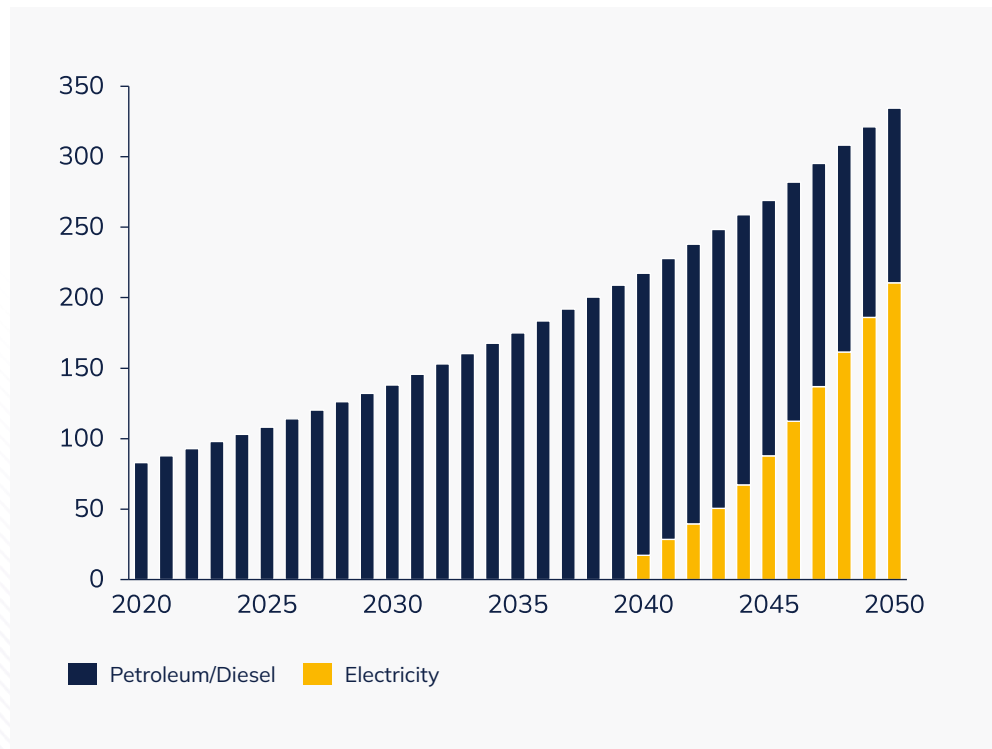
- Fossil fuel remains dominant throughout the projection period, but a noticeable shift towards electricity begins after 2035.
- The gradual increase in electricity use reflects Sierra Leone’s strategic move towards more electrification of the road transport segment.
- The increase in demand for electricity by 2050 underscores the importance of expanding the power sector.

## UNDERLYING ASSUMPTIONS

- The projections assume a slower transition to alternative fuels in the early years due to potential barriers such as infrastructure and technology availability.
- Continuous government and international support are assumed to encourage the adoption of alternative fuels, particularly in the transport sector.

# TRANSPORT | PASSENGER CARS | TECHNOLOGY MIX ('000 UNITS)

## PASSENGER CARS TECHNOLOGY MIX '000 UNITS



## KEY INSIGHTS

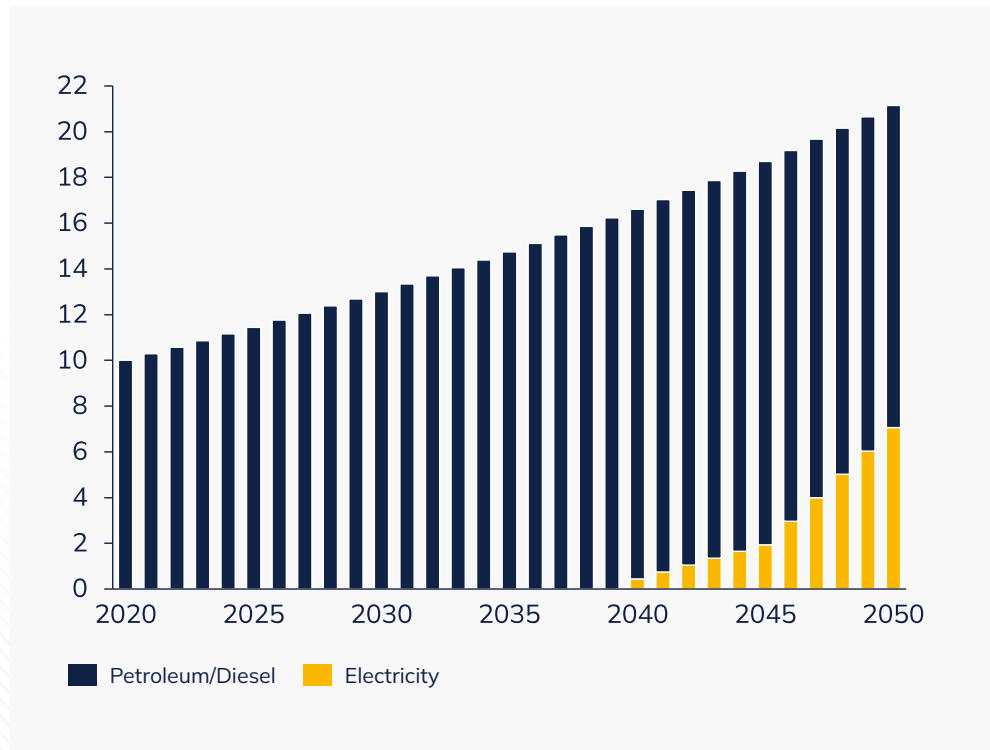
- A noticeable shift from fossil fuels to electric vehicles in the passenger car sector by 2050 due to the global accelerated adoption of electric vehicles.
- The future ICE vehicles fleet would be aligned with best-in-class fuel-efficient vehicles from the African continent.
- The shift towards electric vehicles necessitates new skills and education in the automotive sector, aligning with the Human Capital Development goals in the National Development Plan.

## UNDERLYING ASSUMPTIONS

- The projections assume advancements in electric vehicle technology and the corresponding infrastructure development, particularly in charging stations.
- The market is assumed to be ready for electric vehicles, supported by affordable options and consumer acceptance.
- The projections assume continuous government incentives for electric vehicle adoption, such as tax benefits, subsidies, and investment in infrastructure.

# TRANSPORT | HEAVY TRUCKS | TECHNOLOGY MIX ('000 UNITS)

## HEAVY TRUCKS TECHNOLOGY MIX '000 UNITS



## KEY INSIGHTS

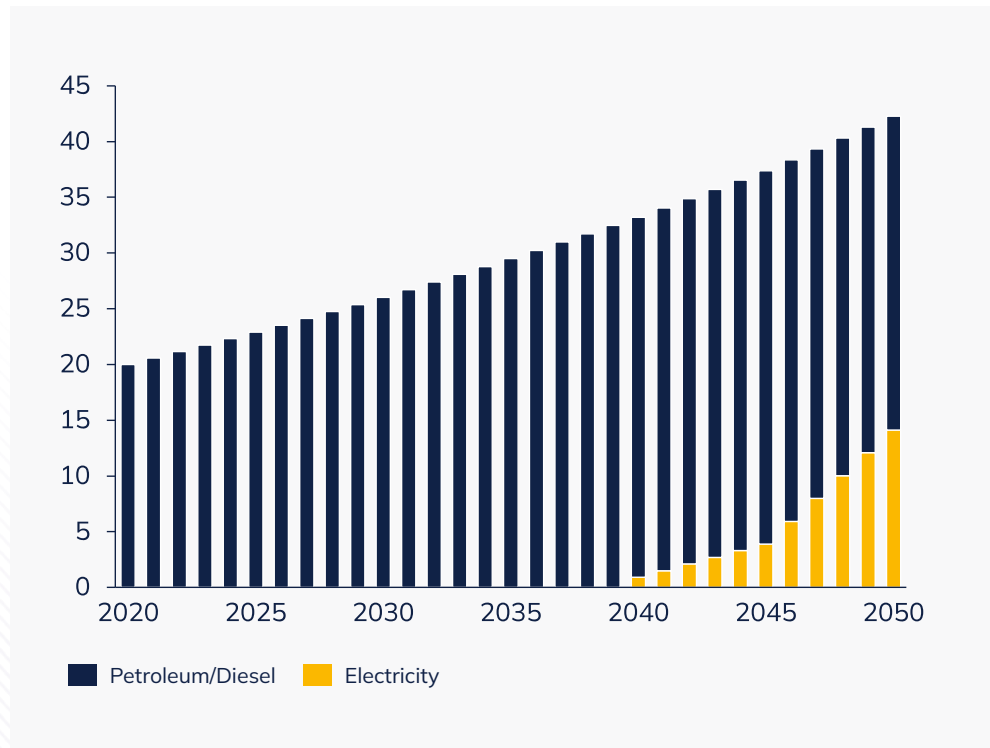
- The heavy truck sector is slower in transitioning to electricity, reflecting the challenges in decarbonizing this segment compared to passenger vehicles.
- The dominance of fossil fuels until 2040 indicates that heavy trucks will remain reliant on traditional fuels for the foreseeable future.
- Requiring targeted policies to encourage the switch to cleaner alternatives, although Biofuels would replace traditional liquid fuels by 2040.

## UNDERLYING ASSUMPTIONS

- The projections assume that technological advancements in heavy truck electrification will lag behind those in passenger vehicles.
- It is assumed that economic and market constraints will slow the transition in this sector, particularly in the earlier decades.

# TRANSPORT | LIGHT TRUCKS | TECHNOLOGY MIX ('000 UNITS)

## LIGHT TRUCKS TECHNOLOGY MIX '000 UNITS



## KEY INSIGHTS

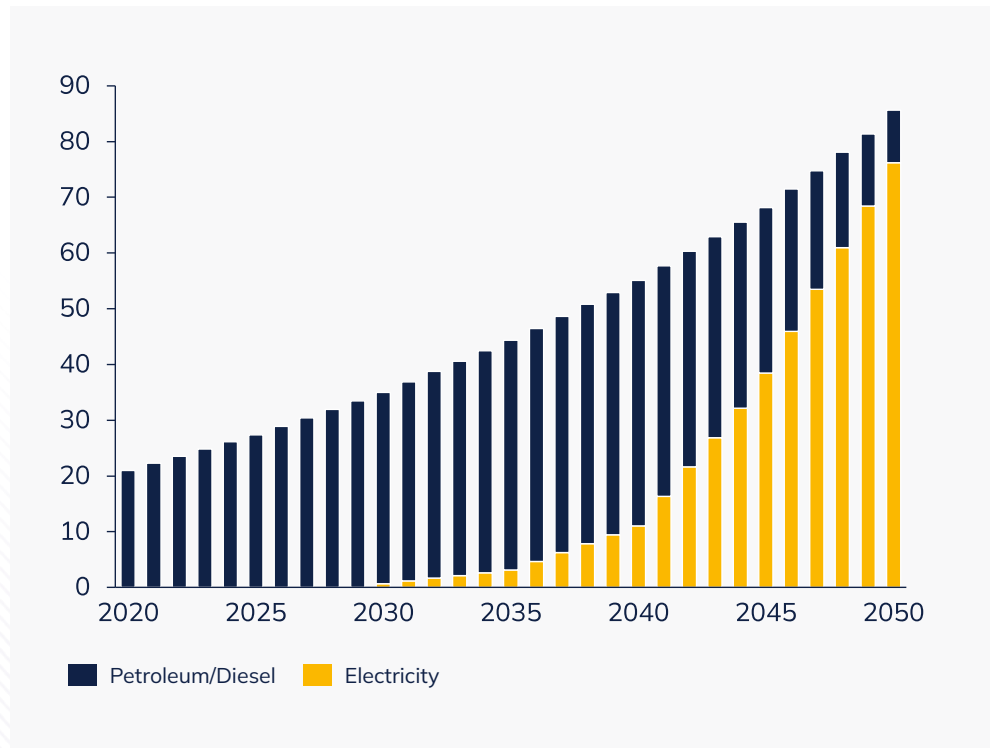
- Light trucks also slow shift towards electricity by 2050, though petroleum remains prominent.
- The gradual increase in electric trucks is due to the lack of scalable products that are commercially available globally.
- Biofuels could also provide decarbonization flexibility in this vehicle segment.
- The transition in light trucks, often used in the agro-food industries, aligns with efforts to make these industries more sustainable, a key focus area under infrastructure development.

## UNDERLYING ASSUMPTIONS

- The projections assume the availability and affordability of electricity for light trucks as the market evolves.
- It is assumed that specific policies will target the light truck sector, encouraging the adoption of cleaner vehicles.
- The successful adoption of alternative fuels assumes that the necessary refueling and recharging infrastructure will be in place.

# TRANSPORT | BUS | TECHNOLOGY MIX ('000 UNITS)

## BUS TECHNOLOGY MIX '000 UNITS



## KEY INSIGHTS

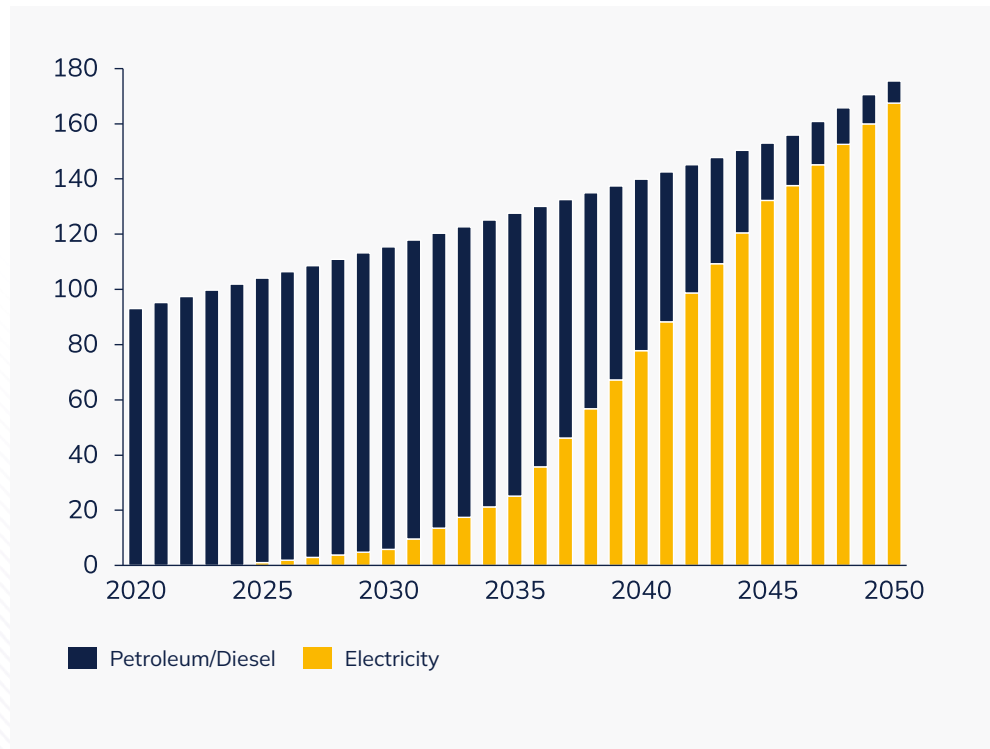
- The bus sector shows a significant shift towards electricity by 2050, reflecting a viable technology cost viability from 2040 in relation to ICE engines.
- The rapid decline in fossil fuel usage in the bus sector aligns with national goals for reducing emissions and improving urban air quality.
- Electrification of buses enhances public services by providing cleaner, more reliable transport, contributing to energy planning and infrastructure expansion.

## UNDERLYING ASSUMPTIONS

- Public investment in electrifying the bus fleet, supported by government policies and international funding.
- It is assumed that urban infrastructure, such as charging stations and grid capacity, will be sufficiently developed to support the shift to electric buses.
- The projections assume that the public and transportation providers will accept and adopt electric buses as a viable alternative to traditional buses.

# TRANSPORT | MOTORCYCLES | TECHNOLOGY MIX ('000 UNITS)

## 2/3 WHEELERS TECHNOLOGY MIX '000 UNITS



## KEY INSIGHTS

- The rapid shift from fossil fuel to electricity in 2/3 wheelers by 2050 highlights a successful transition in this segment and the availability of cost-effective products.
- The transition to electric 2/3 wheelers opens opportunities for youth employment and entrepreneurship in emerging green sectors, aligning with the goals of the **National Development Plan 2024-2030**.

## UNDERLYING ASSUMPTIONS

- The projections assume that the market will respond positively to electric 2/3 wheelers, supported by cost reductions and improvements in battery technology.
- The projections assume continued urbanization will drive the demand for efficient, clean, and affordable 2/3 wheelers.



CHAPTER SEVEN

# FINANCING



# CHALLENGES OF ENERGY FINANCING IN SIERRA LEONE

## ENERGY SECTOR OVERVIEW

- Sierra Leone’s energy sector requires urgent and substantial investment to address critical infrastructure deficits and expand access to electricity. With only 34% of the population connected to the grid and frequent blackouts in served areas, the country’s energy shortage severely hampers economic development and quality of life.
- The current installed generation capacity of around 300 MW is grossly inadequate to meet growing demand, while the limited and inefficient transmission and distribution networks further constrain reliable power delivery.



## CHALLENGES



The national electricity utility EDSA faces severe financial challenges, including high losses and low revenue collection, making it difficult for independent power producers to participate.



Many proposed projects lack proper feasibility studies and environmental assessments, hindering their bankability.



Regulatory uncertainty persists despite recent reforms, creating risks for private investors.




Limited fiscal space constrains the government’s ability to fund large-scale energy infrastructure projects.




Long-term integrated planning for generation and transmission expansion exhibits significant gaps.

# ENERGY TRANSITION PROVIDE OPPORTUNITIES FOR NEW INVESTMENTS AND FINANCING IN THE POWER SECTOR

## OPPORTUNITIES

 Abundant untapped renewable resources, including hydropower, solar, and biomass potential have been captured in this plan to demonstrate a credible technology pathway for Sierra Leone to achieve its economic growth targets in a sustainable manner following a low-carbon emissions trajectory.

 Regional integration through the West African Power Pool offers prospects for electricity trading.

 Off-grid solutions, including mini-grids and stand-alone systems, show growing potential for to serve rural areas.

 Ongoing power sector reforms, currently undertaken by the Government aims to create a more conducive environment for private participation.

 Support from development partners through technical assistance and concessional financing to catalyze investments are urgently needed











## INVESTMENT PRIORITIES AND REFORMS

- Key investment needs, as identified by this plan, include rehabilitation and expansion of hydropower plants, development of utility-scale solar PV projects, strengthening of the national transmission and distribution network, and deployment of off-grid electrification solutions. Addressing these needs requires a comprehensive approach that tackles the fundamental challenges in sector governance, planning, and financial sustainability.
- Creating an enabling environment for investment will necessitate continued reforms to strengthen the regulatory framework, improve the financial viability of the power sector, enhance planning and project preparation capabilities, and develop innovative financing mechanisms. With sustained efforts to address these issues, Sierra Leone can attract significant private and public investment to transform its energy sector, unlocking the country’s economic potential and improving the lives of its citizens.



# SIERRA LEONE WOULD REQUIRE A TOTAL CAPITAL INVESTMENT OF ~US\$ 39 BN TO DRIVE GREEN ECONOMIC GROWTH UNTIL 2050

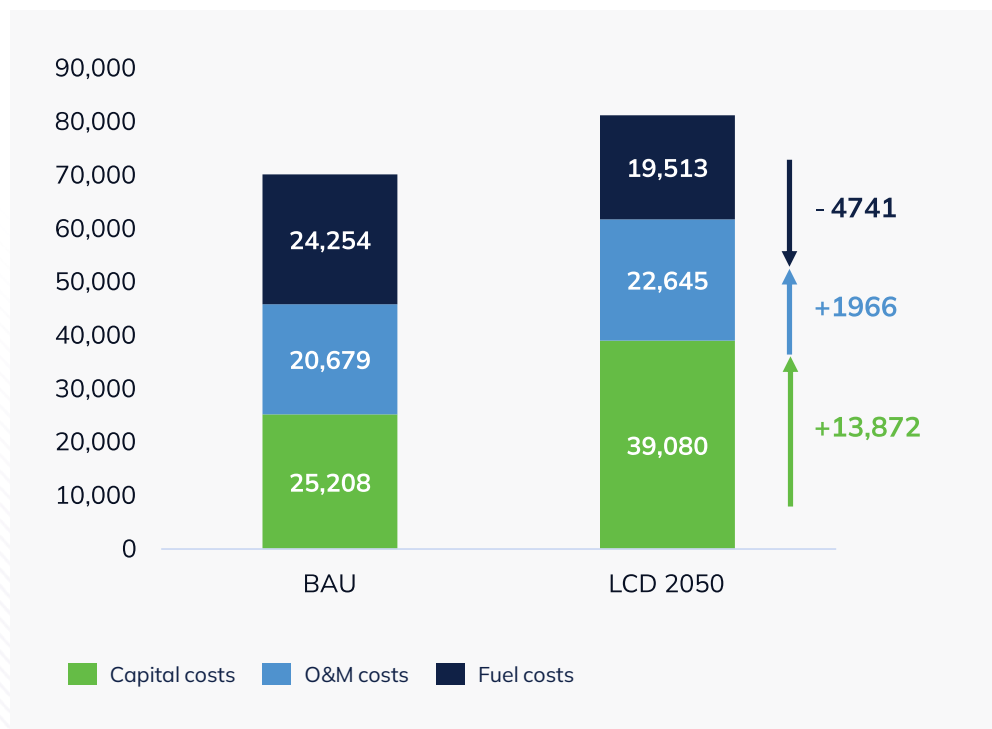
INVESTMENT, SELECTED PROJECTS		CUMULATIVE TOTAL INVESTMENT, USD Mn	
Sector	Project archetypes	2020-2040	2040-2050
 <b>Power</b>	Grids and mini-grids, renewables, battery storage, T&D (ex. residential)	4239	6647
 <b>Electricity access (distribution)</b>	Electricity access distribution costs for current and new connections	725	925
 <b>Industry &amp; Mining (distribution)</b>	Clean high-temperature heating processes	1375	760
 <b>Clean Cooking</b>	Clean cookstoves	88	61
 <b>Agriculture</b>	Generation including through mini-grid, diesel gen-sets and SHS, and distribution from grid	21	95
<b>Total</b>		<b>6,448</b>	<b>8,488</b>
			
 <b>Transport</b>	Electric two-wheelers, cars, trucks, buses, and associated infrastructure incl. distribution	10,967	13,177
 <b>Hydrogen</b>	Electric two-wheelers, cars, trucks, buses, and associated infrastructure incl. distribution	0	143
<b>Total</b>		<b>10,967</b>	<b>13,320</b>

## KEY MESSAGES

- Sierra Leone requires a total capital investment of ~39 billion USD to achieve universal energy access by 2040 and drive green economic growth together with to reach middle-income status by 2050.
- The investment need spans various sectors, with the most significant investments in transport, power, and mining, driven by demographic and economic growth leading to increased energy demand.
- The transport sector alone requires ~24 billion USD (61% of total capital investments) until 2050. This is primarily driven by GDP growth increasing demand for diverse transport modes, to be powered by sustainable solutions including biofuels and partial electrification.
- The power sector has the second-largest investment with ~11 USD billion by 2050 needed due to significant increases in generation capacity required to meet demand from electrification of mining, transport, industrial, and residential sectors.
- Electricity access and mining will require ~5% of total capital needs to strengthen and expand the distribution network.

# ACHIEVING MIDDLE-INCOME ECONOMY WOULD REQUIRE SUBSTANTIAL CAPITAL INVESTMENTS OVER THE NEXT 30 YEARS IN GREEN AND SUSTAINABLE TECHNOLOGIES

## CUMULATIVE SPENDING MILLION USD, 2020-2050



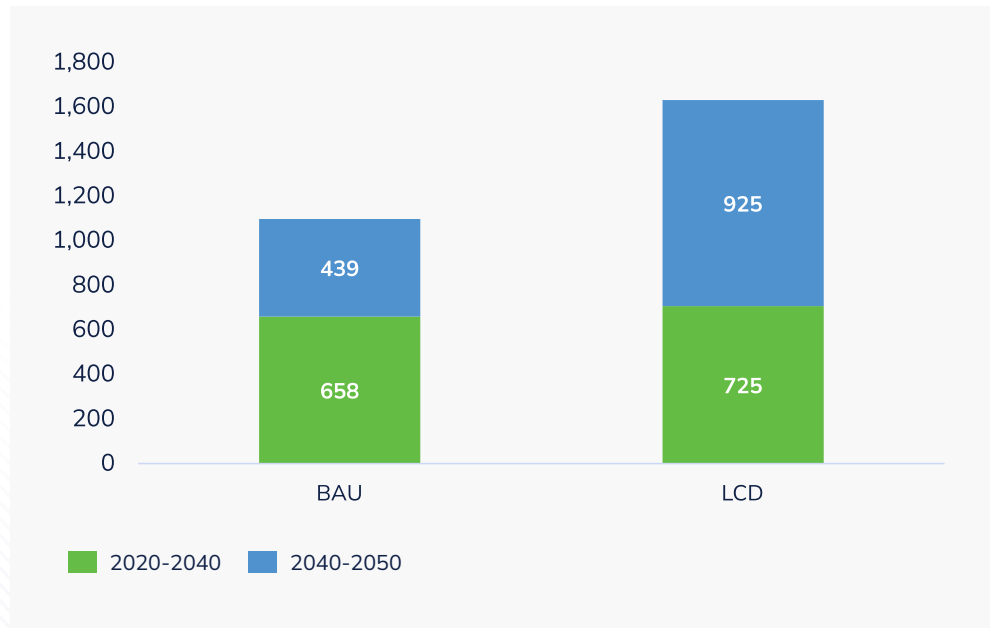
## KEY INSIGHTS

- The Low Carbon Development (LCD) 2050 scenario results in **fuel and electricity imports saving of approximately 4.7 billion USD** compared to BAU.
- **The LCD 2050 scenario requires about 13.9 billion USD** more in capital costs compared to BAU, but this is partially offset by savings in fuel costs.
- There's a slight increase in O&M costs in the LCD 2050 scenario, as a result of the implementation of capital intensive low-carbon technologies and infrastructure. However, the net job-creation potential in operations and maintenance, while not calculated in this plan, presents significant opportunities for employment and tax revenue generation.
- While the low-carbon path requires more upfront investment, but it presents significant opportunities for long-term savings and sustainability benefits.

Source: SEforALL analysis

# INVESTMENT NEEDS IN ELECTRICITY ACCESS – BAU V LCD 2050

**CAPITAL INVESTMENT REQUIREMENT IN ELECTRICITY ACCESS** MILLION USD, 2020-50



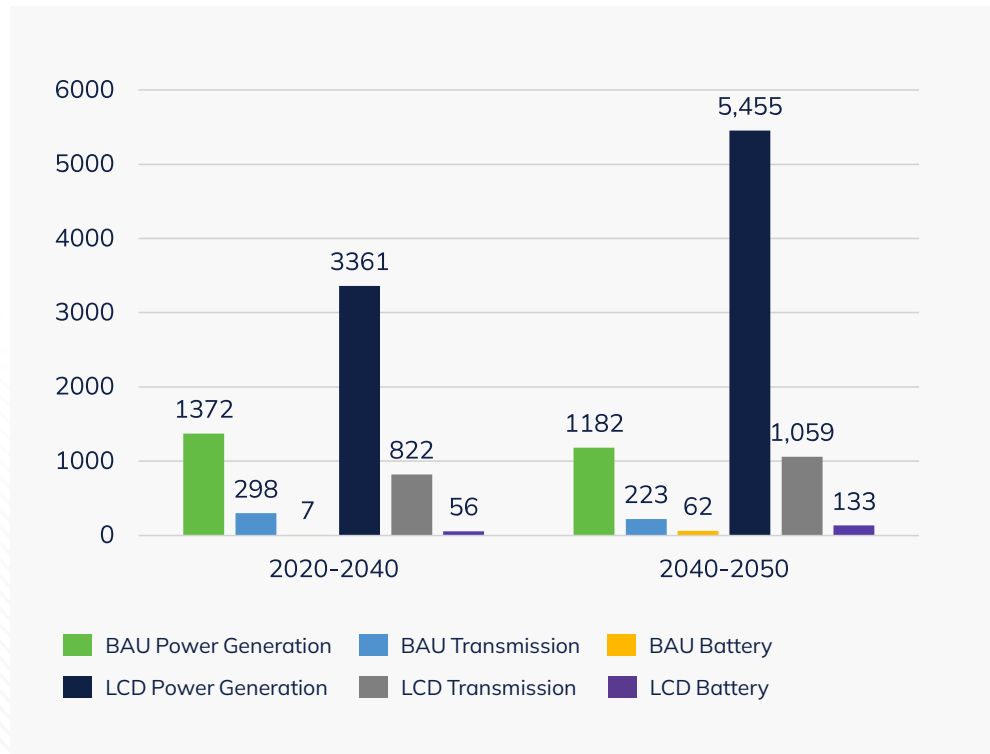
## KEY INSIGHTS

- Sierra Leone requires a total capital investment of 1,630 million USD to ensure universal and reliable electricity access by 2040 and beyond.
- An initial investment of 705 million USD is needed between 2020-2040 to connect all households. A further 925 million USD will be required from 2040-2050 to support grid reinforcement, modernization, and integration of advanced technologies to meet increased demand and improve reliability.
- Compared to the BAU scenario, the LCD pathway requires an additional 533 million USD investment, primarily concentrated in the 2040-2050 period, to ensure a more comprehensive and sustainable electrification strategy.

Source: SEforALL analysis

# INVESTMENT NEEDS IN POWER SECTOR – BAU V LCD 2050

**CAPITAL INVESTMENT REQUIREMENT IN POWER SECTOR** MILLION USD, 2020-2050



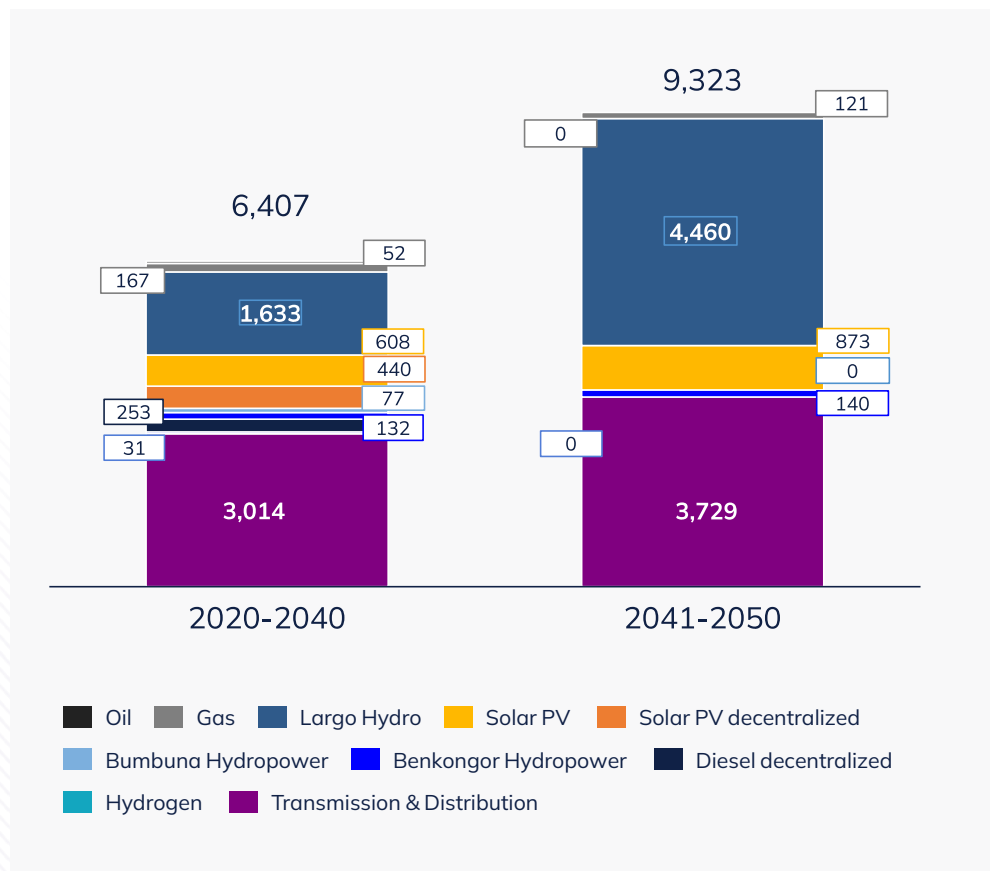
## KEY INSIGHTS

- Power generation takes the bulk of investment in the LCD scenario. Investments are primarily needed in hydropower and solar PV.
- Significant investments are needed in transmission to expand grid infrastructure, especially to mining and agro-industrial areas.
- The LCD scenario shows a substantial increase in power generation investment, reflecting the transition to low-carbon energy sources.
- Transmission investments also increase, as a result of an increased focus on grid expansion and modernization.
- Battery storage investments, while smaller, show significant growth in the LCD scenario, for grid stability as a result of increased integration of renewable energy.

Source: SEforALL analysis

# INVESTMENT NEEDS IN POWER SECTOR – LCD 2050

## CAPITAL INVESTMENT REQUIREMENT IN POWER SECTOR MILLION USD, 2020-2050



## KEY INSIGHTS

- Investment in hydropower is the largest, with 1.6 Bn USD in the short- and medium-term and 4.5 Bn in the long-term.
- Combined investments in solar PV (centralized and decentralized) grow steadily, reaching a cumulative of 1.3 Bn USD by 2050.
- Investment in oil and gas is projected to decline significantly, with no oil investment after 2040 and gas investments reducing from 167 M USD to 121 M USD in the second period.
- Investment in transmission and distribution technologies is expected to stay relatively large and level, with 3 Bn USD in the short- to medium-term and 3.7 Bn USD in the long-term.

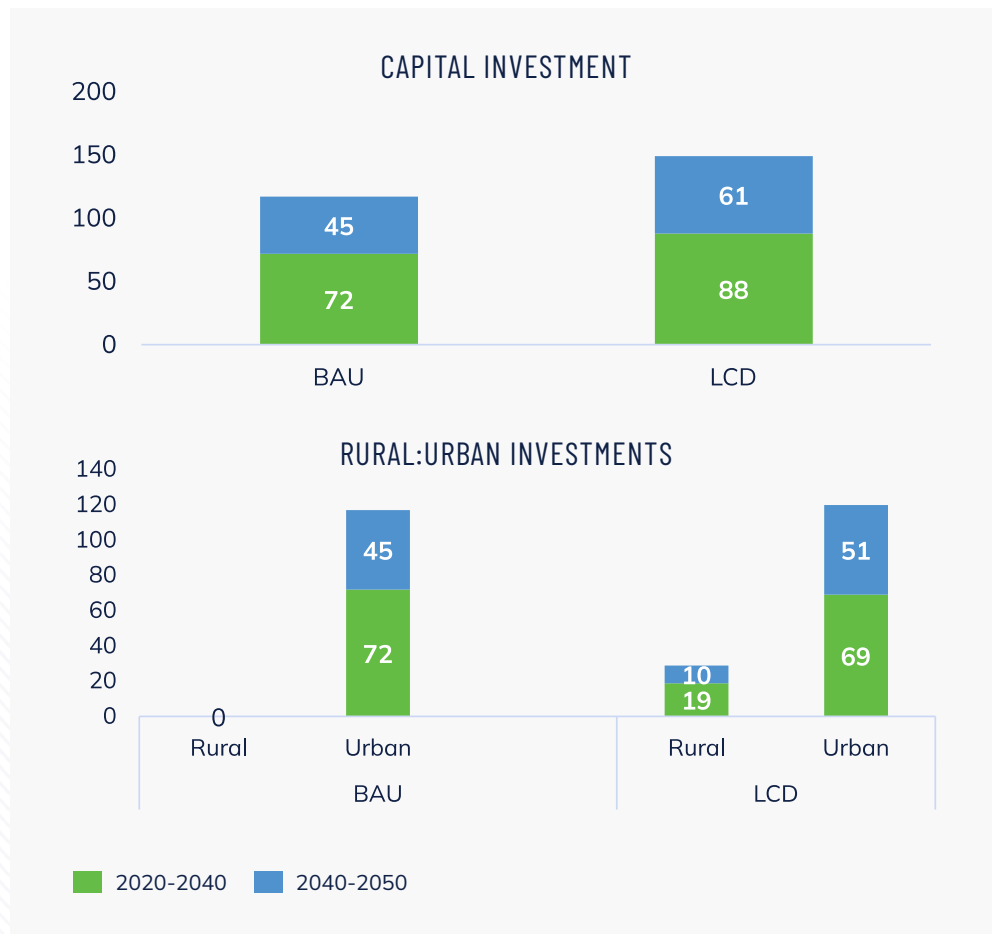
Note: Transmission & distribution costs include distribution network costs to all sectors

Source: SEforALL analysis



# INVESTMENT NEEDS IN CLEAN COOKING SECTOR – BAU V LCD 2050

**INVESTMENT REQUIREMENTS IN CLEAN COOKING (STOVES ONLY)** MILLION USD, 2020-50



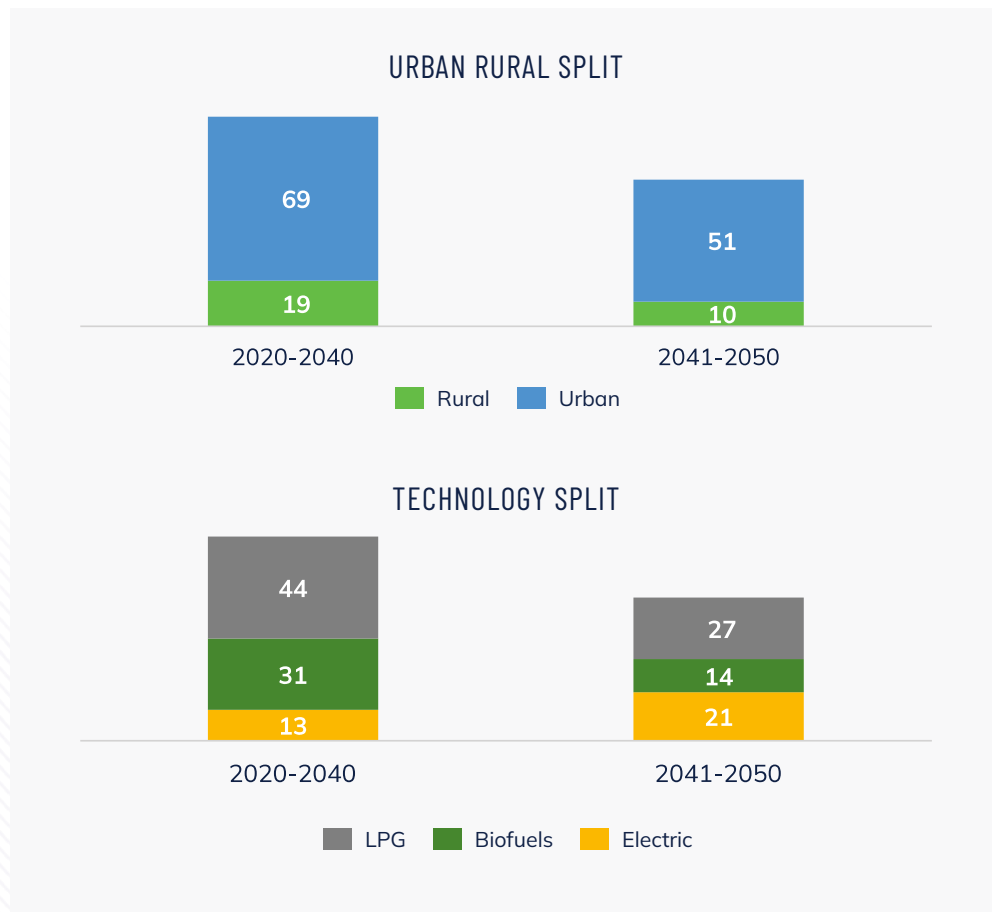
## KEY INSIGHTS

- LCD scenario requires significantly higher investment in clean cooking technologies compared to BAU, with total investments of 149M USD compared to 117M USD in BAU over the 2020-2050 period.
- The rural-urban split reveals a targeted approach in the LCD scenario, with rural areas also receiving significant investments, as opposed to BAU where no investments are made in rural areas. This suggests a concerted effort to address energy poverty and health issues in traditionally underserved regions.
- Rural areas see a substantial increase in investment under the LCD scenario, due to a strong push for equitable and universal access to clean cooking by 2040 – 2050.
- Urban areas require more investments in both scenarios due to urbanization resulting in increased demand.
- The higher investment in the LCD scenario would also lead to significant reductions in indoor air pollution and associated health problems, resulting in an overall net-benefit to the economy.

Source: SEforALL analysis

# INVESTMENT NEEDS IN COOKING SECTOR – LCD 2050

## CAPITAL INVESTMENT REQUIREMENT IN COOKING SECTOR MILLION USD, 2020-50



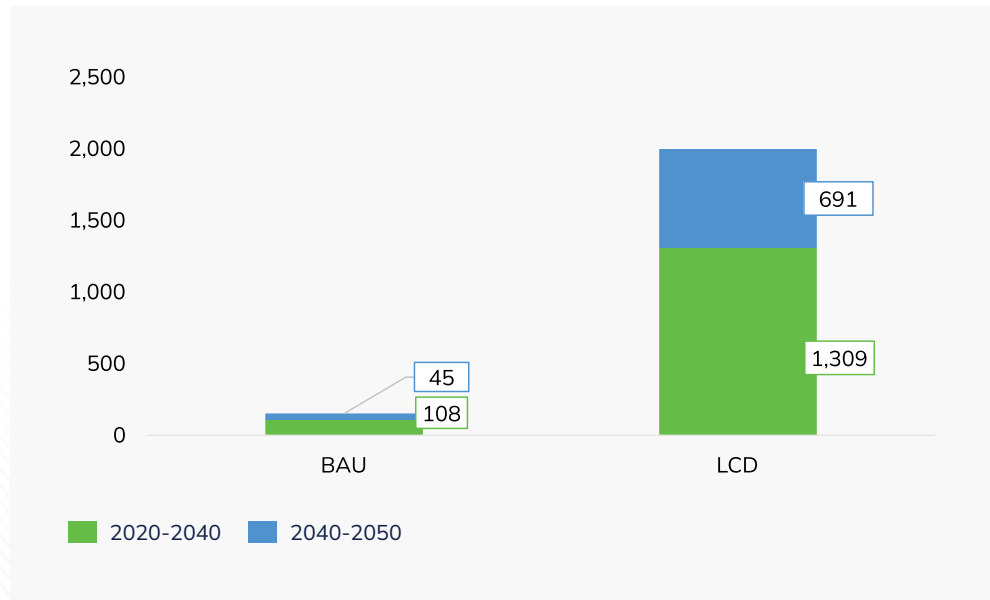
## KEY INSIGHTS

- The bulk of the investments in both short-to-medium-term and long-term are for urban stoves and it is expected to stay **relatively large and level, with 69 M USD in the short-to-medium-term and 51 M USD in the long-term.**
- Investment in LPG stoves is the largest, **with 44 M USD in the short-to-medium-term and 27 M in the long-term.**
- Investment in biofuel stoves is higher in the **short-to-medium-term with 31 M USD** than in the long-term.
- In contrast, investment in e-stoves is higher in the **long-term with 21 M USD.**

Source: SEforALL analysis

# INVESTMENT NEEDS IN MINING SECTOR – BAU V LCD 2050

**CAPITAL INVESTMENT REQUIREMENT IN MINING SECTOR** MILLION USD, 2020-50



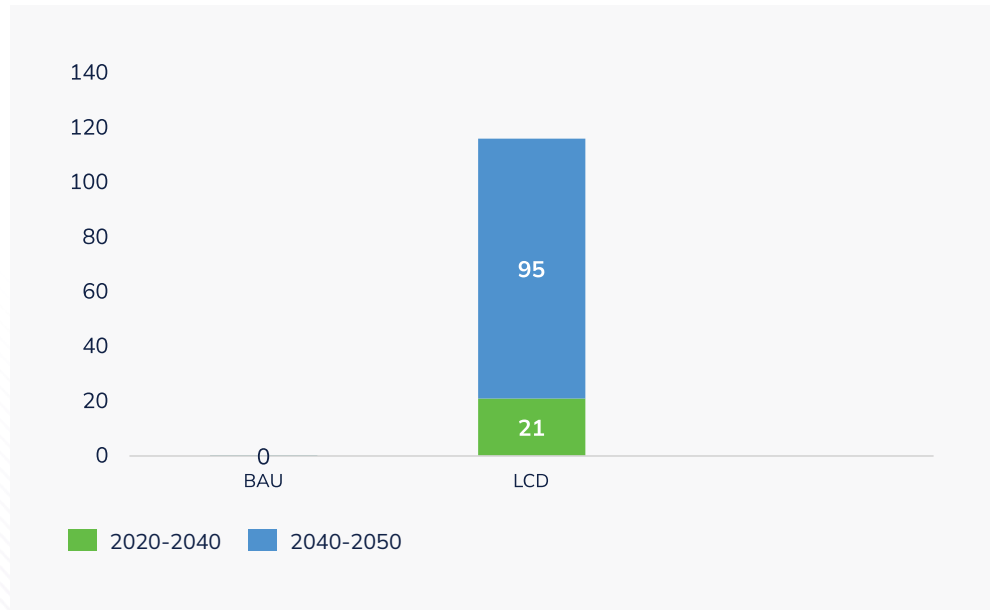
## KEY INSIGHTS

- LCD scenario requires significant investments to expand the distribution network to mining sites. Mining sector is expected to be fully connected to the grid by 2030 in the LCD scenario.
- The dramatic increase in LCD investment reflects the costs of grid connection for all mining operations by 2030, as opposed to BAU where most of the mining operations would still be powered by stand-alone diesel gen-sets.
- This approach is more capital-intensive upfront but likely more sustainable and cost-effective long-term. A decrease in 2040-2050 LCD investment will be due to the fact that most distribution infrastructure will be in place by then.

Source: SEforALL analysis

# INVESTMENT NEEDS IN AGRICULTURAL SECTOR – BAU V LCD 2050

**CAPITAL INVESTMENT REQUIREMENT IN AGRICULTURE SECTOR** MILLION USD, 2020-50



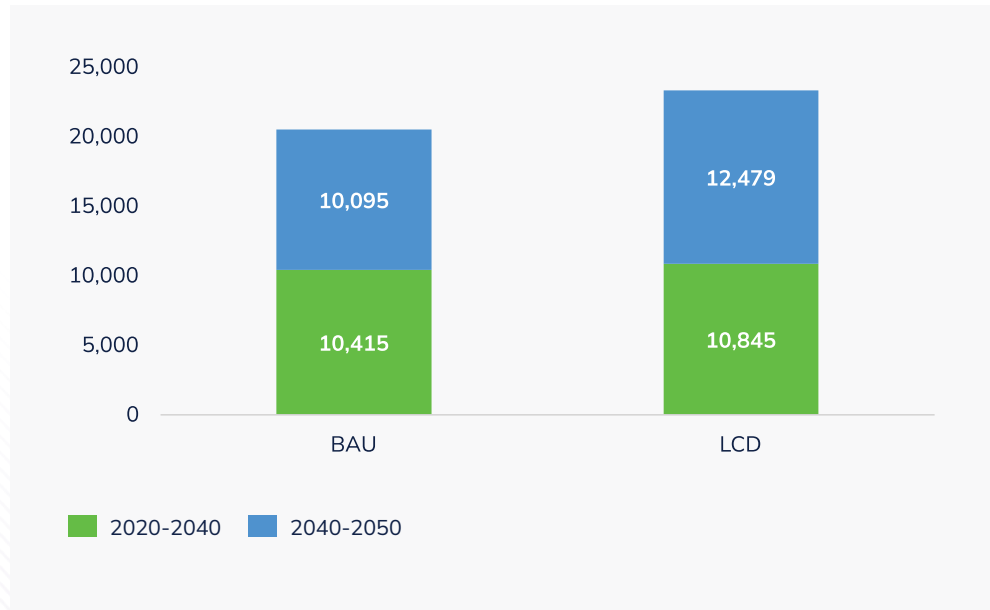
## KEY INSIGHTS

- Electricity requirement in the agricultural sector increases significantly from 0.3 MW in 2020 to 36 MW in 2028 to achieve Feed Salone objectives, with initial reliance on a mix of diesel stand-alone and mini-grid technologies.
- In a BAU scenario, the agricultural sector is not aligned with the Government’s ambitious Feed Salone strategy. Hence, there is very little investments made in agriculture.
- The LCD scenario shows a substantial increase in investment, particularly in the 2040-2050 period, as part of a long-term strategy to electrify and modernize the agricultural sector. A shift from diesel to grid investments in later years will help shift the country to more sustainable energy sources for agriculture, aligning with the overall green-growth plan’s low-carbon development goals.
- This approach would aim to increase both productivity and sustainability in the sector, potentially leading to improved food security and economic growth while reducing the carbon footprint of agricultural activities.

Source: SEforALL analysis

# INVESTMENT NEEDS IN TRANSPORT SECTOR – BAU V LCD 2050

**CAPITAL INVESTMENT REQUIREMENT IN TRANSPORT SECTOR** MILLION USD, 2020-50



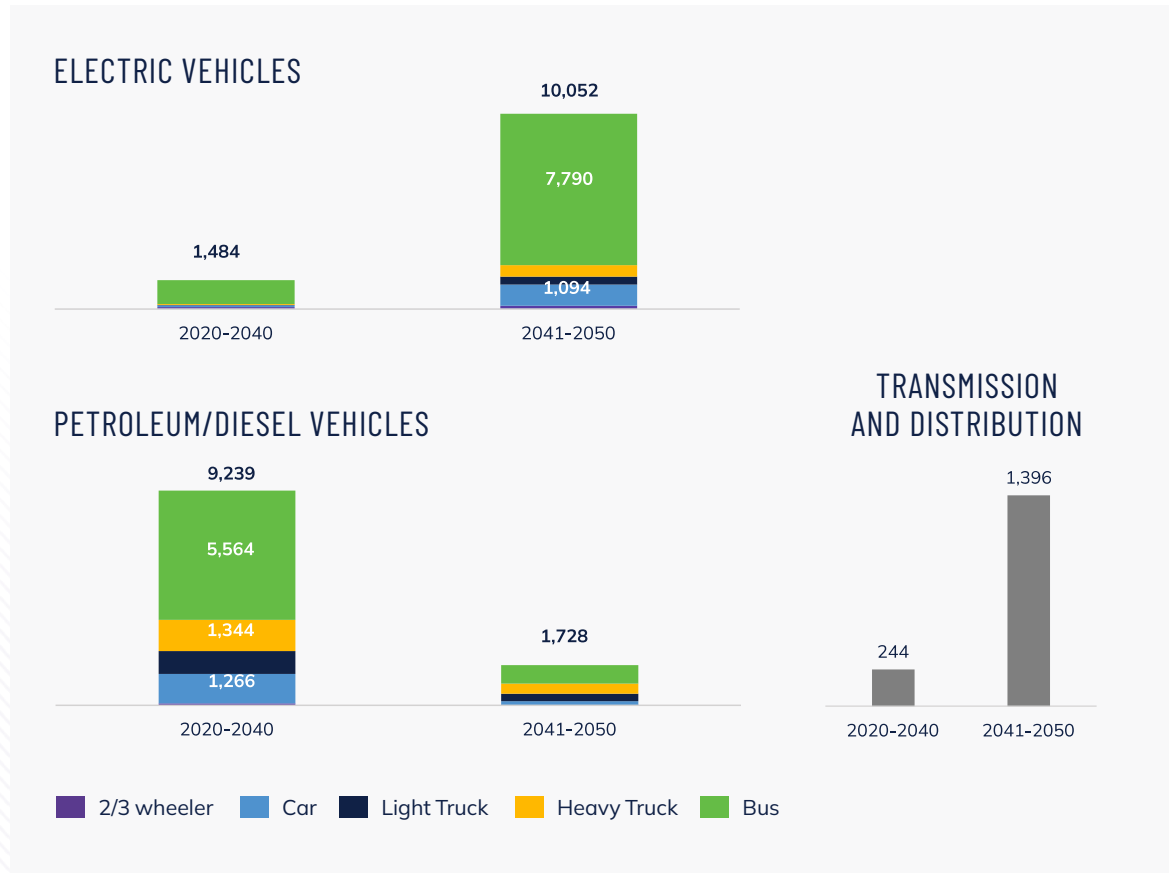
## KEY INSIGHTS

- The LCD scenario requires slightly higher investments due to electrification of the transport fleet.
- Overall transport demand remains similar in both scenarios due to GDP growth.
- Higher investment in the LCD scenario likely reflects the costs of electric vehicles and associated infrastructure.
- Despite higher upfront costs, electrification of transport aligns with emissions reduction goals and may offer long-term operational savings.

Source: SEforALL analysis

# INVESTMENT NEEDS IN TRANSPORT SECTOR – LCD 2050

## CAPITAL INVESTMENT REQUIREMENT IN TRANSPORT SECTOR MILLION USD, 2020-2050



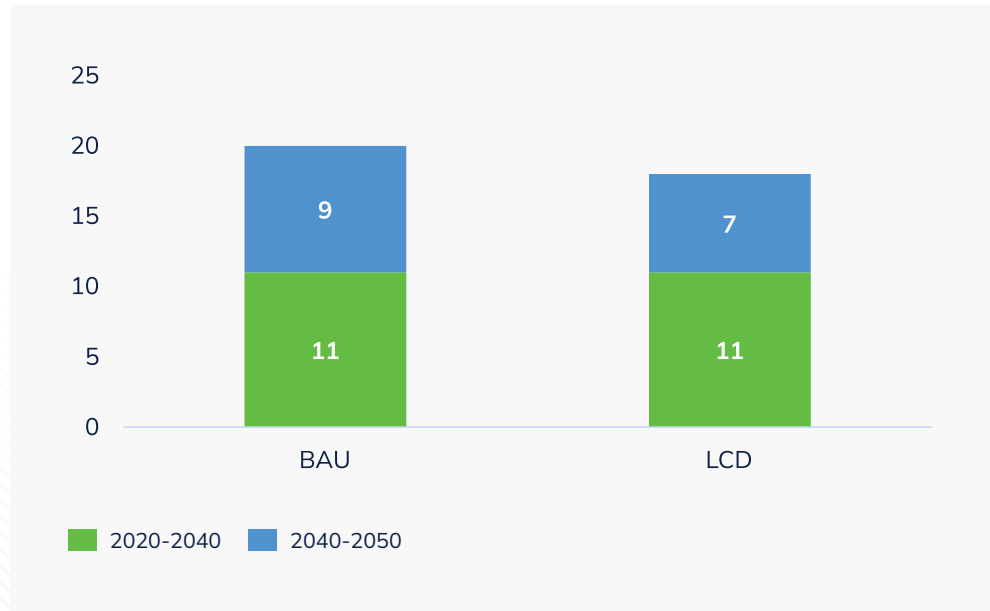
## KEY INSIGHTS

- In the short-to-medium-term, investments are the **highest in petroleum/diesel vehicles, with around 9.2 Bn USD.**
- In contrast, in the long-term, investments in **electric vehicles (10 Bn USD) increases significantly** with a drastic reduction in petroleum vehicles' investments (1.7 Bn USD).
- **The bulk of the investment goes for electric and petroleum/diesel buses** in both short-to-medium-term and long-term.
- Investments in the transmission and distribution technology for the transport sector share a similar trend with the electric vehicles, to support their infrastructure.

Source: SEforALL analysis

# INVESTMENT NEEDS IN INDUSTRIAL SECTOR – BAU V LCD 2050

**CAPITAL INVESTMENT REQUIREMENT IN INDUSTRIAL SECTOR** MILLION USD, 2020-50



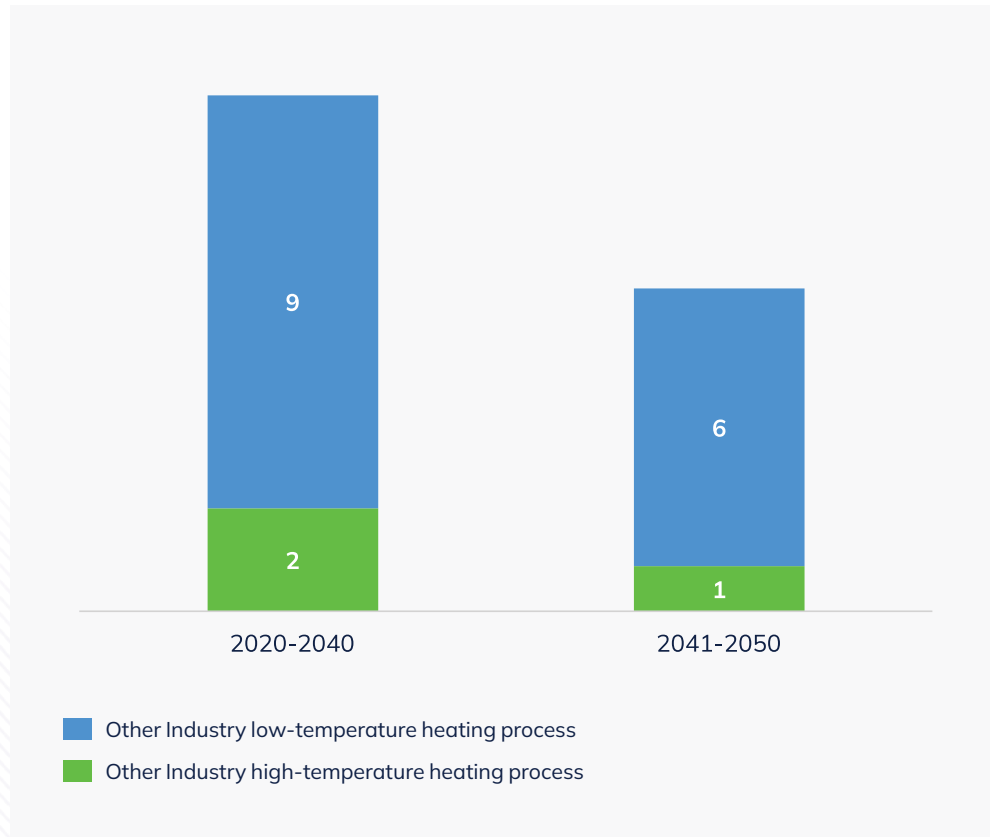
## KEY INSIGHTS

- Both scenarios envisage investments to gradually shift industrial heating processes (both low and high temperature) away from biomass to oil and gas.
- LCD scenario introduces gas to replace oil and biomass in later years.
- Both scenarios show decreased investment needs over time, due to increased efficiency in operations thus requiring fewer boilers.
- The shift to gas in the LCD scenario will enable a move towards cleaner fuel sources in industrial operations by 2050.

Source: SEforALL analysis

# INVESTMENT NEEDS IN INDUSTRIAL SECTOR – BAU V LCD 2050

## CAPITAL INVESTMENT REQUIREMENT IN INDUSTRY SECTOR MILLION USD, 2020-50



## KEY INSIGHTS

- Investments in the industrial sector are only for **other industry high and low temperature heat processing technologies**.
- The bulk of the investment is for low-temperature heat processing technologies, with **9 M USD in the short-to-medium-term and 6 M USD in the long-term**.
- Investments for high-temperature heat processing technologies are **2 M USD in the short-to-medium-term, reducing to around 1 M USD in the long-term**.
- While the majority of the investments are in 2020-2040, significant investments are made in the second period too.

Source: SEforALL analysis



# A COMBINATION OF PRIVATE SECTOR CAPITAL AND DE-RISKING INSTRUMENTS COULD HELP FINANCE SIERRA LEONES' ENERGY TRANSITION

	CORE FINANCE PROVIDERS			PROVIDERS OF DE-RISKING INSTRUMENTS e.g., guarantees/insurance, first-loss-capital, etc.					
	PRIVATE SECTOR			DOMESTIC PUBLIC SECTOR	INTERNATIONAL INSTITUTIONS				
ACTORS	COMMERCIAL FINANCIAL INSTITUTIONS	CORPORATIONS	HOUSEHOLDS AND INDIVIDUALS	PUBLIC INSTITUTIONS	MULTILATERAL DFIs <sup>3</sup>	BILATERAL DFIs <sup>3</sup>	NATIONAL FIs <sup>3</sup>	GREEN FINANCE FUNDS	PRIVATE FOUNDATIONS
EXAMPLES	Sierra Leone Commercial Bank Rokel Commercial Bank Standard Chartered Bank	EGTC EDSA Mini-grid and SHS companies	n.a.	Ministry of Finance Sierra Leone	IFC US Development Finance Corporation World Bank Millennium Challenge Corporation	Foreign, Commonwealth and Development Office EU	Bank of Sierra Leone	Green Climate Fund Global Environment Facility Adaptation Fund Clean Technology Fund	Rockefeller Foundation ClimateWorks Foundations Bloomberg IKEA foundation Bezos Earth fund Africa Climate Foundation
RETURN FOCUS	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="width: 45%; border-left: 1px solid black; border-right: 1px solid black; height: 20px;"></div> <div style="border: 1px solid black; padding: 2px 5px;">Economic returns</div> <div style="width: 45%; border-left: 1px solid black; border-right: 1px solid black; height: 20px;"></div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 10px;"> <div style="width: 45%; border-left: 1px solid black; border-right: 1px solid black; height: 20px;"></div> <div style="border: 1px solid black; padding: 2px 5px;">Environmental impact</div> <div style="width: 45%; border-left: 1px solid black; border-right: 1px solid black; height: 20px;"></div> </div>								

<sup>3</sup> Development finance institutions

Note: Not exhaustive – the list here is for illustration purpose

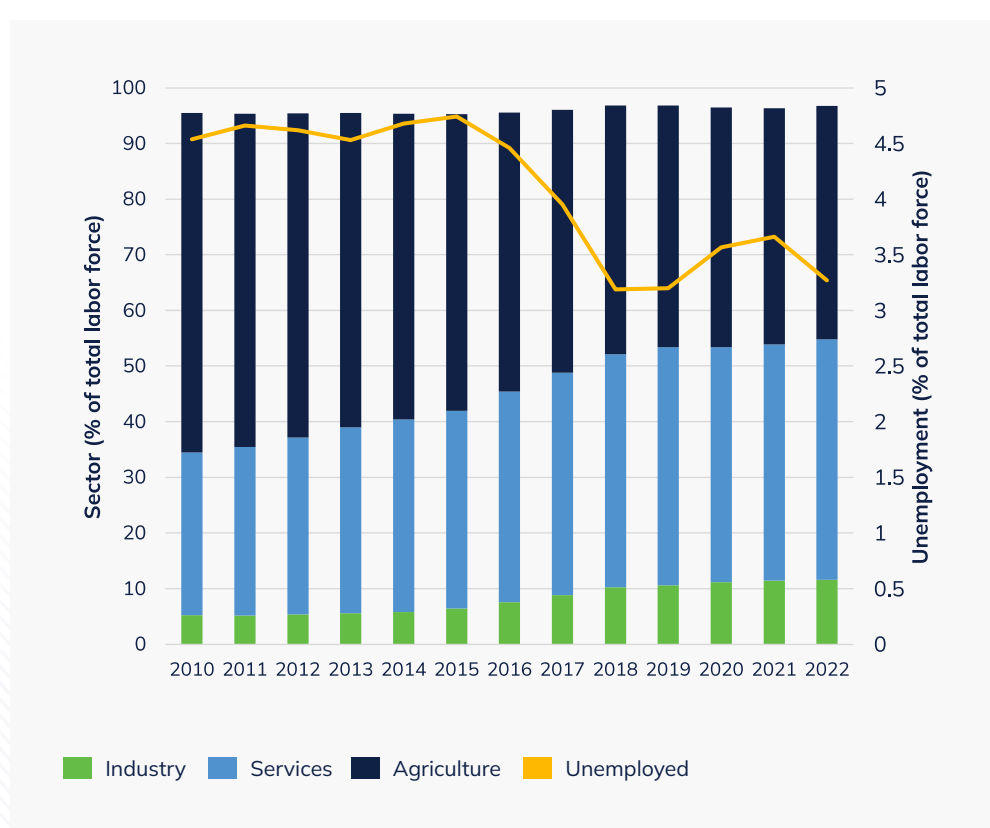
CHAPTER EIGHT

# JUST TRANSITION OPPORTUNITIES



# JOBS BY SECTOR AND UNEMPLOYMENT RATE

## TOTAL LABOR FORCE IN DIFFERENT SECTORS %



## KEY INSIGHTS

- The share of the workforce in the services and industrial sectors is growing while that in the agriculture sector is declining.
- In 2022, the services sector had the major workforce of the country (43%), contrary to the agricultural sector being the majority of the workforce a decade ago (61% in 2010).
- The unemployment rate has a declining trend, although without much variation in the past 5 years, but there is widespread underemployment observed.

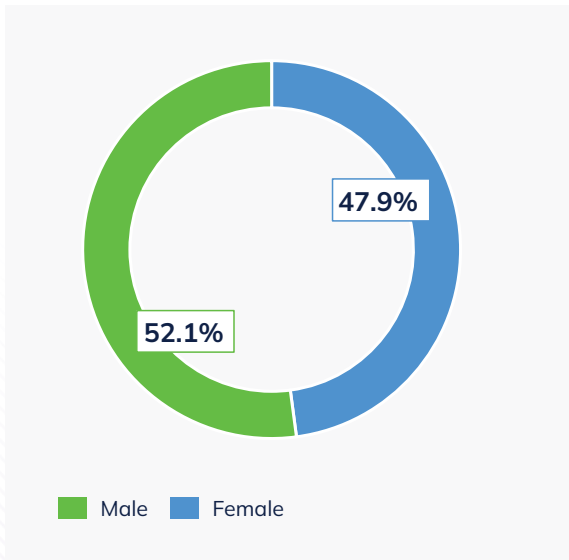
## ASSUMPTIONS AND DEFINITIONS

- Unemployment refers to the share of the labor force that is without work but available for and seeking employment.
- The industry sector consists of mining and quarrying, manufacturing, construction, and public utilities (electricity, gas, and water).
- The services sector consists of wholesale and retail trade and restaurants and hotels; transport, storage, and communications; financing, insurance, real estate, and business services; and community, social, and personal services.
- The agriculture sector consists of activities in agriculture, hunting, forestry and fishing.

Sources: World Bank Group (2024a, 2024b, 2024c, 2024d)

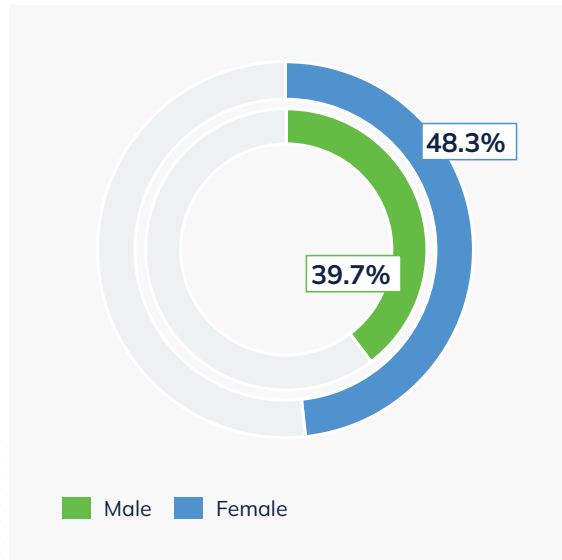
# JOB OPPORTUNITIES BY GENDER

## LABOUR FORCE BY GENDER



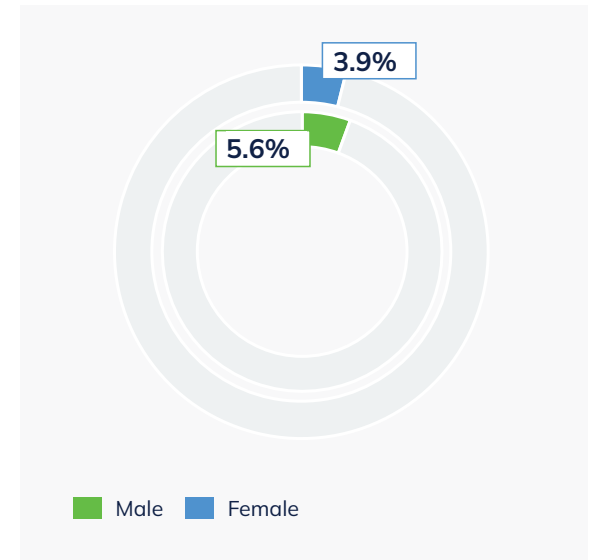
The female labour force is 47.9%, almost with an equal gender split.

## EMPLOYED POPULATION BELOW INTERNATIONAL POVERTY LINE AGE 15+



A larger share of female workforce is employed below the international poverty line.

## UNEMPLOYMENT RATE AGE 15+

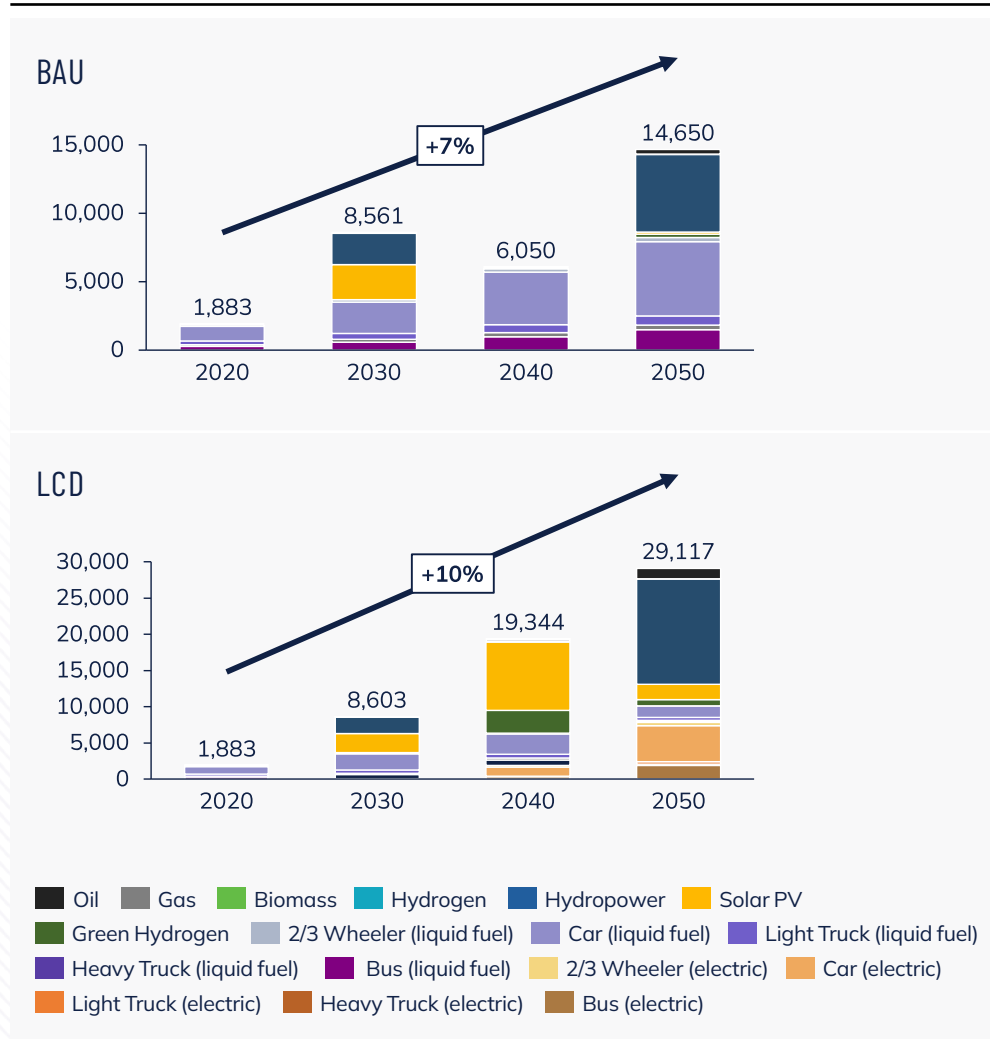


A larger share of male workforce is unemployed.

Sources: UN Women (2024), World Bank Group (2024e)

# JOBS IMPACT BY TECHNOLOGY (NUMBER OF DIRECT & INDIRECT JOBS)

## NUMBER OF JOBS



## KEY INSIGHTS

- BAU and LCD will have significant growth in new jobs. The number of jobs between 2020 and 2050 increase around **15 times** in the **LCD**.
- **LCD will create more jobs than BAU.** The number of jobs created in LCD (29,117) will be double the jobs created in BAU (14,650) by 2050.
- **BAU** will generate new jobs, primarily in the transport sector from the growth of cars.
- **LCD** will generate significant new jobs, primarily in the power sector from hydropower and solar. There is also a noticeable growth of electric buses and cars from 2040.
- The **power sector** is the key enabler of jobs in LCD. While most of the new jobs from solar will be around 2040, those from hydropower will be around 2050.

## UNDERLYING ASSUMPTIONS

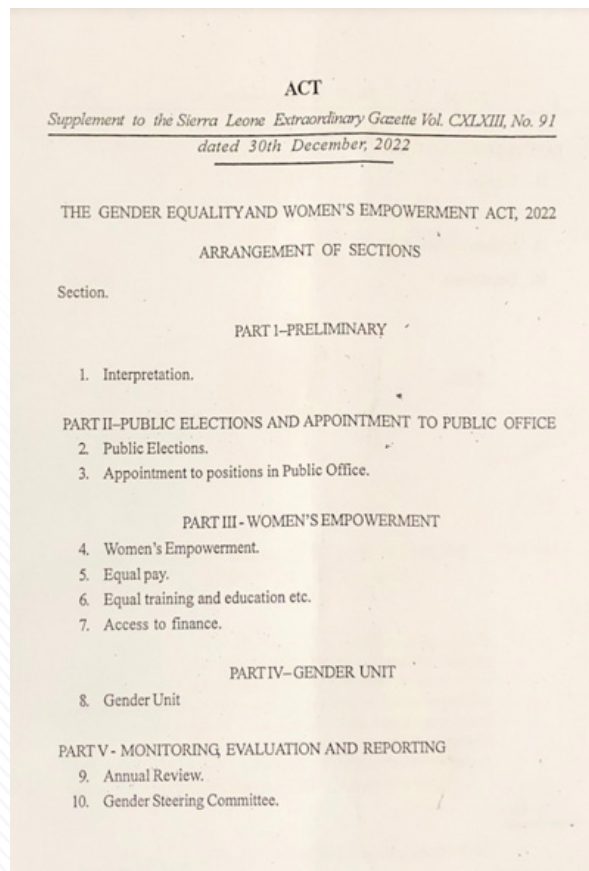
- Job multipliers are aligned with the country's job's and technology's perspectives.

CHAPTER NINE

# GENDER, EDUCATION & YOUTH



# SIERRA LEONE'S GENDER EQUALITY AND WOMEN'S EMPOWERMENT ACT, 2022 (GEWE)

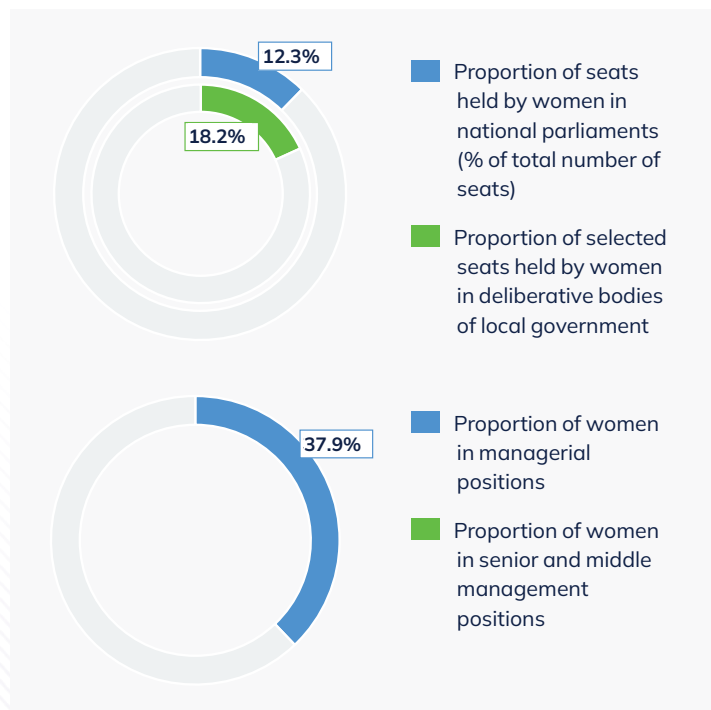


- In January 2023, President of Sierra Leone signed into law the country's landmark Gender Equality and Women's Empowerment Act (GEWE).
- The law is a fundamental step for gender equality in the country, especially considering that Sierra Leone is ranked 181 out of 191 countries in the United Nations Development Program's Gender Inequality Index.
- The law prescribes **improvements in women's access to funding, job opportunities, equal pay, maternity leave, training opportunities and political representation, introducing a 30 per cent quota for women's participation in government.** This implies an increase in women's political representation from the current 12 per cent of parliamentary seats and four of 32 cabinet positions.
- The GEWE Act also includes a **minimum of 30 per cent quota for women in the private sector**, which includes a 30 per cent quota of top leadership positions for women.
- The GEWE quota became effective on 24 June 2023.



Sources: [Industrial Relations and Labour Law \(2023\)](#)

## WOMEN, UNDER LCD, COULD ACCESS MORE EMPLOYMENT OPPORTUNITIES CONTRIBUTING TO GREEN GROWTH AND ADVANCING GEWE



Despite the GEWE Act's 30% quota mandate, women remain underrepresented in leadership and decision-making roles, including in the renewable energy sector, with inadequate representation in STEM fields both in education and employment, resulting in a shortage of qualified women to fill these positions.

Source: [UN Women](#)

### OPPORTUNITIES

- **MSSE STEM scholarship programs** to increase women's enrolment, degree completion, and advancement into employment.
- **LCD creates opportunities to leverage the GEWE Act**, promoting gender parity in the energy workforce and enabling women to access the 29,117 new jobs created.
- Multiplier effect from women's contributions in the **informal sector**, contribute to formal sector contributions & prepare women to take on formal roles created through job development.
- Expansion of **women-led SMEs** diversify energy supply chain & advance grid expansion to hard-to-reach communities.

### KEY ENABLERS

- Leverage the LCD and GEWE to facilitate women's entrance and advancement in the sustainable energy sector through equal access to job opportunities, pay, and training.
- **Invest in vocational training programs** focused on power & sustainable transportation for women.
- **Mandate on-the-job training opportunities** for local workers, including women & youth, in government-contracted energy projects.
- Design **gender-responsive subsidies and incentives** for adopting sustainable energy & transportation options.
- Develop **low-interest loan programs, grants, and subsidies** specifically for women-owned and led sustainable energy enterprises.



# YOUTH: EDUCATION & EMPLOYMENT OPPORTUNITIES CREATES A PATHWAY FOR A SKILLED WORKFORCE TO TAKE ON JOBS CREATED BY GREEN GROWTH

## BARRIERS

- Youth (18-35 years old) represent 18% of Sierra Leone's population and approximately 19% of the total workforce, signaling a national youth bulge (World Bank Data).
- While the unemployment rate has declined since 2020, youth unemployment stood at 3.57% of the total working age in 2023 (ILO Estimates). Many employed youth are **concentrated in informal, low-paid jobs due**, in part, to **limited productive job opportunities and low education levels**.
- **Inadequate school infrastructure**, including lack of properly equipped STEM labs and climate-resilient facilities, hinders students' ability to gain practical skills for the green economy.
- Despite the integration of climate change education and STEM-focused curricula, the effectiveness of climate change education resources and curriculum is limited by **delivery challenges**, including teacher shortages.

## OPPORTUNITIES

- The installed capacity of 4.7 GW in the LCD will have a multiplier effect and unlock employment opportunities for youth in various related industries such as materials production, transportation, and support services.
- The LCD's alignment with the Human Capital Development Goals in Sierra Leone's National Development Plan will promote the attainment of new skills and education in the automotive sector for **youth to drive the shift towards electric vehicles by 2050**.
- **MBSSE has integrated climate change education and STEM-focused curricula** into the compulsory Senior Secondary School Curriculum on Climate Change Awareness, Preparedness, and Resilience, providing young people with the skills necessary to thrive in renewable energy and climate adaptation sectors.
- MBSSE collaborates with IOs and NGOs to provide **hands-on trainings and skill development programs**, which could further enhance youth participation in the energy sector.

## ENABLERS

Improved educational opportunities and attainment

Access to vocational & technical training

Investments in innovative technologies and skills

## RECOMMENDATIONS FOR ENHANCING GENDER EQUALITY AND YOUTH INCLUSION IN SIERRA LEONE'S LOW CARBON DEVELOPMENT PATHWAY



### EXPAND LEADERSHIP OPPORTUNITIES FOR WOMEN

Build on existing initiatives by investing in leadership development and technical training for women, ensuring they can contribute to decision-making and technical roles in the energy and education sectors.

### DEVELOP GENDER AND YOUTH INCLUSIVE POLICIES

Ensure gender and youth considerations are central to national policies on energy and climate action, with specific funding allocated to support women's and youth employment in these sectors.

### INVEST IN YOUTH EMPLOYMENT PROGRAMMES

Increase funding for youth-focused vocational training programmes and up-skilling programmes in renewable energy and green job sectors. Target rural areas where youth unemployment is highest to bridge the gap between education and employment.

### STRENGTHEN COLLABORATIONS FOR GREEN JOBS

Foster collaboration between key ministries to create a cohesive strategy for youth & women's employment in the green economy. Leverage projects like solar installations and clean cooking solutions in schools as opportunities for job creation and skills development.

### ENHANCE INFRASTRUCTURE & TECHNOLOGY AMONG EDUCATIONAL INSTITUTIONS

Target infrastructure improvements in schools to ensure students, particularly girls, receive quality education in conducive learning environments. Integrate clean cooking technologies within the National School Feeding Program. Invest in resilient school infrastructure and solar panel installations for clean, reliable energy.

### ENHANCE STEM EDUCATION & SKILLS DEVELOPMENT

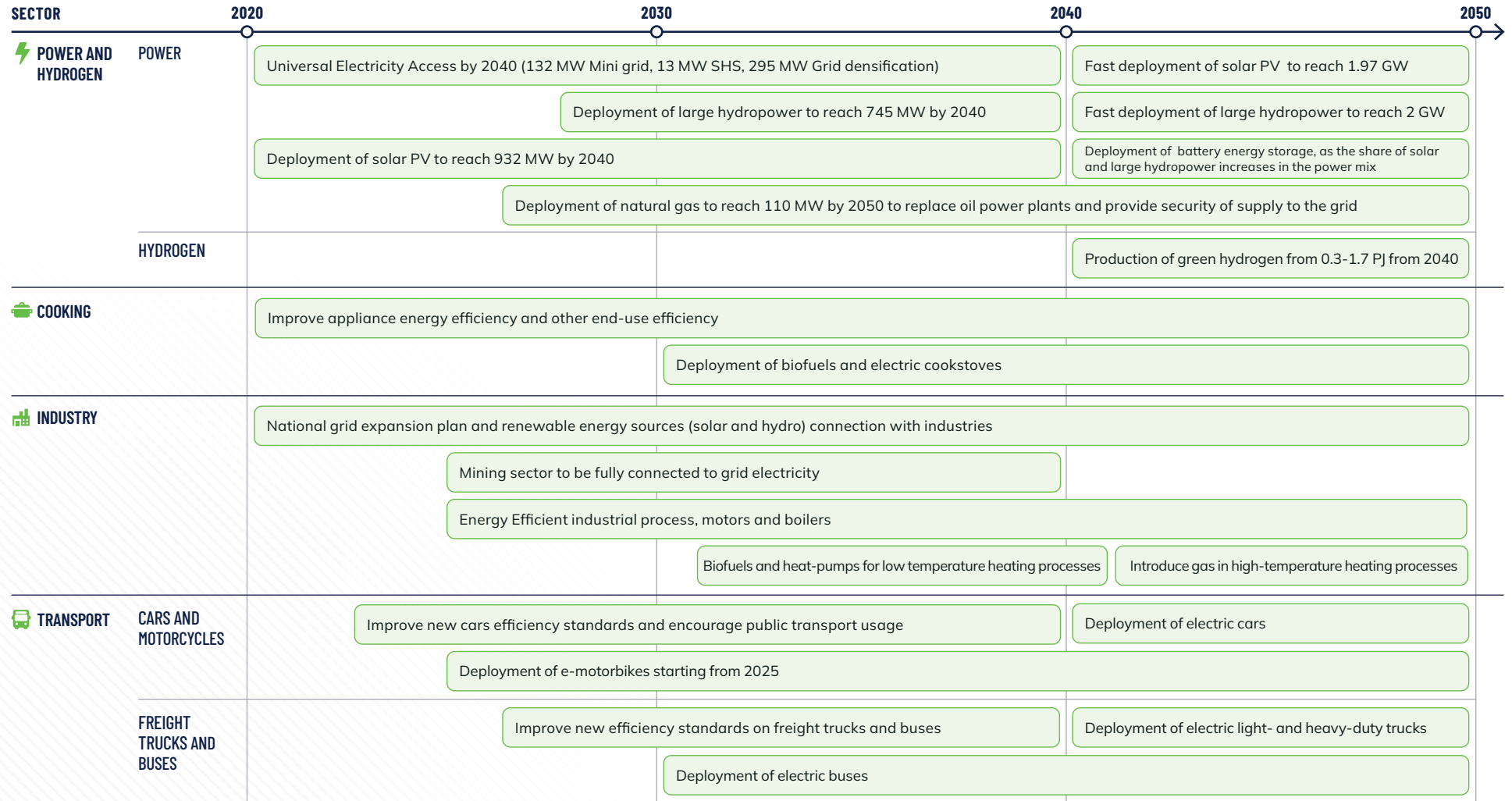
Increase funding for STEM labs, STEM traineeship programmes, and teacher recruitment to address the skills shortage. Prioritize investments to make STEM education more accessible and engaging for girls, encouraging their participation and empowering them to pursue careers in these fields.

CHAPTER TEN

# THE PATH FORWARD



# A SET OF TECHNOLOGY TRANSITIONS SUPPORTED BY POLICY FRAMEWORKS WILL BE NEEDED TO ACHIEVE A GREEN GROWTH FUTURE




# THERE ARE BARRIERS TO BE ADDRESSED ACROSS SECTORS TO ENABLE A GREEN GROWTH FUTURE (1/9)

Sector	Barriers	Potential Actions
<p> <b>Power</b></p>	<ul style="list-style-type: none"> <li>• Low electricity access</li> <li>• Unreliable grid supply and affordability</li> <li>• High transmission and distribution losses</li> <li>• Lack of infrastructure</li> <li>• High costs for mini-grids and off-grid solutions</li> </ul>	<p><b>Capacity and Generation expansion plan:</b></p> <ol style="list-style-type: none"> <li>01 Deployment of mini-grids (132 MW) , SHS (13 MW), and Grid Densification (295 MW) for universal electricity access, along with focused investments in Bonthe, Pujehun, and Kambia for achieving major Feed Salone objectives and the national healthcare and education facilities.</li> <li>02 Install decentralized technologies in locations closer to the demand load centers to decrease distribution costs and provide more reliable electricity and closer to the national grid to be connected in the future.</li> <li>03 Expansion and Refurbishment of the national grid (2.5 GW by 2050), implement a losses reduction program on reducing the transmission and distribution losses, from 46% in 2020 to 22% in 2040 and expand energy infrastructure (4.5 GW, 2050) to achieve electrification with priority given to social infrastructure.</li> <li>04 Reliable electricity supply would require investments in large hydropower (2 GW), including Bumbuna and Benkongor with natural gas investments (110 MW, 2026) needed for security of supply meeting the load in a dry period and low solar radiation and reducing overall costs and emissions.</li> <li>05 Develop an energy and climate resilient power system that has diverse energy sources and can withstand extreme weather events.</li> <li>06 Significant uptake of solar PV by 2050 of 1.9 GW would require a comprehensive national utility scale solar deployment program.</li> <li>07 BESS (Battery storage) policy should prioritize supporting stable electricity access (2,343 MWh of storage) and scaled up after 2040 for grid stability.</li> <li>08 The grid needs to be expanded by 278 MW and connect the mining sector by 2030 to reduce overall emissions and total system costs by replacing back-up diesel generators with increased penetration of renewables (hydropower, solar) in the main grid and increasing revenues.</li> </ol>

# THERE ARE BARRIERS TO BE ADDRESSED ACROSS SECTORS TO ENABLE A GREEN GROWTH FUTURE (2/9)

Sector	Barriers	Potential Actions
<p> <b>Power</b></p>	<ul style="list-style-type: none"> <li>• Low electricity access</li> <li>• Unreliable grid supply and affordability</li> <li>• High transmission and distribution losses</li> <li>• Lack of infrastructure</li> <li>• High costs for mini-grids and off-grid solutions</li> </ul>	<p><b>Enhance Policy, Strengthen Regulations and Institutional Framework:</b></p> <ul style="list-style-type: none"> <li>01 Develop clear, transparent regulations for energy generation and distribution, encouraging competition and investment in the sector.</li> <li>02 Strengthen the ongoing regulatory and institutional unbundling efforts in the power sector.</li> <li>03 Strengthen the capacity of the regulatory body and other key stakeholders in energy planning, regulation, and enforcement.</li> <li>04 Ensure that electricity tariffs are cost-reflective but also consider affordability for low-income households.</li> <li>05 Develop standards and labeling program for main energy consuming appliances such as motors, pumps, air-conditioners, fans, cookstoves etc.</li> <li>06 Examine a comprehensive policy for developing sustainable biofuels in the country.</li> <li>07 Develop policies that encourage private sector participation in renewable energy projects, such as tax incentives, subsidies, or guaranteed power purchase agreements (PPAs).</li> </ul> <p><b>Grid modernization:</b></p> <ul style="list-style-type: none"> <li>01 In addition to the installation of new generation and transmission facilities, it is important to install a modern electrical control system so that it will allow the operational of the electrical assets in a secure and reliable manner.</li> <li>02 An electrical control system would allow the integration of more renewable technologies while the deployment of new power sources may require the formulation of new grid codes.</li> <li>03 Use of smart meters to improve billing and service quality.</li> </ul>

# THERE ARE BARRIERS TO BE ADDRESSED ACROSS SECTORS TO ENABLE A GREEN GROWTH FUTURE (3/9)


Sector	Barriers	Potential Actions
<p> <b>Power</b></p>	<ul style="list-style-type: none"> <li>• Low electricity access</li> <li>• Unreliable grid supply and affordability</li> <li>• High transmission and distribution losses</li> <li>• Lack of infrastructure</li> <li>• High costs for mini-grids and off-grid solutions</li> </ul>	<p><b>Capacity building and awareness:</b></p> <p>01 Educate consumers about energy-saving practices and the benefits of energy-efficient appliances.</p>

# THERE ARE BARRIERS TO BE ADDRESSED ACROSS SECTORS TO ENABLE A GREEN GROWTH FUTURE (4/9)

Sector	Barriers	Potential Actions
 Mining	<ul style="list-style-type: none"> <li>Limited electricity access</li> <li>Inefficient operations in mining</li> <li>Environmental degradation</li> <li>Lack of energy and environment standards</li> </ul>	<p><b>Energy Infrastructure Development:</b></p> <p>01 Strengthen the national grid and expand energy infrastructure to rural areas. Reliable electricity access would enable more efficient mining operations and reduce operational costs.</p> <p><b>Promote Sustainable Mining Practices:</b></p> <p>01 Enforcing stringent environmental impact assessments by incorporating international sustainable mining guidelines (e.g., Initiative for Responsible Mining Assurance (IRMA) or ISO 14001 on Environmental Management Systems) for favorable exports.</p> <p>02 Promoting the use of renewable energy sources, such as solar and hydroelectric power, in mining operations.</p> <p>03 Supporting the the adoption of energy-efficient mining technologies and appliances (e.g., motors, engines, heaters, fleets) through minimum energy performance standards (MEPS) and electrification.</p> <p>04 Prioritizing investments and providing incentives to adopt cleaner and more efficient technologies, such as tax breaks or subsidies for companies that invest in green mining innovations.</p> <p>05 Introducing circularity of raw materials practice for resource efficiency.</p>




# THERE ARE BARRIERS TO BE ADDRESSED ACROSS SECTORS TO ENABLE A GREEN GROWTH FUTURE (5/9)

Sector	Barriers	Potential Actions
 Mining	<ul style="list-style-type: none"> <li>• Inadequate power supply</li> <li>• Limited private-sector engagement</li> <li>• High cost of renewable energy development</li> <li>• Skills gap in the workforce</li> <li>• Lack of local expertise</li> <li>• Slow adoption of sustainable practices</li> </ul>	<p><b>Public-Private Partnerships:</b></p> <p>01 Encourage collaboration between the government and private sector for energy development projects, particularly in renewable energy, for reliable power supply for industries.</p> <p>02 Creating financial incentives, such as tax exemptions or subsidies for clean energy investments, would attract private investment.</p> <p><b>Capacity Building and Innovation:</b></p> <p>01 Invest in training and capacity building to develop a local workforce skilled to implement sustainable mining practices. Encourage research and innovation in recent sustainable technologies tailored to the needs of the country’s mining sector.</p>


# THERE ARE BARRIERS TO BE ADDRESSED ACROSS SECTORS TO ENABLE A GREEN GROWTH FUTURE (6/9)

Sector	Barriers	Potential Actions
<p> <b>Agriculture</b></p>	<ul style="list-style-type: none"> <li>• Limited electricity access to agricultural zones</li> <li>• High dependency on diesel fuel</li> <li>• Lack of incentives/ financial support from government</li> <li>• High cost of renewable energy development</li> <li>• Skills gap in the workforce</li> <li>• Lack of local expertise</li> <li>• Slow adoption of sustainable practices</li> </ul>	<p><b>Energy Infrastructure Development:</b></p> <p>01 Strengthen the national grid and accelerate energy infrastructure expansion, particularly to key pilot zones: Kambia, Bonthe, and Pujehun. Reliable and widespread access to electricity would enable the implementation of Feed Salone Strategy, such as mechanization and processing facilities that further boosts agriculture and fisheries contribution to the economy.</p> <p><b>Promote Energy-Saving and Low-Carbon Technologies:</b></p> <p>01 Offer attractive financial incentives, such as soft loans, to encourage adoption of energy-saving technologies in agriculture and fisheries (e.g., solar-powered irrigation pumps, electric motive power). This will reduce energy use, lower costs, and enhance sustainability.</p> <p><b>Support for Biomass and Waste-to-Energy Projects:</b></p> <p>01 Utilize Sierra Leone’s abundant agricultural waste to promote biomass energy generation in agricultural sector, including post-harvest processing.</p> <p>02 Offer incentives for waste-to-energy and local biofuel projects to meet energy demand and reduce environmental impact.</p> <p><b>Public-Private Partnerships:</b></p> <p>01 Encourage collaboration between the government and private sector by creating supportive financial instruments for projects that support the implementation of Feed Salone Strategy.</p> <p><b>Capacity Building and Innovation:</b></p> <p>01 Invest in training and capacity building to develop a local workforce skilled to support the transformation in agriculture and fisheries sector. Encourage research and innovation in clean energy technologies in agriculture and fisheries.</p>


# THERE ARE BARRIERS TO BE ADDRESSED ACROSS SECTORS TO ENABLE A GREEN GROWTH FUTURE (7/9)

Sector	Barriers	Potential Actions
 <b>Cooking</b>	<ul style="list-style-type: none"> <li>• Slow transition to e-cooking</li> <li>• Outdated energy policies</li> <li>• Dependence on traditional biomass</li> <li>• Vulnerability to price volatility</li> <li>• Low consumer awareness</li> <li>• Limited market for biofuels</li> <li>• Lack of financial mechanisms</li> </ul>	<p><b>Government:</b></p> <p>01 A holistic clean cooking strategy that reviews the various solutions available that is viable for adoption and can be balanced to also provide co-benefits associated to clean cooking (e.g.: support to a better health, climate &amp; environment, and gender &amp; livelihood).</p> <p>02 Prioritize the implementation of the Electricity Sector Reform Roadmap (2018-2040) to facilitate a switch to e-cooking.</p> <p>03 Update the Sierra Leone National Energy Strategic Plan of 2009, with revised timelines and implementation ownership of the household energy sector.</p> <p><b>Supply side:</b></p> <p>01 Develop national strategies and targets for the following:</p> <ul style="list-style-type: none"> <li>• Securing supply chains of modern and cleaner fuels through an integrated resource planning approach.</li> <li>• Support the development of a market for biofuels such as ethanol or biogas, via R&amp;D of local opportunities for conversion and distribution of biowaste to energy.</li> </ul> <p>02 Develop regulations and frameworks to enable a carbon credit financing targeting private sector, to empower them to invest in cleaner, efficient and more affordable cooking technologies.</p> <p><b>Demand side:</b></p> <p>01 Provide policy and financial incentives to reduce the high cost of e-cooking and to encourage a switch to more e-stoves, thus reducing the reliance of fossil fuels. This might require potential local grid upgrades to account for any extra load demand due to increased consumption.</p> <p>02 Increase awareness and incentives for consumers to leapfrog to e-cookstoves.</p>

# THERE ARE BARRIERS TO BE ADDRESSED ACROSS SECTORS TO ENABLE A GREEN GROWTH FUTURE (8/9)

Sector	Barriers	Potential Actions
 <b>Industry</b>	<ul style="list-style-type: none"> <li>• Limited industrial growth</li> <li>• Insufficient investment</li> <li>• Dependence on diesel generators</li> <li>• High operational costs</li> <li>• Inadequate energy supply</li> <li>• High carbon emissions from manufacturing</li> <li>• Inefficient energy use</li> <li>• Regulatory challenges</li> <li>• Overdependence on mining and agriculture</li> <li>• Skills gap in the workforce</li> </ul>	<p><b>Government Initiatives &amp; Policy Support:</b></p> <ul style="list-style-type: none"> <li>01 Further the development of industrial zones and special economic zones (SEZ) to attract investment and boost industrial production along with incentives for energy and resource efficiency manufacturing.</li> <li>02 In alignment with the goal of a low-carbon economy, establish policies to promote green industries.</li> <li>03 Industrial Energy Efficiency Program developed and deployed.</li> </ul> <p><b>Energy Infrastructure Development:</b></p> <ul style="list-style-type: none"> <li>01 National grid expansion plan prioritizing industries and also incentivizing renewable captive generation could reduce reliance on diesel generators and lower operational costs, making industries more competitive.</li> </ul> <p><b>Clean Heat Solutions:</b></p> <ul style="list-style-type: none"> <li>01 Incentives for adopting clean heat technologies in the manufacturing sector is crucial for reducing carbon emissions and enhancing sustainability.</li> </ul> <p><b>Diversification:</b></p> <ul style="list-style-type: none"> <li>01 Diversifying the industrial base beyond mining and agriculture will be critical for long-term growth. Investments in sectors such as manufacturing and small-scale industries are essential to create jobs and reduce dependence on imported goods.</li> </ul> <p><b>Human Capital Development:</b></p> <ul style="list-style-type: none"> <li>01 A key element for future industrial growth will be developing skilled labor to support modern industries. Investment in education, vocational training, and technical skills will be necessary to build a workforce capable of handling advanced technologies and higher-value industrial production.</li> </ul>

# THERE ARE BARRIERS TO BE ADDRESSED ACROSS SECTORS TO ENABLE A GREEN GROWTH FUTURE (9/9)

Sector	Barriers	Potential Actions
 <b>Transport</b>	<ul style="list-style-type: none"> <li>• High initial costs of EVs</li> <li>• Limited public transport options</li> <li>• Inadequate charging infrastructure</li> <li>• Poor vehicle fuel economy</li> <li>• Skills gap in EV technology</li> <li>• Limited job opportunities in green industries</li> </ul>	<p><b>Electric Vehicle (EV) Adoption Policy:</b></p> <ul style="list-style-type: none"> <li>01 Introduce tax incentives for purchase of electric vehicles, particularly in the 2/3 wheeler segment to be competitive to 2/3 wheelers based on ICE.</li> <li>02 A public e-bus transport policy with additional incentives for public transport operators to transition to electric buses.</li> <li>03 Provide tax deductions or exemptions for companies that invest in developing EV charging stations and related infrastructure.</li> </ul> <p><b>Fuel Efficiency Standards for Vehicles:</b></p> <ul style="list-style-type: none"> <li>01 Introduce fuel efficiency standards for passenger cars to be aligned with major export markets to ensure that new and used vehicles in the country meet certain minimum fuel economy standards.</li> <li>02 Introduce biofuel mixing into conventional fuels with progressive standards.</li> <li>03 Policy on quality checking of import of used vehicles.</li> </ul> <p><b>Green Skills Training and Employment Program:</b></p> <ul style="list-style-type: none"> <li>01 Partner with technical institutes and universities to create specialized certification programs for EV technology, renewable energy systems, and green infrastructure development.</li> </ul>

# THE PATH FORWARD WOULD BE TO SETUP A GOVERNANCE STRUCTURE AND ACTION PLAN IMPLEMENTATION THROUGH A CENTRALLY COORDINATED FRAMEWORK IS KEY FOR GREEN GROWTH IN SIERRA LEONE



01

## ESTABLISH A CENTRALIZED CROSS-MINISTERIAL COORDINATION BODY (CCB)

- Empower the CCB with cross-ministerial authority to align policies and actions with the Ministry of Energy and other ministries
- Staff the CCB with experts in sustainable development, renewable energy and climate resilience

02

## ESTABLISH A DEDICATED ENERGY PLANNING UNIT

- Create a dedicated energy planning unit within the Ministry of Energy with cross-sectoral coordination functions to sustainably build and retain modelling capacity in the long term
- Adequately staff the planning unit and support it with dedicated government funding

03

## ENSURE PERIODIC UPDATE OF GREEN GROWTH PLAN (GGP) AND INTEGRATION IN LONG-TERM DEVELOPMENT TARGETS

- Set clear, measurable targets for renewable energy adoption, emissions reductions and sustainable resource management; align the strategy with Sierra Leone's Nationally Determined Contributions (NDCs) under the Paris Agreement
- Integrate green growth objectives into all sector-specific development plans
- Conduct a periodic review and update of GGP

04

## FOSTER CAPACITY BUILDING AND PUBLIC AWARENESS

- Launch a nationwide green skills development programme targeting key sectors (e.g., agriculture, energy, construction)
- Integrate climate change and sustainable development into national education curricula
- Conduct regular public awareness campaigns to promote sustainable consumption and production patterns



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