Nationallly Determined Contributions (NDC3.0): 2025 -2030

Mitigation Measures

October 2025

Contents

List of Abbreviations and Acronyms

A4P	Agenda for Prosperity
AFOLU	Agriculture, Forestry and Other Land Uses
BUR	Biennial Update Report
CCP	Climate Change Project
CCS	Climate Change Secretariat
CCSAP	Climate Change Strategy and Action Plan
CO2	Carbon Dioxide
CEF	Carbon Emission Factors
CFC	Chloro Fluorocarbon
CH4	Methane
CMB	Coastal Management Board
CO	Carbon Monoxide
COP	Conference of Parties
ECOWAS	Economic Community of West African State
EF	Emission Factor
EI	Energy Industries
EJ	Exajoule
EPA-SL	Environment Protection Agency – Sierra Leone
FAO	Food and Agricultural Organization
FBC	Fourah Bay College
GDP	Gross Domestic Product
GEF	Global Environmental Facility
Gg	Gigagrams
GHG	Greenhouse Gas
HCFC	Hydro-Chlorofluorocarbon
HFO	Heavy Energy Oil
IPCC	Intergovernmental Panel on Climate Change
ICZM	Integrated Coastal Zone Management
IMBO	Institute of Marine Biology and Oceanography
INC	Initial National Communication
IPCC	Inter-governmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
ISIC	International Standard Industrial Classification
MASSADA	A Waste Management Company in Freetown
MAFFS	Ministry of Agriculture, Forestry and Food Security

MBSE	Ministry of Basic and Secondary Education
MCI	Manufacturing and Construction Industries
MoEnv	Ministry of the Environment
MOE	Ministry of Energy
MRU	Mano River Union
MTA	Ministry of Transport and Aviation
MT	Million Tonnes
MTNDP	Medium-Term National Development Plan
MP	Metal Production
NOx	Nitrogen Oxide
N2O	Nitrous Oxide
NC	National Communication
ND	"New Direction" (Sierra Leone National Development Plan 2019/24)
NDC	Nationally Determined Contribution
NGO	Non-Governmental Organization
NMVOC	Non-Methane Volatile Organic Compound
NCCS	National Climate Change Secretariat
NCSP	National Communications Support Programme
NPPA	National Protected Area Authority
PA	Paris Agreement
PRSP	Poverty Reduction Strategy Paper
SLS	Sierra Leone Statistics
SLSB	Sierra Leone Standard Bureau
SNC	Second National Communications
SSL	Statistics Sierra Leone
SO2	Sulphur Dioxide
SF6	Sulphur Hflexafloride
TNC	Solid Wastes Disposal Sites
UNDP	Third National Communications
UNEP	United Nations Development Programme
UNFCCC	United Nations Environmental Programme
UNITAR	United Nations Framework Convention on Climate Change
USL	United Nations Institute for Training and Research
VMT -	University of Sierra Leone
WONES	Vehicle Miles Traveled

1 Mini-grids

1.1 Detailed Description

This measure builds on and scalees up the existing EU/UNOPS risk-based model that focuses on mini-grids. This mini-grid measure targets rural and peri-urban communities currently relying on diesel generators and traditional fuels for lighting and productive uses. Systems are typically solar PV + battery (‘PV-BESS’) hybrids with limited diesel back-up for resilience. Sizing is between 1-100 KW as basic mini grid and above 100KW to 20 MW classed as full mini grid, depending on demand clusters (households, clinics, schools, agro-processing, markets). Designs include smart metering and load management, anchor-business connections (e.g., milling, cold-chain, irrigation), and standardized O&M contracts to ensure high uptime. Tariffs should follow transparent, cost-reflective principles complemented by results-based financing (RBF)/capital grants to keep household tariffs affordable. Where appropriate, interconnection-ready designs and net-billing arrangements allow integration with the national grid or utility feeders when they arrive.

It is planned to implement minigrids powered by minihydro as well.

A national site pipeline should prioritized using clear criteria: social infrastructure density (health posts and schools), productive-use potential (agro-processing, fisheries/cold-chain), current reliance on diesel/kerosene, and ability to establish community energy committees. The program should adopt standard technical specifications, safety and environmental management procedures, and gender-inclusive customer engagement (onboarding, payment options, and productive-use grants).

1.2 GHG Abatement (Methodology)

Baseline emissions derive mainly from diesel generator use and kerosene for lighting. Project emissions are minimal for PV-BESS mini-grids (limited to periodic diesel back-up and embodied emissions not counted in operational MRV). Abatement is calculated from displaced fuels and/or displaced grid electricity where relevant, using emission factors consistent with Sierra Leone’s BUR/NDC tables.

Indicative calculation (annual):

- Diesel displacement: tCO_2e = (Liters_diesel_baseline − Liters_diesel_project) × EF_diesel ($kgCO_2/L$) ÷ 1,000
- Kerosene displacement: tCO_2e = (Liters_kerosene_baseline − Liters_kerosene_project) × EF_kerosene ($kgCO_2/L$) ÷ 1,000
- Grid electricity displacement: tCO_2e = (MWh_delivered) × Grid_EF (tCO_2e/MWh)

1.3 Outcomes & Indicators (2030 and 2035)

Item	2030 Target (Indicators)	2035 Target (Indicators)
Installed capacity & sites	25 MW in installed capacity. 80% solar and 25 % hydro. (Indicator: MW installed; number of commissioned sites)	50 MW in installed capacity. 80% solar and 25 % hydro. (Indicator: MW installed; cumulative sites)
Service & reliability	≥95% annual technical availability; (Indicator: uptime %, SAIDI/SAIFI proxies)	≥97% annual availability; (Indicator: uptime %, customer hours served)
Energy delivered	93.75 GWh/yr delivered; (Indicator: annual MWh metered)	187.5 GWh/yr delivered; (Indicator: annual MWh metered)
Customers & PUE	20,000 household connections; ≥1,500 productive-use connections; (Indicator: active meters by class)	50,000 household connections; ≥4,000 productive-use connections; (Indicator: active meters by class)
GHG reductions	20 $ktCO_2e/yr$ avoided (diesel/kerosene displacement); (Indicator: tCO_2e/yr)	40 $ktCO_2e/yr$ avoided; (Indicator: tCO_2e/yr)

1.4 Financial Needs (Order-of-Magnitude)

Unit costs vary by site size, logistics, and storage duration. For planning, use ranges below and refine with feasibility studies. O&M excludes tariff subsidies/RBF which can be budgeted separately.

Phase	Scope	Indicative CAPEX	Indicative OPEX (annual)
2025–2026 (Prep)	Policy, grid-code/interface rules, pipeline, feasibility, E&S, procurement	US$ 2–5 million (TA & transaction)	US$ 0.2–0.4 million
2026–2030 (Scale-1)	≈25 MW (80% solar, 20% hydro)	US$ 75 million (US$ 3/MW)	US$ 1.0–1.5 million
2031–2035 (Scale-2)	Additional ≈25 MW	US$ 75 million	US$ 1.5–2.0 million

Note: Figures are planning ranges for budgeting and should be validated through detailed designs. Blended finance is recommended: concessional credit, grants/RBF for connection affordability, and private equity/debt.

1.5 Implementation Agency (Roles & Responsibilities)

- LeadRural Energy Agency under supervision of Ministry of Energy
- Utility: EDSA and EGTC for interconnection/interface standards, feeder planning, data sharing, and potential offtake agreements.

- Regulator/Permits: EPA-SL & Standards Bureau, and EWRC for environmental approvals, technical/safety standards.
- Local Government, and Ministry of Lands: District/City Councils forcommunity engagement, site permissions, land
- Private Sector: Mini-grid developers/operators (EPC + O&M), financiers, equipment suppliers.
- Development Partners: TA, concessional finance, results-based grants, and capacity building.

1.6 Implementation Schedule (2025–2035)

- 2025–Q2 2026: Program setup and enabling environment to finalize mini-grid interconnection code, tariff/risk-sharing framework, EF registry entries for MRV; complete national pipeline and prefeasibility; launch first tenders.
- Q3 2026–2028: Build-out Wave 1 to finance and commission ~20 priority sites; establish O&M training; deploy PUE grants for anchor loads and productive users.
- 2028–2030: Build-out Wave 2 to commission remaining sites; integrate remote monitoring; refine tariffs and RBF based on performance.
- 2031–2035: Expansion & optimization for a continuous MRV and verification for ETF/BTR reporting.

MRV Notes

- Primary data: smart-metered MWh, uptime, customer counts by class, diesel back-up fuel logs
- Emission factors: use nationally adopted values from the BUR/NDC; keep a central EF registry and change-log.
- Verification: annual utility/developer submissions, random site audits, and QA/QC by MoECC/EPA-SL.

1.7 Key co-benefits

- Local economic development: new MSMEs (milling, cold rooms, welding, ICT), longer trading hours.
- Public services: reliable power for schools/health posts (lighting, vaccine cold chain, labs).
- Household welfare: safer lighting (kerosene substitution), study time for students, phone/IT connectivity.
- Gender: time savings, women-led last-mile businesses, safer evening mobility.
- Environment/air quality: diesel genset displacement (noise, NOx/PM), reduced kerosene use.
- Resilience: backup supply for clinics/EM services; mobile money/communications during outages.

Indicative indicators & MRV hooks

- MSMEs connected & productive-use meters installed; monthly kWh sold to PUE.
- Liters of diesel & liters of kerosene avoided (developer fuel logs/HH survey).
- Uptime (%) of clinics' cold chain; school evening-lighting hours logged.
- Share of female-owned connections/enterprises; formal jobs created (FTEs).

2 Commercial/Industrial PV

2.1 Detailed Description

This measure builds on the measures already outlined in the Renewable Energy Policy (2016) and the National Renewable Energy Action Plan, which already sets clear targets up to 2030.

The Commercial/Industrial (C&I) PV measure supports rooftop and ground-mounted solar at factories, agro-processors, cold-chain facilities, mines, hotels, commercial buildings, universities, and health complexes. Systems are primarily behind-the-meter for self-consumption, optionally with battery storage to reduce peak demand and provide backup. Where policy allows, surplus generation are exported under net-billing/bi-directional metering. Designs include anti-islanding protection, UL/IEC-compliant inverters, single-line diagrams, and standardized O&M with remote monitoring. Procurement will leverage framework tenders and model PPAs/lease contracts to accelerate deployment, while ensuring electrical safety (lock-out/tag-out, harness protocols), roof structural checks, and worker training.

Candidate sites are prioritized based on daytime load profiles, high diesel/self-generation costs, roof/land suitability, and potential for productive-use synergies (cold storage, milling, water pumping). The program should integrate with EDSA and EGTC interconnection rules and metering procedures, and adopt a commissioning checklist (as-built drawings, performance testing, O&M manuals, and warranty records).

2.2 GHG Abatement (Methodology)

C&I PV reduces emissions by (i) displacing grid electricity with a positive emission factor and/or (ii) reducing on-site diesel generator use. Annual avoided emissions are computed using Sierra Leone's national emission factors from the BUR/NDC.

Indicative calculation (annual):

- Grid displacement: tCO_2e = MWh_PV_used_on-site × Grid_EF (tCO_2e/MWh)

- Diesel displacement: tCO_2e = (Liters_diesel_baseline − Liters_diesel_project) × EF_diesel ($kgCO_2/L$) ÷ 1,000
- Exports (if net-billing): treat exported MWh as displacing average grid MWh unless directed otherwise by regulator.
- Document metering boundaries (self-consumed vs exported) and maintain fuel logs for sites with existing gensets.

2.3 Outcomes & Indicators

Targets for 2030 and 2035 and the associated monitoring indicators are summarized below.

Item	2030 Target (Indicators)	2035 Target (Indicators)
Installed capacity & sites	40 MW across 20 C&I sites; (Indicators: MW installed; # sites)	50 MW across 30 sites; (Indicators: MW installed; cumulative sites)
Energy delivered	150 GWh/yr self-consumed/exported; (Indicator: annual MWh metered)	170 GWh/yr; (Indicator: annual MWh metered)
Reliability & performance	≥98% inverter availability; PR ≥ 75%; (Indicators: monitoring logs, PR)	≥98% availability; PR ≥ 78%; (Indicators: monitoring logs, PR)
Demand-side benefits	Peak demand reduced ≥15% at participating facilities; (Indicator: kW peak vs baseline)	Peak demand reduced ≥20%; (Indicator: kW peak vs baseline)
GHG reductions	8 $ktCO_2e$/yr avoided; (Indicator: tCO_2e/yr)	20 $ktCO_2e$/yr avoided; (Indicator: tCO_2e/yr)

2.4 Financial Needs (Order-of-Magnitude)

Budgeting uses planning ranges to be refined through site audits. Costs vary with logistics, structural retrofits, and storage duration.

Phase	Scope	Indicative CAPEX	Indicative OPEX (annual)
2025–2026 (Prep)	Regulatory updates (net-billing, interconnection), pipeline screening, audits, procurement docs	US$ 1–2 million (TA & transaction)	US$ 0.2–0.4 million
2026–2030 (Scale-1)	40 MW C&I PV; optional BESS at critical loads	US$ 80 million (US$ 2/MW)	US$ 0.5–1.0 million
2031–2035 (Scale-2)	Additional 10 MW; portfolio O&M, inverter replacements reserve	US$ 30 million	US$ 0.5–1.0 million

Financing mix: private equity/debt, green credit lines, leasing, and concessional grants/RBF to unlock smaller clients. Consider tax/VAT treatment, accelerated depreciation, and guarantee instruments for SME participation.

2.5 Implementation Agency (Roles & Responsibilities)

- **Lead:** Ministry of Energy (MoE) for policy, program oversight, pipeline coordination.
- **Utility:** EDSA and EGTC for interconnection approvals, metering, and data sharing for net-billing.
- **Standards/Permitting:** Standards Bureau, EWRC & EPA-SL for codes, product certifications, environmental approvals.
- **Facility Owners:** Companies/institutions for host sites, O&M coordination, data reporting.
- **Private Sector:** EPCs, IPPs, lessors to design, finance, build, operate; monitoring and reporting.
- **Financial Partners:** Local banks/DFIs for lending, leasing, guarantees; results-based facilities.

2.6 Implementation Schedule (2025–2035)

- 2025–Q2 2026: Regulatory enablement and pipeline to publish net-billing rules, update interconnection code, create standard PPAs/lease templates; complete 20+ site audits.
- Q3 2026–2028: Wave 1 deployment to commission 20 MW at priority facilities; set up remote monitoring center; initiate SME leasing window.
- 2028–2030: Wave 2 deployment to complete to 20 MW; performance review; expand BESS at sites with frequent outages.
- 2031–2035: Expansion to add 10 MW; portfolio optimization, inverter upgrades; continued MRV for ETF/BTR submissions.

2.7 Key co-benefits

- Competitiveness: reduced LCOE and OPEX; lower outage losses (spoilage, downtime).
- Jobs & skills: electricians, EPC crews, O&M technicians; HSE practice diffusion.
- Grid support: peak-shaving, potential ancillary services with storage.
- Environment: diesel displacement, quieter operations.

Indicators

- LCOE vs baseline; outages-related loss reduction (SLE/month).
- Diesel liters avoided; CO_2e co-benefit (scope 1 reductions at facilities).
- green jobs & certified technicians; storage response events logged.
- Uptime (%) of clinics' cold chain; school evening-lighting hours logged.
- Share of female-owned connections/enterprises; formal jobs created (FTEs).

3 Solar Home Systems (SHS)

3.1 Detailed Description

The EU-funded SOGREA project and RESPITE programme have supported off-grid and mini-grid deployment that complements SHS expansion; and the Renewable Energy Policy (2016) and National Renewable Energy Action Plan (NREAP) already set clear targets for distributed solar and rural electrification up to 2030.

This Solar Home Systems (SHS) tries to accelerate Tier-1 to Tier-3 electricity access for rural and peri-urban households and micro-enterprises using quality-verified systems (typically 20–200 Wp PV with lithium-ion batteries, charge controllers, and DC appliances such as LED lights, phone chargers, radios, TVs, and fans). Distribution would rely on PAYGo/lease-to-own models with agent networks, device telemetry for performance/warranty, and standardized after-sales service. Quality control follows recognized standards (e.g., Lighting Global quality-verified products) and consumer protection guidelines. The program complements mini-grids by targeting dispersed settlements and last-mile households where grid extension is uneconomic in the near term.

Key design features include: pre-installation site screening, minimum warranty periods, user training, spare-parts logistics, and financing facilitation through MFIs and mobile-money payment rails. Gender-responsive outreach ensures women-led businesses and female-headed households are prioritized in awareness and financing windows. E-waste and battery end-of-life management protocols are integrated with EPA-SL guidance and vendor take-back schemes.

Other enabling activities include:

- Supporting consumer finance and results-based financing to make SHS more affordable and accelerate private-sector delivery.
- Expanding quality assurance and certification systems to prevent the influx of sub-standard solar products.

- Promoting local assembly, maintenance, and after-sales services to increase employment and sustainability.
- -ligning off-grid SHS planning with grid and mini-grid roll-out, to ensure complementarity and avoid duplication.

3.2 GHG Abatement (Methodology)

SHS primarily displace kerosene lighting and small diesel/gasoline generator use. Annual avoided emissions are computed using national emission factors from the BUR/NDC.

Indicative calculation (annual):

- Kerosene displacement: tCO_2e = (Liters_kerosene_baseline − Liters_kerosene_project) × EF_kerosene ($kgCO_2/L$) ÷ 1,000
- Small genset displacement: tCO_2e = (Liters_diesel/gasoline_baseline − project) × EF_fuel ÷ 1,000

Optional: If SHS charge DC appliances otherwise powered by grid, use Grid_EF × MWh offset. Document baselines via household surveys (Multi-Tier Framework) and vendor telemetry; keep fuel purchase receipts/surveys as corroboration.

3.3 Outcomes & Indicators

Targets for 2030 and 2035 and the associated monitoring indicators are summarized below.

Item	2030 Target (Indicators)	2035 Target (Indicators)
Households	4,000 households; (Indicators: # active SHS; PAYGo accounts)	5,000 households (Indicators: # active SHS; PAYGo accounts)
Access tier	≥70% of new SHS at Tier 1 and Tier ≥2; (Indicator: MTF survey tier)	≥80% at Tier 1 and Tier ≥2; ≥30% at Tier ≥3; (Indicator: MTF survey tier)
Energy delivered	2.25 GWh-DC/yr estimated; (Indicator: device telemetry kWh, modeled by Wp × PR)	2.81 GWh-DC/yr; (Indicator: device telemetry kWh)
Reliability & service	≥95% systems functional at 12-month check; (Ind.: service logs, warranty returns)	≥96% systems functional; (Ind.: service logs)
GHG reductions	0.48 $ktCO_2e/yr$ avoided via kerosene/genset displacement; (Indicator: tCO_2e/yr)	0.6 $ktCO_2e/yr$ avoided; (Indicator: tCO_2e/yr)

3.4 Financial Needs (Order-of-Magnitude)

Costs depend on system size, logistics, and financing terms. Ranges below are for budgeting and should be refined with vendor data. Figures exclude any consumer subsidies that may be delivered via RBF/vouchers.

Phase	Scope	Indicative CAPEX	Indicative OPEX (annual)
2025–2026 (Prep)	Standards & consumer protection, vendor qualification, e-waste protocol, pipeline, awareness	US$ 0.5-1 million (TA & program design)	US$ 0.05–0.1 million
2026–2030 (Scale-1)	Deploy ≈4,000 SHS (Tier 1–3), agent networks, after-sales centers	US$ 1 million (US$ 200/system average)	US$ 0.05–1.0 million
2031–2035 (Scale-2)	Additional ≈1,000 SHS; upgrades/replacements; recycling system	US$ 0.2 milion	US$ 0.05-1.0 million

Financing mix: vendor equity/debt, micro-loans, PAYGo receivables financing, concessional guarantees, and RBF for affordability. Consider VAT/tariff relief for certified products, and a working-capital facility for local distributors.

3.5 Implementation Agency (Roles & Responsibilities)

- **Lead:** Ministry of Energy (MoE) for policy, standards adoption, program oversight.
- **Standards/Environment:** Standards Bureau & EPA-SL for product certification, e-waste/battery take-back guidance.
- **Local Government:** District/City Councils for last-mile outreach, beneficiary targeting, public facilities integration.
- **Private Sector:** PAYGo/Energy-as-a-Service vendors, distributors, service partners for sales, installation, O&M, telemetry, reporting.
- **Finance Partners:** MFIs/mobile-money operators/DFIs for consumer finance, vendor working capital, receivables facilities.
- **Development Partners:** TA, concessional funding, RBF windows, consumer awareness campaigns.

3.6 Implementation Schedule (2025–2035)

2025–Q2 2026: Enabling & vendor onboarding to adopt quality/consumer standards; tax/VAT review; vendor qualification; launch awareness. Design RBF/voucher scheme and e-waste protocol.

Q3 2026–2028: Wave 1 to deploy ~1,000 SHS via PAYGo/leasing; set up regional service hubs; launch female-agent program.

2028–2030: Wave 2 to complete to 4,000 SHS; incorporate telemetry-driven maintenance; evaluate affordability measures.

2031–2035: Expansion & refresh to add 1,000 SHS; manage replacements/upgrades; scale battery recycling and verified MRV.

3.7 Key co-benefits

- Energy access leap: Tier-1/2 electricity; phone charging and radio/TV.
- Education & security: evening study hours; reduced fire risk vs candles/kerosene.
- Micro-enterprise: pay-per-charge services, small retail refrigeration (higher-capacity SHS).

Indicators

- HHs shifting from kerosene/candles; monthly lighting hours.
- Reported study hours/child; kerosene-related incident reports.
- Vendor income from charging/services; SHS warranty/repair rates.

4 Cooking Transition – Improved Cookstoves (ICS)

4.1 Detailed Description

This measures builds on the significant progress already being made in the clean cooking sector, rather than proposing entirely new or isolated initiatives. Over the past few years, Sierra Leone has taken practical steps to expand access to clean and efficient cooking solutions, with strong engagement from both government and partners.

This program accelerates the uptake of Tier-2 and above efficient biomass stoves for households, institutions (schools, clinics, barracks), and micro-enterprises (street food vendors, fish smoking). Eligible technologies include high-efficiency wood rocket stoves, improved charcoal stoves, insulated institutional batch stoves, and (where viable) gasifier stoves with verified performance and durability. The package combines:

- Standards & certification (adoption of performance/safety specs; periodic re-testing).
- Quality-assured supply chains (pre-qualified local manufacturers/importers; warranties; spare parts).
- Affordability instruments (results-based grants per verified stove-in-use, targeted vouchers for poor/ vulnerable HHs, micro-leasing for vendors/institutions).
- Behaviour change & user training (safe use, nutrient retention, balanced diet, correct fuel prep/drying, maintenance); promote energy saving and healthy food preparation and cooking approaches that ensure retention of nutrients.
- Supporting local manufacturing, maintenance, and distribution networks to expand access in rural and peri-urban areas.
- Health & gender co-benefits (reduced exposure to household air pollution; time savings for fuel collection/cooking; women-led and disability inclusive distribution networks). The ICS program complements LPG/biogas pathways by reducing biomass demand immediately, mitigating fuel stacking while modern-fuel access scales.

4.2 GHG Abatement (Methodology)

Emissions reductions come from **lower biomass consumption** per meal/day relative to baseline three-stone fires or traditional metal charcoal stoves. Apply nationally adopted factors and document **fNRB** (fraction of non-renewable biomass). Account for fuel-stacking and rebound effects.

4.3 Outcomes & Indicators (2030 and 2035)

Item	2030 Target (Indicators)	2035 Target (Indicators)
Household ICS	35% of HHs (500,000 HHs using certified ICS Tier-2 and above) (Ind.: active, verified units; survey usage rates)	90% of HHs (900,000 HHs , Ind.: verified units; longitudinal usage)
Institutional/enterprise ICS	10,000 institutional stoves; 600 MSME/vendor stoves (Ind.: commissioning records)	12,000 institutional; 1,500 MSME stoves
Fuel savings	40 % wood/charcoal reduction vs baseline (Ind.: KPTs, fuel-weighing)	50% reduction sustained (Ind.: repeat KPTs)
GHG reductions	600 ktCO_2e/yr avoided (stacking-adjusted)	900 ktCO_2e/yr avoided

Notes: Ranges depend on technology mix, sustained usage, and national fNRB/EF values.

4.4 Financial Needs (Order-of-Magnitude)

Phase	Scope	Indicative CAPEX	Indicative OPEX (annual)
2025–Q2 2026 (Prep)	Standards & testing lab support; vendor pre-qualification; BCC campaign; MRV setup	US$ 0.8–1.5 m	US$ 0.1–0.2 m
2026–2030 (Scale-1)	500k HH ICS; 10,000 institutional; 600 SME stoves	US$ 6 m (public support share of unit costs, QA, M&E)	US$ 0.6–1.0 m
2031–2035 (Scale-2)	400k HH; 12,000 institutional; 1,000 SME	US$ 3 m	US$ 0.8–1.2 m

Unit cost & finance mix: Household ICS US$ 15–60 (tech dependent); institutional US$ 500–5,000. Combine RBF per verified stove-in-use, pro-poor vouchers, micro-loans/leasing for vendors/institutions, duty/VAT relief on certified models, and donor TA.

4.5 Implementation Agency (Roles & Responsibilities)

- **Lead:** Ministry of Energy (Renewables) with MoECC for policy oversight; program governance.
- **Standards & Safety:** Standards Bureau; Fire Service for performance/safety specs; certification; market surveillance.
- **Environment/Health:** EPA-SL; Ministry of Health for E&S screening; HAP monitoring protocols.
- **Local Government/CSOs:** Councils/NGOs for last-mile distribution, training, grievance redress.
- **Private Sector:** Local manufacturers/importers/distributors for production, warranties, after-sales service; data reporting.
- **Finance Partners:** MFIs/DFIs for consumer/vendor finance; RBF administration.
- **Development Partners:** Technical assistance; co-financing; independent verification.

4.6 Implementation Schedule (2025–2035)

- **2025–Q2 2026:** Enablement to adopt ICS standards; set up testing & certification; vendor pre-qualification; design RBF/voucher windows; baseline KPTs; national BCC campaign launch.
- **Q3 2026–2028:** Wave 1 to distribute 1000k HH ICS; 150 institutional; 150 MSME stoves; establish regional service hubs; first independent verification round.
- **2028–2030:** Wave 2 to reach 600k HH; 10,000 institutional; 600 MSME; refine RBF by verified usage; expand QA/lab audits.
- **2031–2035:** Expansion & refresh to add 200k HH and remaining institutional/MSME targets; replacements & maintenance funds; continuous MRV for ETF/BTR reporting.

4.7 MRV Notes

- **Primary data:** Serialized stove sales, geotagged delivery, warranty/repair logs; household Kitchen Performance Tests (fuel-weighing), periodic Usage Surveys/Monitors.
- **Parameters:** Technology-specific efficiency; fNRB; stacking adjustment; charcoal production losses where relevant. Maintain a central EF registry consistent with national inventory tables.
- **Verification:** Annual independent checks (usage + functionality), spot fuel-use measurements, and reconciliation with RBF claims; QA/QC by MoECC/EPA-SL.

4.8 Key co-benefits

- Immediate affordability gains: lower fuel spend for poor HHs/vendors.
- Health & safety: reduced smoke exposure; burn/injury risk declines with safer designs.
- Local enterprise: stove manufacturing/repair value chains; QA/testing lab ecosystem.

Indicators

- Fuel spend reduction (SLE/HH/month); KPT results ; stacking-adjusted usage rates (%).
- Kitchen $PM_{2.5}$ change in ICS users; reported burn incidents.
- Local producers certified; warranty claim rates; lab tests passed.

5 Cooking Transition – LPG

5.1 Detailed Description

The country has made some important strides through ongoing policies, pilots, and private sector engagement. For example, the SDG7 Energy Compact and the Energy Transition and Green Growth Plan both identify LPG as a key pathway for achieving universal access to clean cooking. The National Petroleum Regulatory Agency (NPRA) has also strengthened oversight of LPG importation, storage, and distribution, while private operators like Afrigas are piloting flexible household LPG models in Freetown's informal settlements under the ENACT programme.

There are also signs of growing institutional capacity and infrastructure readiness, with LPG storage facilities being monitored by NPRA and new initiatives supporting safety standards and supply consistency. However, uptake remains low due to affordability challenges, limited distribution outside major towns, and weak demand-side awareness.

This measure will

- Focus on scaling existing LPG pilots and regulatory efforts to national level rather than introducing parallel initiatives.
- Support market development and affordability, including pay-as-you-cook and cylinder exchange models pioneered by Afrigas and others.
- Promote public-private partnerships to expand LPG distribution infrastructure beyond Freetown and regional capitals.
- Strengthen data, monitoring, and safety systems through NPRA to ensure consumer confidence and sustainable growth.
- Link LPG deployment explicitly to gender, health, and climate co-benefits, highlighting reduced deforestation and emissions alongside health improvements.
- Introduce a data systems should track cylinder movements, refill volumes, and incident reports for continuous safety improvement.

5.2 GHG Abatement (Methodology)

LPG displaces non-renewable biomass (wood/charcoal) currently used for cooking. Net abatement equals the baseline emissions from non-renewable biomass minus project emissions from LPG combustion. Use national factors from the BUR/NDC and document assumptions on fuel stacking (households partially using multiple fuels).

Indicative calculation (annual per cohort):

- Baseline biomass: tCO_2e = (Biomass_mass_baseline × EF_biomass_CO_2e × fNRB) / 1,000
- Charcoal: tCO_2e = (Charcoal_mass_baseline × EF_charcoal_CO_2e × fNRB) / 1,000
- Project LPG: tCO_2e = (LPG_mass_project × EF_LPG_CO_2e) / 1,000
- Net savings: (Baseline biomass + charcoal) − Project LP

5.3 Outcomes & Indicators

Targets for 2030 and 2035 and the associated monitoring indicators are summarized below.

Item	2030 Target (Indicators)	2035 Target (Indicators)
People regularly cooking with LPG	30,000 HHS or around 10% of HHs (Indicators: household surveys; active cylinder accounts; annual LPG tonnes)	60,000 HHs or 25% HHs (Indicators: surveys; LPG sales; active accounts)
Access & affordability	30,000 new connections with starter kits; (Ind.: # kits delivered; MFIs loans disbursed)	60,000 cumulative new connections; (Ind.: # kits; repayment performance)
Safety & quality	National installer training program; incident rate < 2 per 10,000 connections; (Ind.: training records; incident log)	Incident rate < 1 per 10,000; periodic cylinder re-qualification ≥ 95%; (Ind.: inspection logs)
GHG reductions	25 ktCO_2e/yr avoided (net of LPG emissions; stacking-adjusted); (Ind.: tCO_2e/yr)	50 ktCO_2e/yr avoided; (Ind.: tCO_2e/yr)

5.4 Financial Needs (Order-of-Magnitude)

Budget ranges depend on cylinder fleet scale, depot density, and subsidy design. Excludes end-user fuel costs which are paid by consumers; public funds focus on connection affordability and safety systems.

Phase	Scope	Indicative CAPEX	Indicative OPEX (annual)
2025–2026 (Prep)	Regulatory updates, standards, safety curriculum, MIS, awareness campaign	US$ 1-1.5 million (TA & systems)	US$ 0.3–0.5 million
2026–2030 (Scale-1)	Cylinder fleet + starter kits (30k), depots, training, RBF/connection subsidies	US$ 15-20 million	US$ 0.5-1.5 million
2031–2035 (Scale-2)	Expansion to 60k kits, cylinder re-qualification equipment, rural micro-depots	US$ 15-20 million	US$ 0.5–1.5 million

Financing mix: private marketer investment (cylinders/logistics), consumer micro-finance, results-based grants for connections/safety, and potential tax/VAT relief for certified equipment.

5.5 Implementation Agency (Roles & Responsibilities)

- **Lead:** Ministry of Energy (MoE) & MOECC for policy, licensing, cylinder management framework, pricing oversight.
- **Standards/Fire Safety:** Standards Bureau, Fire Service for equipment standards, installer certification, safety inspections.
- **Local Government:** Councils for depot siting permits, market outreach.
- **Private Sector:** LPG marketers/distributors for cylinder fleet, filling plants, distribution, training, reporting.
- **Finance Partners:** MFIs/banks for connection loans; RBF administrators for subsidies.
- **Development Partners:** TA, concessional windows, public awareness.

5.6 Implementation Schedule (2025–2035)

- **2025–Q2 2026:** Regulatory enablement; standards adoption; safety curriculum; pilot depots.
- **Q3 2026–2028:** Scale-up Wave 1 to roll out around 10K kits; expand cylinder fleet and depots; installer certification.
- **2028–2030:** Wave 2 to reach 30K kits; refine RBF based on uptake/safety data; rural micro-depots.
- **2031–2035:** Expansion to cumulative 60K kits; periodic cylinder re-qualification; continuous MRV for ETF/BTR.

5.7 Key co-benefits

- **Health and nutrition:** large reductions in household air pollution ($PM_{2.5}$/CO); fewer ALRI/COPD cases. Energy saving cooking stoves offer an opportunity to promote good nutrition with emphasis on children's diets.
- **Gender & time:** 1–3+ hrs/day saved from fuel collection/slow cooking; women's economic participation.
- **Forestry:** reduced pressure on woodlands/mangroves; lower black carbon.
- **Agri-nexus (biogas):** improved sanitation; digestate as organic fertilizer; reduced indoor smoke for fish/meat processing.

Indicators

- Kitchen $PM_{2.5}$ change (µg/m^3) in panel households; HAP-related clinic visits.
- Hours/week saved (survey); # women distributors/retailers financed.
- LPG retail points added; days of stock security; biogas digesters installed.
- Digestate volumes used; reported crop yield improvements (farmer diaries).

6 Cooking Transition – Biogas

6.1 Detailed Description

This measure builds on the progress already being made in Sierra Leone's biogas sector. Over the past few years, several initiatives have laid a solid foundation for integrating biogas into the country's broader clean energy and waste management agenda. Key examples include the National Bioenergy Action Plan, which identifies biogas as a viable energy source for households and institutions; the Renewable Energy Policy (2016), which promotes the conversion of agricultural and municipal waste into energy; and demonstration projects such as the ENERGICA programme in Waterloo and the Waste Transformer pilot in Freetown. These initiatives are showing how biogas can link energy access, waste management, and agricultural productivity.

The biogas program deploys institutional, community, and household biodigesters that convert organic waste and manure into biogas for clean cooking and thermal uses (e.g., school canteens, clinics, markets, agro-processing). Systems include digesters (fixed-dome or prefabricated), gas storage, basic H_2S scrubbing, piping, and biogas stoves. Slurry is valorized as organic fertilizer with safe handling protocols. Site selection considers steady feedstock supply (livestock numbers, market organics), water availability, trained operators, and nearby users. O&M manuals and service contracts ensure uptime and safety.

Institutional/market-scale plants (≥20–100 m^3/day) should be prioritized in urban/peri-urban hubs with significant organic waste streams, while household digesters (6–12 m^3) target farms with ≥2–3 cattle or equivalent feedstock.

The enabling activities will include:

- Emphasise scaling up existing pilots and demonstration projects, particularly those showing strong co-benefits in waste-to-energy, sanitation, and fertilizer production.
- Support capacity building and technical training for local operators and municipalities to manage biogas systems effectively.
- Strengthen institutional and regulatory frameworks, including standards for system design, waste segregation, and safety protocols.

- Encourage public-private partnerships to attract investment for biogas infrastructure, leveraging models like ENERGICA's municipal biogas systems.
- Prioritise integration with waste management and agricultural value chains, ensuring feedstock availability and the productive use of by-products such as organic fertilizer.
- Establish monitoring and performance reporting systems to capture lessons from existing installations and inform national scale-up.
- Establish a certification scheme for installers, a spare-parts supply chain, and a performance-based payment window to reward verified gas production and safe operation.

6.2 GHG Abatement (Methodology)

Emissions are reduced by (i) avoiding methane from unmanaged decomposition of manure/organic waste and (ii) displacing biomass/charcoal/LPG formerly used for cooking. Apply national/IPCC factors. Account for potential methane leakage and combustion efficiency.

Indicative calculation (annual per plant):

- Methane avoidance: $tCO_2e = (VS \times B_0 \times MCF\_baseline - Methane\_leakage) \times GWP\_CH_4 / 1{,}000$
- Fuel displacement: tCO_2e = (Biomass/Charcoal/LPG replaced × respective EF_CO_2e × fNRB where applicable) / 1,000
- Net savings: Methane avoidance + Fuel displacement − Project emissions (parasitic electricity, leakage), where VS (volatile solids) and B_0 are feedstock-specific; use conservative defaults when plant-level data are limited.

6.3 Outcomes & Indicators

Targets for 2030 and 2035 and the associated monitoring indicators are summarized below.

Item	2030 Target (Indicators)	2035 Target (Indicators)
Digesters operating	35,000 household units (Indicators: commissioning records; operational logs)	90,000 household units (Indicators: operational logs)
Organic waste diverted	20,000 t/yr from markets/livestock (Ind.: weighbridge/sampling)	50,000 t/yr (Ind.: waste audits)
GHG reductions	700 $ktCO_2e$/yr avoided (methane + fuel switch) (Ind.: tCO_2e/yr)	1750 $ktCO_2e$/yr avoided (Ind.: tCO_2e/yr)

6.4 Financial Needs (Order-of-Magnitude)

Costs reflect digester size/technology, civil works, gas handling, and O&M training. Ranges below guide budgeting; detailed feasibility will refine them.

Plant Type	Typical Size	Indicative CAPEX	Indicative OPEX (annual)
Household	6–12 m^3	US$ 600–1,200	US$ 20–40
Community/Institutional	20–100 m^3/day	US$ 25,000–120,000	US$ 1,000–4,000

Program budgeting (aggregate):

2026–2030: US$ 40 million (plants, metering, TA, service network)

2031–2035: US$ 100 million (scale-up, replacements, operator training

Financing mix: public RBF for verified gas, concessional credit, carbon revenue (where eligible), and community co-finance.

6.5 Implementation Agency (Roles & Responsibilities)

- Lead: Ministry of Energy (Renewables) & Ministry of Agriculture for program governance, feedstock integration.
- Environment/Standards: EPA-SL & Standards Bureau for environmental approvals, safety codes, performance standards.
- Local Government: Councils/market authorities for site allocation, waste segregation logistics.
- Private Sector/NGOs: EPC/installers/operators for design, build, O&M, metering, reporting.
- Finance Partners: MFIs/DFIs for CAPEX loans, guarantees; RBF administrators.
- Development Partners: TA, grants, capacity building, MRV support.

6.6 Implementation Schedule (2025–2035)

2025–Q2 2026: Frameworks & pilots to standards, O&M training curriculum, site selection, 10–15 pilot plants, MRV templates.

Q3 2026–2028: Wave 1 to commission 200 community/institutional plants and 2000 household units; establish service hubs.

2028–2030: Wave 2 to reach 500 community/institutional and 35,000 household units; optimize feedstock logistics; validate MRV.

2031–2035: Expansion to cumulative 1000 community/institutional and 90,000 household units; replacement/upgrade cycle; ongoing verification for ETF/BTR reporting.

6.7 Key co-benefits

- Health: large reductions in household air pollution ($PM_{2.5}$/CO); fewer ALRI/COPD cases.
- Gender & time: 1–3+ hrs/day saved from fuel collection/slow cooking; women's economic participation.
- Forestry: reduced pressure on woodlands/mangroves; lower black carbon.
- Agri-nexus (biogas): improved sanitation; digestate as organic fertilizer; reduced indoor smoke for fish/meat processing.

Indicators

- Kitchen $PM_{2.5}$ change (µg/m^3) in panel households; HAP-related clinic visits.
- Hours/week saved (survey); # women distributors/retailers financed.
- LPG retail points added; days of stock security; biogas digesters installed.
- Digestate volumes used; reported crop yield improvements (farmer diaries).

7 E-buses for Public Transport

7.1 Detailed Description

This emasure builds on the tangible progress already being made across Sierra Leone's transport sector on e-mobility and other clean transport transition models. Over the past few years, the sector has taken meaningful steps through the National e-Mobility Strategy and Implementation Plan, the GEF/UNEP-supported "Supporting Sierra Leone with the Shift to Electric Mobility" project, and pilot initiatives such as the EPA-led e-kekeh demonstration, the NEEV Salone local e-vehicle assembly, and ongoing UNDP-supported feasibility work on commercial EVs. These initiatives are supported by the EPA, the Ministry of Transport, and development partners, all working towards electrifying transport and reducing reliance on fossil fuels.

The e-bus measure introduces battery-electric buses for high-demand urban corridors in Freetown and regional cities. Phase 1 focuses on depot-based overnight charging with opportunity (top-up) charging at termini where feasible. Buses will be sized 9–12 m for trunk routes and 6–8 m for feeder services, equipped with CCS2 charging, onboard telematics, and regenerative braking. The program includes: (i) route redesign and scheduling to suit electric range, (ii) depot upgrades with transformers, chargers (60–180 kW), and energy management systems, (iii) driver/mechanic training, and (iv) a service contract model (availability-based) with private operators and (v) battery recycling procedures.

Renewable PPAs and time-of-use tariffs are encouraged to maximize GHG impacts and lower OPEX. The connection between this e-mobility measure (and the following measure) and the energy sector is given explicitely in the document: RE Based EV Charging" report from a GEF-funded project available at EPA-SL. The project develops the institutional, legal, and technical foundation for the introduction of electric two- and three-wheelers (e-kekes and e-bikes) and their associated renewable-based charging infrastructure. It establishes an inter-ministerial coordination body linking the energy, transport, and environment sectors, develops a national gender-sensitive e-mobility strategy,

Fleet selection will be based on duty-cycle simulations (km/day, dwell times, grades, ambient temperature). A centralized operations control center will monitor state-of-charge, consumption (kWh/km), and uptime. Interoperability will follow open standards for chargers and telematics, and safety protocols will cover high-voltage systems, fire response, and workshop isolation procedures.

7.2 GHG Abatement (Methodology)

GHG reductions come from replacing diesel bus-km with electric bus-km. Use national grid emission factors (tCO_2e/MWh) and diesel factors ($kgCO_2$/L). Account for electricity consumed by charging and any renewable energy procurement.

Indicative calculation (annual):

- Diesel avoided: tCO_2e = (Liters_diesel_baseline − Liters_diesel_project≈0) × EF_diesel ÷ 1,000
- Electricity emissions: tCO_2e = (MWh_charging) × Grid_EF
- Net savings: Diesel avoided − Electricity emissions

Track passenger-km to capture mode shift effects (from taxis/kekeh to buses) when applicable.

7.3 Outcomes & Indicators

Targets for 2030 and 2035 and associated monitoring indicators:

Item	2030 Target (Indicators)	2035 Target (Indicators)
Fleet & service	50 e-buses in service; ≥7,500 pax/day; (Ind.: fleet registry; AFC/ticketing data)	100 e-buses; 15,000 pax/day; (Ind.: AFC; AVL/telematics)
Operational performance	Availability ≥ 90%; energy use ≤ 1.2–1.5 kWh/km (route-dependent); (Ind.: telematics)	Availability ≥ 92%; energy use ≤ 1.1–1.4 kWh/km; (Ind.: telematics)
Charging & depots	5 depots electrified; 20 chargers installed; (Ind.: charger uptime logs)	10 depots; 40 chargers; (Ind.: uptime logs)
GHG reductions	≥80–130 $ktCO_2e$/yr avoided (net of grid emissions); (Ind.: tCO_2e/yr)	≥180–280 $ktCO_2e$/yr avoided; (Ind.: tCO_2e/yr)

7.4 Financial Needs (Order-of-Magnitude)

Ranges depend on bus size, charging power, and depot upgrades. Budget with contingencies for logistics and training.

Item/Phase	Scope	Indicative CAPEX	Indicative OPEX (annual)
Buses	9–12 m bus (200–300 kWh packs)	US$ 260k–380k per bus	—
Chargers	60–180 kW DC fast chargers	US$ 30k–90k per charger	—
Depot upgrades	Transformers, cabling, EMS, civil works	US$ 0.8–2.0 million per depot	—
2025–2026 (Prep)	Fleet simulation, route redesign, procurement docs, training	US$ 1–3 million (TA & setup)	US$ 0.1–0.2 million
2026–2030 (Scale-1)	Procure 50 e-buses + depots/chargers	US$ 12–20 million	US$ 0.5-0.7 million
2031–2035 (Scale-2)	Add 50 e-buses; expand depots	US$ 12–20 million	US$ 0.5-0.7 million

Financing mix: public procurement with availability-based service contracts, concessional credit/guarantees, carbon finance for verified reductions, and blended capital for depots/chargers. Explore duty/VAT relief and green bonds.

7.5 Implementation Agency (Roles & Responsibilities)

- Lead: Ministry of Transport and Aviation (MoTA) to route planning, contracting, regulation.
- Utility/Energy: Freetown City Council (FCC), District Councils, EDSA, EWRC, SLPTA, & MoE to grid connections, tariffs, potential renewable PPAs for depots.
- Operators: Public/private bus operators to service delivery, O&M, data reporting.
- Standards/Safety: EPA-SL, Standards Bureau & Fire Service to charger/bus standards, workshop and emergency protocols.
- Finance Partners: DFIs/banks to fleet/depot financing, guarantees; results-based payments.
- Development Partners: TA, training, and co-financing windows.

7.6 Implementation Schedule (2025–2035)

- 2025–Q2 2026: Enablement for duty-cycle studies; route redesign; depot siting; tariff design; procurement templates; pilots.
- Q3 2026–2028: Wave 1 for commission first 15 e-buses; operational control center; driver/mechanic training; reliability ramp-up.
- 2028–2030: Wave 2 for scale to 35 e-buses; optimize charging windows; add renewable PPAs; formal MRV workflow.
- 2031–2035: Expansion for cumulative 100 e-buses; regional city deployment; depot optimization; continuous ETF/BTR reporting.

7.7 Key co-benefits

- Urban air quality & noise: lower roadside PM/NOx; quieter streets.
- Public transport service quality: higher reliability/comfort; digital ticketing; inclusive mobility.
- Operating economics: lower per-km energy/maintenance costs; forex savings on diesel.
- Skills & jobs: drivers retrained; local assembly/maintenance hubs.

Indicators

- Ambient roadside $PM_{2.5}$/NOx at corridors; dB(A) noise profiles.
- On-time performance; passenger load factors; satisfaction scores.
- SLE/km OPEX vs diesel baseline; electricity-to-diesel cost ratio; FX savings.
- Trained e-bus technicians/drivers; charger uptime (%).

8 E- Compact Mobility Vehicles (Electric 3-wheelers and 2-wheelers)

8.1 Detailed Description

This measure builds on the strong foundation already being laid in the transport sector through the ongoing e-Compact Mobility Vehicles (e-CMV)initiatives. Over the past two years, Sierra Leone has made measurable progress in piloting electric three-wheelers under the “Supporting Sierra Leone with the Shift to Electric Mobility” project, led by the EPA with support from UNEP, the EU SOLUTIONS Plus programme, and local partners. The project has developed a Comprehensive Implementation Plan, procured pilot vehicles, and initiated deployment of solar-powered charging and battery-swapping infrastructure in Freetown. These efforts have already generated valuable lessons on technical feasibility, operational costs, user acceptance, and gender inclusion; for example, the pilot’s target of 30% female drivers demonstrates that e-mobility can also advance social equity.

This measure focus on scaling and consolidating this work in the following areas: - Scaling up e-kekeh and e-bike deployment from the current pilot stage to a broader fleet transition, especially in urban and peri-urban areas.

- Expanding charging and battery-swapping infrastructure, including solar-hybrid systems for resilience in areas with unreliable grid access.
- Formalising maintenance, servicing, and safety systems, ensuring local technicians and drivers are trained in EV operation and battery management.
- Strengthening financing and business models, such as leasing schemes, concessional financing, or pay-as-you-go ownership to make adoption affordable for operators.
- Integrating lessons into national transport planning, ensuring e-CMV routes link with proposed e-bus and low-carbon public transport corridors.

Deployment combines (i) driver cooperatives and (ii) fleet-as-a-service/leasing to lower upfront costs. Infrastructure includes neighborhood charging points and optional battery-swap kiosks at markets/terminals. Safety features (lights, brakes, seatbelts where applicable) and driver training are integral, alongside registration and fare regulation by MoTA/FCC/SLRSA.

Target operating areas: dense urban wards and peri-urban corridors with high trip density. Integration with bus routes will reduce congestion and emissions by shifting short trips from ICE kekeh/taxis/bikes to electric CMV. Vendor qualification will require parts availability, service centers, and warranties.

8.2 GHG Abatement (Methodology)

Abatement is the difference between baseline fuel use of ICE tricycles/bikes/minibuses and electricity used by e-CMV. Use national diesel/gasoline emission factors and grid EF. Where renewable charging is verifiably used, apply a lower EF.

- Indicative calculation (annual per vehicle cohort):
- Fuel savings: tCO_2e = (Liters_fuel_baseline − Liters_fuel_project≈0) × EF_fuel ÷ 1,000
- Electricity emissions: tCO_2e = (MWh_charging) × Grid_EF
- Net savings: Fuel savings − Electricity emission

Survey passenger-km and trip counts to quantify mode shift from ICE vehicles.

8.3 Outcomes & Indicators

Targets for 2030 and 2035 and associated monitoring indicators:

Item	2030 Target (Indicators)	2035 Target (Indicators)
Fleet deployed	5,000 e-CMV in operation, around 35% of kekehs; (Ind.: registration data; vendor sales)	10,000 e-CMV, around 70%; (Ind.: registrations; telematics)
Service & performance	Average energy use ≤ 35–45 Wh/km; availability ≥ 92%; (Ind.: telematics)	Energy use ≤ 35–45 Wh/km; availability ≥ 94%; (Ind.: telematics)
Charging/swap points	150 neighborhood charge points; 25 swap kiosks; (Ind.: uptime logs)	300 charge points; 50 swap kiosks; (Ind.: uptime logs)
GHG reductions	70 $ktCO_2e$/yr avoided (net of grid emissions); (Ind.: tCO_2e/yr)	150 $ktCO_2e$/yr avoided; (Ind.: tCO_2e/yr)

8.4 Financial Needs (Order-of-Magnitude)

Unit economics vary by battery size, financing terms, and charger density.

Item/Phase	Scope	Indicative CAPEX	Indicative OPEX (annual)
Vehicle	E-CMV with 2–5 kWh battery	US$ 1,800–3,500 per unit	—
Charging/swap	AC charge posts; swap kiosks	US$ 1,000–3,000 per post; US$ 15k–40k per swap kiosk	—

2025–2026 (Prep)	Regulatory updates, finance facility design, pilot routes, vendor qualification	US$ 1–2 million (TA & setup)	US$ 0.1–0.2 million
2026–2030 (Scale-1)	Deploy 5,000 vehicles; 150 charge points; swap network pilots	US$ 45 million	US$ 0.8–1.5 million
2031–2035 (Scale-2)	Add 5,000 vehicles; expand charging/swap	US$ 45 million	US$ 0.8–1.5 million

Financing mix: micro-leases via MFIs, fleet-as-a-service models, concessional credit lines, and results-based payments tied to verified electric-km. Consider duty/VAT relief and insurance products tailored to e-CMV fleets.

8.5 Implementation Agency (Roles & Responsibilities)

- Lead: MoTA & FCC for licensing, routing, fares, integration with bus corridors.
- Road Safety: SLRSA for registration, safety inspections, driver training.
- Utility/Energy: EDSA & MoE and EWRC for connections and tariffs for neighborhood charging; rooftop PV for kiosks where feasible.
- Private Sector: Vendors/leasing firms/cooperatives for vehicles, service, data reporting.
- Finance Partners: MFIs/banks/DFIs for micro-leasing and working capital; risk-share facilities.
- Development Partners: TA for road safety, driver training, and inclusion programs (women/young drivers).

8.6 Implementation Schedule (2025–2035)

2025–Q2 2026: Enablement for regulations for e-tricycles; finance facility; pilot areas; charger siting; vendor qualification.

Q3 2026–2028: Wave 1 to deploy first 2,500 units; build charge/swap network; telematics dashboard; safety training.

2028–2030: Wave 2 to scale to 5,000 units; optimize tariffs and charging windows; formal MRV workflow.

2031–2035: Expansion for cumulative 10,000 units; expand peri-urban coverage; continuous ETF/BTR reporting.

8.7 Key co-benefits

- Urban air quality & noise: lower roadside PM/NOx; quieter streets.
- Public transport service quality: higher reliability/comfort; digital ticketing; inclusive mobility.
- Operating economics: lower per-km energy/maintenance costs; forex savings on diesel.
- Skills & jobs: drivers retrained; local assembly/maintenance hubs.

Indicators

- Ambient roadside $PM_{2.5}$/NOx at corridors; dB(A) noise profiles.
- On-time performance; passenger load factors; satisfaction scores.
- SLE/km OPEX vs diesel baseline; electricity-to-diesel cost ratio; FX savings.
- Trained e-bus technicians/drivers; charger uptime (%).

9 Fuel Efficiency and Standards

9.1 Detailed Description

This measure complements earlier frameworks such as the National Energy Efficiency Action Plan (2015), which, while focused largely on buildings and appliances, established a broad national direction for energy efficiency. The National e-Mobility Strategy and Implementation Plan also anticipates the development of vehicle emission standards for internal combustion engine vehicles (ICEVs), aligning efficiency improvements with the country's emerging electric mobility agenda. In addition, the Integrated and Resilient Urban Mobility Project (IRUMP) supported by the World Bank has been addressing the issue of old, inefficient public transport vehicles, creating opportunities for scaling cleaner and more efficient fleets.

It's also important to flag that implementation of these measures remains limited. Fuel efficiency and emissions standards are still aspirational, labelling systems and inspection regimes have not yet been operationalised, and import policies continue to allow older, high-emission vehicles into the fleet. Enforcement capacity is also weak, with little systematic monitoring of vehicle fuel consumption or emissions performance.

The enabling activities will be focused on the following areas:

- Operationalising the National Energy Efficiency Policy through the enforcement of vehicle labelling, inspection, and performance standards.
- Strengthening coordination between fuel efficiency and e-mobility measures to ensure policy coherence across the transport sector.
- Phasing in vehicle age and emission limits to progressively reduce the import of older, inefficient vehicles.
- Introducing fiscal and procurement incentives for cleaner, low-emission public and government vehicles.

Standards will be phased: e.g., initial import age cap of 10–12 years for light-duty vehicles tightening to 8 years by 2030 and 5–7 years by 2035; minimum fuel-economy thresholds by vehicle class; and emissions/OBD checks during inspections. A digital registry will capture model year, fuel type, and odometer reading at import and during inspections to track the fleet cohort over time.

9.2 GHG Abatement (Methodology)

Abatement is driven by lower fuel intensity (L/100 km) across the fleet and removal of the worst-performing imports. Two MRV approaches can be used in parallel: (1) a bottom-up cohort model of registered vehicles (km travelled × improvement in L/km × EF_fuel), and (2) a top-down check using national fuel sales relative to a calibrated baseline trend.

Indicative calculation (annual):

- Liters_saved = Σ_i [VKT_i × (Baseline_Intensity_i − Project_Intensity_i)]
- tCO_2e_saved = (Liters_saved × EF_mix_kgCO2_per_L) ÷ 1,000

where VKT_i is vehicle-km traveled for class i; EF_mix reflects gasoline/diesel mix. Use national EF values and document assumptions on VKT, scrappage rates, and compliance.

9.3 Outcomes & Indicators

Targets for 2030 and 2035 and the associated monitoring indicators are summarized below.

Item	2030 Target (Indicators)	2035 Target (Indicators)
Policy adoption & enforcement	Import standards gazetted; max age 10 years (LDV); inspection coverage ≥ 70%; (Ind.: legal notices; inspection stats)	Max age 8 years; inspection coverage ≥ 90%; (Ind.: legal notices; inspection stats)
Fleet efficiency	Average fuel intensity reduced 10% vs 2025 baseline; (Ind.: cohort model; inspection data)	Average fuel intensity reduced 20%; (Ind.: cohort model)
Fuel savings	20–35 million liters/yr saved (range to be refined); (Ind.: fuel sales vs baseline; model outputs)	45–70 million liters/yr saved; (Ind.: same)
GHG reductions	≥50–80 $ktCO_2e$/yr avoided; (Ind.: tCO_2e/yr)	≥110–170 $ktCO_2e$/yr avoided; (Ind.: tCO_2e/yr)
Safety/quality co-benefits	Road-worthiness failure rate declines 30%; sulphur/spec standards enforced; (Ind.: inspection logs; fuel QA)	Failure rate declines 50%; (Ind.: inspection logs)

9.4 Financial Needs (Order-of-Magnitude)

Budget elements include legal drafting, customs/inspection IT, testing equipment, inspection center upgrades, data systems, and training. Figures are planning ranges to be refined during design.

Phase/Item	Scope	Indicative CAPEX	Indicative OPEX (annual)
2025–2026 (Prep)	Legislation, standards, IT registry, baseline studies, training	US$ 2–4 million	US$ 0.3–0.5 million
Inspection centers	Equipment (emissions/OBD), lanes, QA system	US$ 4–8 million	US$ 0.6–1.2 million
Customs enforcement	VIN scanners, HS code integration, staff training	US$ 0.8–1.5 million	US$ 0.2–0.3 million
2026–2030 (Scale-1)	Operational rollout & public awareness	US$ 1.5–3.0 million	US$ 0.5–0.8 million
2031–2035 (Scale-2)	Expansion, system upgrades	US$ 2–4 million	US$ 0.6–1.0 million

Potential financing: national road-safety funds, inspection fee revenues (cost recovery), concessional/DFI support for equipment/IT, and TA grants. Consider incentives (reduced duties) for high-efficiency/hybrid/EV imports.

9.5 Implementation Agency (Roles & Responsibilities)

- Lead: Ministry of Transport and Aviation (MoTA) for policy and program leadership.
- Customs: National Revenue Authority (NRA) to import enforcement, data capture.
- Road Safety/Registration: Sierra Leone Road Safety Authority (SLRSA) for inspections, registry, enforcement.
- Standards/Environment: Standards Bureau & EPA-SL for fuel/vehicle standards, fuel QA.
- Police/Local Government: Enforcement support and roadside checks.
- Private Sector: Accredited inspection operators; dealerships; training providers.
- Development Partners: TA, equipment financing, and MRV support.

9.6 Implementation Schedule (2025–2035)

2025–Q2 2026: Draft and gazette import/inspection standards; design IT registry; pilot inspections and customs workflow.

Q3 2026–2028: Wave 1 for nationwide inspection rollout; import age cap at 10 years; public awareness; early enforcement.

2028–2030: Wave 2 to refine standards; tighten age/efficiency thresholds; integrate labelling; independent QA of inspection network.

2031–2035: Expansion to age cap 8 years; advanced analytics for cohort MRV; continuous ETF/BTR reporting.

9.7 Key co-benefits

- Macroeconomic: fuel import bill reduced; improved balance of payments.
- Safety & quality: better vehicle condition; fewer breakdowns/accidents.
- Market transformation: newer, cleaner vehicles; inspection capacity upgraded.

Indicators

- Fleet average L/100 km (by class); national fuel intensity (MJ/VKT).
- Road worthiness inspections passed; accident rates per VKT.
- Average vehicle age; standards compliance rate at import/registration.

10 Forestry and Mangroves

10.1 Detailed Description

This measure is based on the solid progress already being made across Sierra Leone's forestry sector, rather than introducing entirely new measures in isolation. Several important initiatives are already underway that provide a strong foundation for scaling results and enhancing ambition.

The National Forest Inventory (NFI), being implemented by the Forestry Division with support from FAO, represents a major milestone in developing accurate data on forest cover, condition, and carbon stocks. Once completed, the NFI will offer an evidence base for more targeted reforestation, restoration, and monitoring of forest resources across the country. This work is complemented by FAO's ongoing technical support on REDD+ readiness, which is helping Sierra Leone develop frameworks for sustainable forest management, carbon accounting, and benefit sharing. These initiatives are strengthening institutional capacity for forest governance and improving the country's ability to meet global reporting standards.

In addition, Sierra Leone has made tangible progress through a series of forest and mangrove restoration and protection efforts, including community-based restoration in the Sherbro River Estuary, the "Freetown the Treetown" urban greening programme, and new carbon-financed initiatives such as the West Africa Blue project. These interventions are generating valuable lessons on sustainable land use, community participation, and ecosystem-based climate solutions.

This measure should protect, restore, and sustainably manage Sierra Leone's forests and mangroves, focusing on high-risk deforestation fronts and coastal ecosystems (e.g., Sherbro, Scarcies). Interventions include: (i) community forestry agreements with performance-based incentives; (ii) protected area strengthening (patrols, boundary demarcation, fire management, livelihood alternatives); (iii) assisted natural regeneration (ANR) and enrichment planting with native species; (iv) mangrove restoration and hydrological rehabilitation; (v) land-use planning and a basic land cadastre to reduce encroachment; and (vi) sustainable woodfuel measures where appropriate (efficient kilns, regulated harvest). Gender-inclusive governance and benefit-sharing are integrated across all activities.

Integrate the cultivation of a wider range nutrient diverse trees of indigenous / traditional edible plants that provide fruits, nuts, vegetables, etc., to increase the availability of diverse and sustainable foods.

Site selection prioritizes biodiversity value, carbon density (including blue carbon), community readiness, and threat level. Nursery networks and local contractor models will deliver seedlings and ANR services. Social safeguards, FPIC principles, and grievance redress mechanisms apply across the program.

Some other enabling activities could include:

- Consolidating and scaling up the NFI and REDD+ processes to form the backbone of national forest monitoring and carbon accounting systems.
- Aligning reforestation and mangrove restoration efforts with national and local forest management plans to ensure consistency and long-term sustainability.
- Strengthening coordination between the Forestry Division, EPA, FAO, and other partners to link forest data, REDD+ readiness, and restoration initiatives into one coherent national framework.
- Expanding livelihood and community forest programmes to reduce dependency on forest exploitation while improving local resilience.

10.2 GHG Abatement (Methodology)

Mitigation derives from (i) avoided deforestation/degradation, (ii) reforestation/ANR sequestration, and (iii) mangrove soil and biomass carbon gains. Use activity data (hectares) from remote sensing and field plots, multiplied by country-specific emission/removal factors (tCO_2e/ha).

Indicative calculations (annual):

- Avoided deforestation: tCO_2e = Area_protected (ha) × EF_forest_loss (tCO_2e/ha)
- Reforestation/ANR: tCO_2e = Area_restored (ha) × Sequestration_rate (tCO_2e/ha/yr)
- Mangrove restoration/avoidance: tCO_2e = Area_mangrove (ha) × (Soil+Biomass EF) (tCO_2e/ha/yr)

MRV uses satellite imagery (annual wall-to-wall), stratified field plots for biomass, mangrove soil-carbon cores where feasible, and QA/QC protocols consistent with national inventory guidance.

10.3 Outcomes & Indicators

Targets for 2030 and 2035 with associated indicators:

Item	2030 Target (Indicators)	2035 Target (Indicators)
Areas under improved management	100,000 ha forests; 50,000 ha mangroves (Ind.: signed community agreements; PA patrol logs; GIS)	200,000 ha forests; 100,000 ha mangroves (Ind.: agreements; GIS)
Reforestation/restoration (ANR/planting)	100,000 ha restored forest; survival ≥ 70% at year 3 (Ind.: plot surveys; nursery/planting records); 25 ha restored mangroves 60,000 ha restored; survival ≥ 70% at year 3 (Ind.: plot surveys; nursery/planting records)	200,000 ha restored forest; survival ≥ 75% (Ind.: surveys); 50 ha restored mangroves 120,000 ha restored; survival ≥ 75% (Ind.: surveys)
Livelihoods & co-benefits	10,000 households for forests / 5,000 HHs for mangroves with benefit-sharing/livelihood support (Ind.: program records)	20,000 households, 10,000 HHs (Ind.: program records)
GHG reductions	400 $ktCO_2e/yr$ avoided/removed (Ind.: tCO_2e/yr)	800 $ktCO_2e/yr$ avoided/removed (Ind.: tCO_2e/yr)

10.4 Financial Needs (Order-of-Magnitude)

Budget lines include community agreements and incentives, protected area operations, restoration (ANR/planting), nurseries, mangrove hydrological works, MRV, and program management. Ranges below guide planning and will be refined by site-level designs.

Phase/Item	Scope	Indicative CAPEX	Indicative OPEX (annual)
2025–2026 (Prep)	Land-use planning, cadastre pilots, community agreements, nursery setup, MRV baselines	US$ 6–10 million	US$ 0.6–1.0 million
2026–2030 (Scale-1)	Management of 100k ha; restore 60k ha; mangrove works 30K ha	US$ 40 million	US$ 3–5 million
2031–2035 (Scale-2)	Expand to200k ha; restore 120k ha; mangrove works to 60k ha	US$ 55 million	US$ 6–8 million

Potential financing: national environment funds, development partner grants, REDD+/Article 6 results-based payments, and private impact capital for restoration. Public procurement can prioritize local nurseries and community contracts.

10.5 Implementation Agency (Roles & Responsibilities)

- Lead: Ministry of Environment and Climate Change (MoECC) & Forestry Department for policy, program coordination, technical guidance.
- Environment/Regulator: Forestry and Wildlife Department, National Protected Area Authority (NPAA) , EPA-SL for environmental oversight and safeguards.
- Local Government & Traditional Authorities: District/City Councils, Chiefs for community agreements, land access, conflict resolution.

- Community Institutions/CSOs: Forest committees, cooperatives for on-the-ground management, restoration, monitoring.
- Academia/Data Partners: Universities/NGOs forMRV (remote sensing, biomass plots, soil carbon).
- Finance Partners: DFIs/donors for grants, results-based payments; private sector for restoration services.

Governance includes a national steering committee and district-level implementation units with grievance redress mechanisms.

10.6 Implementation Schedule (2025–2035)

2025–Q2 2026: Enabling & baselines to land-use planning and cadastre pilots; community agreements; nursery networks; MRV baselines; mangrove hydrology diagnostics.

Q3 2026–2028: Wave 1 to operationalize 25k ha under improved management; reforest 10k ha; start mangrove works (3k ha); benefit-sharing pilots.

2028–2030: Wave 2 to reach 10k ha under management; reforest 60k ha; mangrove restoration to 60k ha; MRV verification and reporting.

2031–2035: Expansion to 200k ha under management; reforest 120k ha cumulative; mangrove restoration to 60k ha; scale livelihood programs; continuous ETF/BTR reporting.

10.7 Key co-benefits

- Biodiversity & ecosystem services: habitat recovery; pollination; carbon stocks.
- Coastal resilience: mangrove buffers reduce storm surge/erosion; fisheries nursery grounds.
- Livelihoods: community forestry, NTFPs, eco-tourism; reduced flooding/sediment in rice fields.
- Improved food system
- Improved data

Indicators

- Hectares restored/protected; canopy cover change (remote sensing).
- Shoreline erosion rates; fish CPUE in adjacent estuaries.
- Community income from NTFPs/tourism; flood incidence in target chiefdoms.

11 Food system transformation (Agroecology)

11.1 Detailed Description

Agroecology is an integrated approach to agriculture and food systems, combining ecological and social principles to agricultural management and food systems design. It conserves and restores carbon sinks by shifting from traditional farming and its inherently unsustainable practices towards the climate-sensitive Agroecology approach.

Agroecology can contribute to climate change mitigation through practices such as (i) zero burning; this will not only prevent CO2 introduction into the atmosphere, it will also serve as catalyst for carbon sequestration by supporting in-soil microbial retention and activity. (ii) Soil-carbon retention; by applying cover cropping, green manure, and other organic fertilizers increases soil-carbon retention, improves soil fertility as well as crop productivity and discourages shifting cultivation. (iii) Sedentary farming; this is the situation where farmers farm on a plot of land year in and year out. With sedentary farming, there will be more land available for forest regeneration and other sustainable land use practices. Forest regeneration will serve as potential source for carbon trade. (iv) Non-use of inorganic chemical inputs; by not using the chemical inputs, GHG emission sources associated with these inputs will be limited.

11.2 GHG Abatement (Methodology)

Mitigation is derived from limited tree cutting, avoiding burning of slashed biomass in farms, applying farm practices like cover cropping, green manuring, avoiding inorganic chemical inputs, and replacing with organic input applications, as well as increasing vegetation cover from extra available land through sedentary farming.

Total number of farmers to be targeted over 10 years (2035) will be 60,000 applying these practices and land sizes under cultivation will provide data on CO2 released from burning and soil carbon retention.

Indicative calculations (annual)

- Soil-carbon retention (cover crops, green manure, organic inputs): tCO_2e = Area(soil_practices) (ha) × Sequestration_rate(soil) (tCO_2e/ha/yr)

- Sedentary farming: tCO_2e = Area(regen) (ha) × Sequestration_rate(regrowth) (tCO_2e/ha/yr)
- Non-use / reduction of inorganic inputs (upstream + on-field, combined): tCO_2e = Area(soil_practices) (ha) × ΔN(syn) (kg N/ha/yr) × EF(N_total) (tCO_2e/kg N) where EF(N_total) = EF(N_production) + EF(N_2O_on-field)

Satellite imagery can determine spatial areas not subjected to farm burning. Other methods like stratified farm plots can help determine soil-carbon retention and biomass left unburnt can determine quantum of CO2 not released in the atmosphere.

11.3 Outcomes & Indicators

Targets for 2030 and 2035 with associated indicators:

Item	2030 Target (Indicators)	2035 Target (Indicators)
Areas not burnt during farming	30000 ha (Ind. Registered farmers in programme, GIS data, report of MAFS)	60000 ha (Ind. Registered farmers in programme, GIS data, report of MAFS)
Additional area accumulated from sedentary farming	30,000ha (Ind. Geospatial data, field notes, MAFS report, cadastral)	90,000ha (Ind. Geospatial data, field notes, MAFS report, cadastral)
Livelihoods & co-benefits	30,000 households benefit from increased livelihood (programme records)	60,000 households benefit from increased livelihood (programme records)
GHG reductions	370 $ktCO_2e$/yr avoided/removed (Ind.: tCO_2e/yr)	910 $ktCO_2e$/yr avoided/removed (Ind.: tCO_2e/yr)

11.4 Financial Needs (Order of Magnitude)

Budget lines include community meetings, identification of farming households, assessment/baseline, agroecology inputs, tools and equipment, training and capacity building, programme management, MRV.

Phase/Item	Scope	Indicative CAPEX	Indicative OPEX (annual)
2025-2026 (prep)	Assessment (including stakeholder and MDA mapping), selections, agreements, MRV baseline, policy and legal review,	\$ 3 – 4 million	US\$ 0.3 – 0.4
2026 – 2030 **Scale 1**	On-field supervision of farmers, acquiring agroecology inputs, tools and equipment, distribution of materials to farmers, training of farmers and other stakeholders, coordination of stakeholders and MDAs, etc.	\$ 8 – 10 million	US\$ 0.8 – 1.0million
2031 – 2035 **Scale 2 (prep and scale 1)**	See above	\$11 – 14 million	US\$ 1.65 – 2.1 million

11.5 Implementation Agency (Roles and Responsibilities)

- Lead: Ministry of Agriculture and food security (MAFS) for policy and legal frameworks, governance, technical guidance, visibility.

- Regulator: There are various divisions in the Ministry that can be charged with the responsibility of component.
- Local government and traditional authorities: District/City Councils, Chiefs for community agreements, land access, conflict resolution, enforcement of customary laws.
- Community Institutions/CSOs: Village area land committees, village development committees, farmer associations, cooperatives for on-site engagement with the programme, engage in participatory monitoring
- Academia/Data Partners: Universities/NGOs for MRV (remote sensing, biomass plots, soil carbon).
- Finance Partners: DFIs/donors for grants, results-based payments; private sector for restoration services, involvement in carbon market and largescale production of organic manure.

11.6 Implementation Schedule (2025-2035)

2025 – Q2 2026: Enabling & Baselines: Stakeholder and MDA mapping; community sensitization and agreements; selection of 10,000 farming households; MRV baseline setup (soil-carbon and biomass plots); legal and policy review; establishment of agroecology input supply chains.

Q3 2026 – 2030: Wave 1: Operationalize agroecology practices with 30,000 farmers across 30,000 ha (no-burning, cover crops, organic inputs, sedentary farming); continuous training and distribution of tools; participatory monitoring by village committees and CSOs; MRV annual updates and progress reporting.

2031 – 2035: Wave 2: Expansion to 60,000 farmers across 90,000 ha; integration of agroforestry and large-scale organic input production; strengthen farmer cooperatives for carbon trade; consolidation of MRV data for Enhanced Transparency Framework (ETF) / Biennial Transparency Report (BTR); livelihood diversification (value chains, community enterprises).

11.7 Key Co-benefits

- Climate mitigation and soil health: Avoided emissions through zero-burning; soil-carbon retention via cover cropping, green manuring, and organic inputs; enhanced vegetation cover through sedentary farming.
- Ecosystem restoration: Forest regeneration on freed land; increased biodiversity; improved water regulation and erosion control.
- Livelihoods and resilience: 60,000 households benefit from improved soil fertility, higher yields, and new income sources (organic inputs, agroforestry products, carbon trade opportunities).
- Institutional strengthening and data: Enhanced local governance through land committees and MAFS coordination; improved spatial and MRV datasets (soil carbon, biomass, non-burning areas).

Indicators

- Hectares under agroecology management; hectares not burnt (remote-sensing verification).
- Soil-carbon retention (tCO_2e per ha/yr); vegetation regrowth (sequestration rates).
- Number of farmers trained and adopting practices; community agreements implemented.
- Household income from agroecology and organic inputs; GHG reductions (tCO_2e/yr)

12 Waste Management Organics Diversion

12.1 Detailed Description

This measure is based on the Integrated National Waste Management Strategy (2012–2016). Also, the country's active participation in international conventions on chemicals and waste, such as the Basel, Stockholm, Rotterdam, and Minamata Conventions, means that many of the necessary institutional and legal arrangements are in place and can be reinforced

Recent initiatives such as the Freetown waste management improvements under the C40 network, the GCF-supported tricycle waste collection scheme, and the Waste Wise Koidu pilot supported by UN-Habitat are already demonstrating practical, scalable solutions for waste collection, recycling, and community participation. These efforts, alongside the World Bank's Integrated & Resilient Urban Mobility Project and performance audits by the Audit Service of Sierra Leone, provide a growing evidence base on what works and where systemic gaps persist.

Health care waste management has also improved, with the National Health Care Waste Management Plan (updated during the COVID-19 response) establishing guidelines for segregation, storage, and treatment. Similarly, the UNEP Chemicals and Waste Programme and ongoing National Pollutant Inventory (NPI) work led by EPA are advancing national capacity to manage hazardous waste and track pollutants.

The enabling measures include:

- Update and integrate the national waste management strategy and action plans to reflect new priorities on climate mitigation, circular economy, and pollution prevention.
- Scale up existing pilot initiatives in Freetown, Koidu, and other secondary cities, linking them with climate finance and local development frameworks.
- Strengthen local council capacity for collection, segregation, and data monitoring, building on the lessons from current audits and urban waste assessments.

- Integrate health care and hazardous waste management into national resilience and pollution control strategies.
- Link waste management to climate targets by quantifying emission reductions from improved waste collection, methane capture, recycling, and composting.
- Support public-private partnerships and green enterprise models that build on youth-led collection schemes and promote recycling industries.

Operations will include weighbridges at hubs, routine quality testing of compost, and metered biogas/electricity generation at AD sites. Occupational health and safety (OHS) protocols (PPE, pathogen exposure control) and environmental controls (odor, leachate) are mandatory.

12.2 GHG Abatement (Methodology)

Avoided emissions are primarily methane that would have formed from anaerobic decomposition of organics in unmanaged dumps/landfills. Use national/IPCC factors. For composting, account for minor process emissions; for AD, credit renewable energy displacement.

Indicative calculations (annual):

- Compost pathway: tCO_2e_saved = Tons_organics_composted × (EF_landfill_CH_4_per_ton × GWP_CH_4 × (1 − Capture_rate_baseline)) − Emissions_compost
- AD pathway: tCO_2e_saved = Tons_organics_AD × (EF_landfill_CH_4_per_ton × GWP_CH_4 × (1 − Capture_rate_baseline)) − Emissions_AD − Leakage_CH_4 + (MWh_electricity + MWh_thermal) × Grid/Heat_EF_displaced

Document contamination rates, moisture content, and energy yields; keep QA/QC logs.

12.3 Outcomes & Indicators

Targets for 2030 and 2035 with associated indicators:

Item	2030 Target (Indicators)	2035 Target (Indicators)
Organics diverted	≥60–100 kt/yr diverted from landfill (Ind.: weighbridge; audits)	≥120–180 kt/yr diverted (Ind.: weighbridge; audits)
Processing capacity	2–3 compost hubs (≥20–40 kt/yr total) + 2 AD sites (≥15–25 kt/yr)	4–5 hubs (≥60–90 kt/yr) + 4–5 AD sites (≥40–60 kt/yr)
Product quality & use	≥70% of compost meets Class A spec; ≥60% sold/used (Ind.: lab tests; sales)	≥85% meets Class A; ≥80% sold/used
Energy generation (AD)	≥8–12 GWh/yr electricity/heat (Ind.: meters)	≥20–30 GWh/yr (Ind.: meters)
GHG reductions	≥90–150 $ktCO_2e$/yr avoided (net of process emissions)	≥180–300 $ktCO_2e$/yr avoided

12.4 Financial Needs (Order-of-Magnitude)

Budget includes collection system upgrades (bins, vehicles), compost hubs, AD plants, labs, and outreach. Ranges guide planning.

Phase/Item	Scope	Indicative CAPEX	Indicative OPEX (annual)
2025–2026 (Prep)	Pilots, awareness, procurement, siting & E&S	US$ 1.5–3.0 million	US$ 0.3–0.5 million
Collection & bins (Scale 1)	Two-stream bins; route upgrades; transfer points	US$ 5–10 million	US$ 1.0–1.8 million
Compost hub (Scale 1)	2–4 hubs with pre-processing & QA labs	US$ 6–12 million	US$ 1.5–2.5 million
Anaerobic digestion (Scale 1)	2–5 medium AD plants with CHP/interconnects	US$ 12–25 million	US$ 1.8–3.0 million
2031–2035 (Scale-2)	Network expansion; product market dev.	US$ 8–15 million	US$ 1.5–2.2 million

Financing mix: municipal budgets, user fees, concessional/DFI loans, RBF tied to verified diversion/energy, and carbon revenue where methodologies apply. Procurement can include performance-based O&M contracts.

12.5 Implementation Agency (Roles & Responsibilities)

- Lead: Ministry of Local Government/Decentralization Secretariat for collection, facilities, outreach.
- Environment/Regulator: EPA-SL for E&S approvals, monitoring.
- Standards/Labs: Standards Bureau/Universities for compost specs and QA.
- Private Sector/NGOs: Facility operation under PPP/O&M contracts; Traditional Leaders and community engagement.
- Utilities: EDSA for interconnection for AD CHP where applicable.
- Finance Partners: MFIs/DFIs for equipment finance; RBF administration.

Governance includes a city-level waste steering committee and facility performance dashboards.

12.6 Implementation Schedule (2025–2035)

2025–Q2 2026: Enabling & pilots for two-stream pilots at markets; siting/E&S for hubs/AD; procurement; awareness.

Q3 2026–2028: Wave 1 for commission 1–2 compost hubs and 1–2 AD sites; two-stream roll-out to priority wards.

2028–2030: Wave 2 to expand to 2–3 hubs and 2 AD sites; product market development; MRV verification.

2031–2035: Scale-up for 4–5 hubs and 4–5 AD sites; optimize logistics; continuous ETF/BTR reporting.

12.7 Key co-benefits

- Public health & safety: fewer landfill fires/odours; better vector control.
- Municipal finance & jobs: tipping-fee recovery; recycling/compost enterprises.
- Food systems and agriculture: compost improves soil organic matter; reduced synthetic fertilizer needs.
- Energy access: LFG-to-energy (where viable) adds firm power.

Indicators

- CH_4 flow & destruction hours (SCADA); # fire incidents/year.
- Tonnes diverted to recycling/compost; formal jobs created (incl. former pickers integrated).
- Compost produced/sold; soil OM (%) in pilot farms; fertilizer spend reduction.
- LFG electricity (MWh) exported; revenue collected vs OPEX.

13 Landfill Methane Management

13.1 Detailed Description

The Resilient Urban Sierra Leone Project and related World Bank assessments have already identified the need for better-engineered landfill sites and incorporated design elements that could enable future methane capture. The Infinitum Waste-to-Energy Project proposed for Freetown also presents a major opportunity for methane mitigation through energy recovery from waste, complementing Sierra Leone's broader climate and energy transition goals.

At the same time, the BUR and earlier NDC submissions already recognise methane emissions from the waste sector, setting an important precedent for integrating waste-sector mitigation into national climate targets. Projects such as The Waste Transformers' organic waste conversion system at hospitals and markets in Freetown show that decentralised waste-to-energy solutions are feasible and can reduce the organic fraction that drives landfill methane emissions.

This measure proposes to upgrade existing dumps/landfills to engineered cells with daily cover, stormwater/leachate control, weighbridge, and landfill gas (LFG) collection. Phase 1 installs passive vents and surface emissions monitoring; Phase 2 adds vertical wells and horizontal collectors with a flare station; Phase 3 enables energy recovery (gensets or pipeline) subject to gas yield. Fire control, access control, and waste compaction will be enforced to reduce fugitive emissions and improve site safety.

The gas system will include blowers, enclosed flares, condensate management, and SCADA for flow and methane fraction. Periodic surface scans (OGI/flux box) will verify performance. Site operations will maintain intermediate cover and segregate incoming waste to protect gas infrastructure.

Enabling measures will include:

- Integrate methane management explicitly within the waste and energy pillars, linking waste-to-energy projects with national mitigation targets.

- Encourage public-private partnerships to scale up waste-to-energy and biogas initiatives, leveraging lessons from Infinitum Energy and similar models.
- Incentivise organic waste diversion through composting, recycling, and decentralised anaerobic digestion to reduce landfill methane generation at source.
- Develop an strategy to addresses EV battery management, drawing directly from the recommendations in the document: *Supporting Sierra Leone with the Shift to Electric Mobility* from a GEF funded project and available at EPA-SL

13.2 GHG Abatement (Methodology)

Emissions reductions are from captured methane that is flared or used for energy. Use an IPCC-consistent first-order decay (FOD) model for LFG generation, and meter actual gas capture where available.

Indicative calculations (annual):

- CH_4_captured (t) = (Q_LFG × CH_4_fraction × density_CH_4 × Hours) / 1,000
- tCO_2e_saved = (CH_4_captured × (1 − Oxidation_factor) × GWP_CH_4) − Emissions_flare/engine
- If electricity generated: add (MWh × Grid_EF) displacement credit

Track fires/year and surface methane flux as performance co-indicators.

13.3 Outcomes & Indicators

Targets for 2030 and 2035 with associated indicators:

Item	2030 Target (Indicators)	2035 Target (Indicators)
Engineered landfill cells	1 primary cell with daily cover, drainage, and weighbridge (Ind.: construction records; audits)	3 cells cumulative; maintained intermediate cover (Ind.: audits)
LFG system & flaring	Wellfield + enclosed flare operational; 50–90 Nm^3/h CH_4 average (Ind.: SCADA logs)	Expanded wellfield; 120–200 Nm^3/h CH_4 (Ind.: SCADA)
Energy recovery	Feasibility complete; pilot 0.5–1.5 MW if yields allow (Ind.: commissioning records)	1.5–3 MW cumulative (Ind.: generation meters)
GHG reductions	≥40–80 $ktCO_2e$/yr avoided (net of flare/engine emissions)	≥90–160 $ktCO_2e$/yr avoided

13.4 Financial Needs (Order-of-Magnitude)

Budget covers cell construction, gas collection/flaring, weighbridge, OHS, and monitoring systems.

Phase/Item	Scope	Indicative CAPEX	Indicative OPEX (annual)
2025–2026 (Prep)	Designs, E&S, procurement, staff training	US$ 1.0–2.0 million	US$ 0.2–0.4 million
Engineered cells **(Scale 1)**	Cell construction, compaction, daily/intermediate cover, drainage	US$ 8–15 million	US$ 1.0–1.8 million

LFG system & flare **(Scale 1)**	Wells, headers, blowers, enclosed flare, SCADA, condensate	US$ 3–6 million	US$ 0.6–1.0 million
2031–2035 (Scale-2)	Wellfield expansion; engine upgrades	US$ 3–6 million	US$ 0.5–0.8 million
Energy recovery (option)	0.5–3 MW engines, interconnection	US$ 2–8 million	US$ 0.4–1.0 million

Financing mix: municipal budgets, landfill tipping fees, concessional/DFI loans, carbon finance for verified methane destruction, and PPPs for energy recovery.

13.5 Implementation Agency (Roles & Responsibilities)

- Lead: Ministry of Local Government/Decentralization Secretariat
- Environment: EPA-SL for approvals and monitoring; methane verification protocols.
- Engineering: Public works & contractors to design/build of cells and gas systems.
- Utility/Energy: EDSA for interconnection for power recovery.
- Safety/Standards: Fire Service & Standards Bureau for safety protocols, flare/engine standards.
- Finance Partners: DFIs/carbon funds for capital and results-based payments.

A landfill management plan and O&M manual will define roles, safety, and performance KPIs.

13.6 Implementation Schedule (2025–2035)

2025–Q2 2026: Designs, E&S approvals, procurement, initial passive vents; weighbridge installation.

Q3 2026–2028: Construct first engineered cell; install active wellfield and enclosed flare; establish SCADA and monitoring.

2028–2030: Expand wellfield; evaluate/commission energy recovery if yields allow; full operations manualization.

2031–2035: Add cells; expand gas capture and generation; continuous MRV for ETF/BTR reporting.

13.7 Key co-benefits

- Public health & safety: fewer landfill fires/odours; better vector control.
- Municipal finance & jobs: tipping-fee recovery; recycling/compost enterprises.
- Agriculture: compost improves soil organic matter; reduced synthetic fertilizer needs.
- Energy access: LFG-to-energy (where viable) adds firm power.

Indicators

- CH_4 flow & destruction hours (SCADA); # fire incidents/year.
- Tonnes diverted to recycling/compost; formal jobs created (incl. former pickers integrated).
- Compost produced/sold; soil OM (%) in pilot farms; fertilizer spend reduction.
- LFG electricity (MWh) exported; revenue collected vs OPEX.

14 Cross-Cutting — ETF/MRV System Strengthening

14.1 Detailed Description

This measure establishes and operationalizes a **national Enhanced Transparency Framework (ETF) and MRV system** to generate timely, high-quality data for mitigation planning, tracking, and reporting. It creates a legally-mandated governance structure; standardized MRV protocols for all emitting sectors (Energy, Transport, Waste, IPPU, AFOLU); a digital **Climate Data & MRV Platform** for data intake, QA/QC, calculation, and reporting; and a **Mitigation Outcomes & Article 6 Registry** to avoid double counting and enable results-based finance. The system covers: (i) **GHG inventory** production (IPCC-aligned, with Tier upgrades where feasible), (ii) **mitigation action tracking** with unique IDs, baselines, and monitoring plans, (iii) **finance tracking** (tagging public/external climate finance against actions), and (iv) **KPI dashboards** for decision-makers. It embeds **data-sharing MoUs** with line ministries, utilities, regulators, local councils, and private operators, and builds a professional **MRV cadre** (sector focal points, data engineers, inventory compilers, verifiers). Outputs feed **BTRs**, **NDC stocktakes**, and domestic policy cycles.

14.2 GHG Abatement

Nature: Enabling (systemic) measure. It does not generate standalone tCO_2e reductions to be counted separately; instead it **improves accuracy, completeness, and timeliness** of sector reductions and unlocks verified, saleable mitigation outcomes (Article 6 / results-based programs).

How it supports abatement:

- Raises **policy effectiveness** (e.g., targeting tariffs, standards, and subsidies with real-time evidence).
- Increases **credit-readiness**, enabling monetization of verified outcomes while preventing double counting.
- Reduces **leakage and over/under-estimation** through QA/QC and consistent emission factor (EF) management.
- To avoid double counting, all tCO_2e gains attributable to better implementation are reported under the respective sector measures, with the ETF/MRV system credited through **process indicators** (below).

14.3 Outcomes & Indicators (2030 and 2035)

Outcome Area	2030 Target & Indicators	2035 Target & Indicators
BTR & Inventory Timeliness	BTRs delivered on-time; national inventory compiled annually; publication ≤ 6 months after year-end.	Continuous annual inventories; publication ≤ 4 months after year-end.
Coverage & Consistency	100% of emitting sectors with signed data-sharing MoUs; ≥90% of key activity datasets (energy balance, fuel sales, vehicle stock, solid waste tonnage, cement/clinker, land-use change) reported annually using standard templates.	≥95% key datasets via APIs/automated feeds; full time-series consistency maintained.
Data Quality (QA/QC)	Documented QA/QC plans for all sectors; EF Registry maintained; ≥2 sectors upgraded to Tier 2 parameters.	≥4 sectors at Tier 2; independent QC reviews completed biennially.
Mitigation Action Tracking	Registry live with unique IDs; ≥50 priority actions tracked with baselines, MP&MR plans, and SDG co-benefit fields.	≥120 actions tracked; action-level verification summaries published annually.
Article 6 Readiness	Authorization procedure & corresponding adjustment rules approved; registry able to flag first transfer and vintage.	≥3 programs authorized; adjustments reported in BTRs; public dashboard for issuance/transfer logs.

Capacity & Retention	40 staff certified (inventory, MRV, data engineering); ≥80% 2-year retention.	70 staff certified; ≥85% retention; partnerships with two universities for MRV curricula.

14.4 Sector Data & Responsibilities (examples)

Sector	Key Activity Data	Primary Owner(s)	Frequency	Notes
Energy	Fuel imports/sales, generation mix, grid losses	Energy Ministry/Regulator, Utilities, Customs	Monthly→Annual	API from utility SCADA where feasible
Transport	Fuel sales by type, vehicle registrations/age, VKT sampling	Transport Ministry, Revenue/DMV, Oil Marketing Cos.	Quarterly→Annual	Add odometer/VKT surveys on sample routes
Waste	MSW tonnage, composition, landfill gas & flaring logs	Local Councils/Operators, EPA	Monthly→Annual	Weighbridge + SCADA for flares/gensets
IPPU	Cement/clinker, lime, ammonia, solvents	Industry Min., Stat SL, Firms	Quarterly→Annual	Site-level templates with confidentiality flags
AFOLU	Land-use change, forestry removals, fire, fertilizer	Forestry/Agri Min., EPA, Remote Sensing Unit	Annual	Land-use maps + ground truthing protocols

14.5 Financial Needs (indicative)

Cost Item	2025–2030	2031–2035	Notes
Legal & Governance (Statutory Instrument, MRV policy, MoUs)	$0.6–0.9 m	$0.2–0.3 m	Drafting, consultation, promulgation, refresh
Digital Platform (design, build, hosting, cybersecurity)	$1.8–3.0 m	$1.2–1.8 m	Data warehouse, APIs, registry, dashboards
Equipment & Data (meters, weighbridges support, survey kits, RS imagery)	$1.5–2.2 m	$0.9–1.3 m	Includes SCADA interfaces, tablets, QA kits
Capacity & TA (training, certifications, twinning, audits)	$1.2–1.8 m	$0.8–1.2 m	Inventory/MRV, Article 6, data engineering
Operations (M&E, hosting, licenses, helpdesk)	$0.7–1.0 m/yr	$0.8–1.1 m/yr	Includes independent verification reviews
Total (order-of-magnitude)	**$8–12 m**	**$5–8 m**	Blend of domestic + donor/readiness funds

Potential finance sources: national budget lines (MoECC/EPA/Stats SL), development partners (GEF, GCF Readiness/Capacity, NDC Partnership, EU/UK/ Germany, UNDP/FAO), and program-linked verification windows (results-based finance, Article 6 fees).

14.6 Implementation Agency

- Lead Policy Owner: MoECC (ETF policy, Article 6 authorization, international reporting).
- Technical Lead: EPA-SL (inventory compilation, EF registry, QA/QC, MRV protocols).
- Statistics Sierra Leone (Stats SL): data standards, surveys, data quality assurance.
- Sector Focal Points: Energy Ministry & regulator; Transport Ministry & vehicle registry; Local Councils & Waste operators; Industry/Trade for IPPU; Forestry/Agri for AFOLU.
- Digital Delivery Partner: Government IT agency or contracted systems integrator (cloud hosting, APIs, cybersecurity).
- Independent Reviewers/Verifiers: accredited national auditors/universities with periodic external peer review.
- Finance & Legal: Ministry of Finance (budget tagging); Attorney-General's office (statutory instrument).

14.7 Implementation Schedule (2025–2035)

Phase 1 — Legal & Design (Q4-2025 to Q2-2026). Adopt ETF/MRV policy and Statutory Instrument; constitute National MRV Steering Committee; sign data-sharing MoUs; draft sector MRV protocols; design platform architecture and Article 6 authorization workflow.

Phase 2 — Build & Pilot (Q3-2026 to Q2-2027). Develop data warehouse/APIs, EF Registry, mitigation registry; pilot in Energy, Waste, Transport; run first QA/QC cycle; produce an annual inventory and a BTR-ready mock.

Phase 3 — Scale-Up (Q3-2027 to 2030). Roll out to IPPU/AFOLU; integrate remote sensing and weighbridge/SCADA feeds; operationalize Article 6 registry functions (authorization, first transfer, adjustments); publish open dashboards.

Phase 4 — Consolidation & Automation (2031–2035). Tier upgrades, full API automation, biennial independent QC reviews; embed MRV curricula at two universities; routine BTR submissions and annual inventories within 4–6 months after year-end.

14.8 MRV Architecture & Quality Controls

- Data Pipeline: Standard CSV/API templates → automated validation → EF application → sector calculators → inventory compiler → BTR modules.
- EF Registry: central, version-controlled emission factors (country-specific where available), with change logs and recalculation rules.
- QA/QC: documented procedures (completeness checks, outlier detection, uncertainty analysis), audit trails, and reproducible code.
- Mitigation Registry: unique action IDs; baseline, MP&MR plan, verification notes, SDG co-benefits; Article 6 flags (authorization, ITMO vintage, CA status).
- Transparency: open data by default with confidentiality flags; grievance redress and data-correction workflows.

14.9 Risks & Mitigations

- Data gaps/fragmentation: mitigate with binding MoUs, minimum-dataset definitions, and automated checks.
- Staff turnover: establish career pathways, retention incentives, and university pipelines.
- IT continuity/cybersecurity: cloud backups, role-based access, annual penetration tests.
- Financing variability: phase budgets, bundle readiness/training with sector programs, earmark a % of RBF/Article 6 revenues to MRV O&M.

14.10 Key co-benefits

- Governance & transparency: faster inventories; open data builds trust.
- Finance access: readiness for Article 6/results-based climate finance.
- Capability building: permanent analyst/inspector jobs; university partnerships.
- Policy effectiveness: better targeting of subsidies/tariffs; evidence-based revisions.

Indicators

- Time to produce inventory/BTR; % sectors with QA/QC protocols implemented.
- $ climate finance unlocked; # Article 6-ready methodologies/authorizations issued.
- staff trained/certified; MoUs with universities; retention rates.
- Policy cycle time from data insight to approved adjustment (months).

15 Policy Measures

15.1 Resilient, Low-Carbon Mining

Detailed Description

This is anchored anchored in existing national efforts. Sierra Leone already has policy foundations for resilient, low-carbon mining through the Mines and Minerals Development Act (2022) and the Energy Transition and Green Growth Plan, which promote environmental safeguards and renewable integration in the sector.

It proposed the consolidation and scaling of existing policies and pilots into a national low-carbon mining framework, establish a national program to make Sierra Leone's mining operations both **climate-resilient** and **low-carbon**. The policy mandates climate-risk screening and adaptation plans for all large/medium mines; requires energy and water efficiency measures; promotes **renewable hybrid power (PV+storage/wind)** to displace diesel; incentivizes **electrification** of mine services and material movement (conveyors over haulage where feasible, electric pit auxiliaries, shore-power at processing plants), and sets standards for **tailings safety, stormwater management, and heat/flood resilience**. Mines must publish annual **Scope 1–2** emissions and progress against intensity targets (tCO_2e per tonne processed), alongside water stress indicators.

Policy Instruments

- Regulation: Climate-risk assessments & energy audits as a license condition; annual disclosure of energy/emissions.
- Incentives: Import duty/VAT relief for RE, storage, high-efficiency motors/VFDs; accelerated depreciation (3–4 years) for low-carbon equipment.
- Procurement/Permitting: "Renewable-first" power plans in ESIAs; conveyor/rail preference where feasible.
- Finance: Green credit lines and results-based grants per verified diesel-to-RE MWh; partial risk guarantees for mine-site IPPs.
- Standards: ISO 50001 energy management encouraged; tailings safety per global best practice; spill prevention plans.

Implementation Agency

Lead: Ministry of Mines & Mineral Resources (MMMR) and National Minerals Agency (NMA). Co-leads: MoE (Energy), EPA-SL, EDSA/EGTC.

15.2 Fossil-to-Low-Carbon Transition — Manufacturing Sector

Detailed Description

This measure is anchored in Sierra Leone's existing industrial and energy efficiency frameworks, including the new National Energy Efficiency Policy and the National Energy Efficiency Action Plan (NEEAP, 2015). These already prioritise energy management systems, efficient motors, and clean thermal energy.

A sector program to cut fossil fuel use in industry via energy efficiency, fuel switching, and electrification of heat/power. Priorities: ISO 50001 energy management; high-efficiency motors and VFDs; compressed-air optimization; waste-heat recovery; hybrid PV-battery to replace diesel backup; solar thermal for low-temperature processes; electric boilers/heat pumps/induction where grid or on-site RE supports it; and modern, clean fuel boilers (e.g., LPG or verified biomass residues with emissions controls) where electrification is not yet viable.

Policy Instruments

- Minimum Energy Performance Standards (MEPS) for motors, boilers, and compressors.
- Tax & Tariff: Duty/VAT relief for EE/RE equipment; clear net-metering rules; time-of-use tariffs to reward load shifting.
- Finance: Performance-based grants/loans (e.g., \$/tCO_2e reduced, \$/MWh saved) with IPMVP-aligned M&V; partial guarantees for ESCOs.
- Standards & Skills: ISO 50001 road-map, auditor training, vendor accreditation.
- Information: Audit vouchers for SMEs; public dashboards of aggregated progress.

Implementation Agency

Lead: **Ministry of Trade & Industry** and **MoE**; partners: **EPA-SL**, **Standards Bureau**, **SLIEPA**, Chambers/associations.

15.3 Fossil-to-Low-Carbon Transition — Mining Sector (Energy)

Detailed Description

ABM: This section aligns well with Sierra Leone’s Energy Transition and Green Growth Plan and the Mines and Minerals Development Act (2022), which already encourage renewable integration in mining.

A focused sub-program for mines to **replace diesel** with **renewables and electrification** in power and mobile equipment. Components: site-specific **hybrid power plants** (PV/wind + storage + efficient gensets); **electric or trolley-assist haulage** where terrain permits; **conveyor/rail over truck** for bulk movement; **shore-power** for crushers/mills; and **advanced fuel management** (anti-idling, dispatch optimization, low-rolling-resistance tires).

Policy/Instruments

- License addenda requiring an Energy Transition Plan with milestones.
- RE/storage duty relief; accelerated depreciation; concessional IPP financing.
- Logistics planning preference for conveyor/rail easements in new ESIAs.
- Publishing of a mine energy/emissions league table (transparency).

Implementation Agency

MMMR/NMA with **MoE**, **EPA-SL**, **EDSA/EGTC**.

15.4 Critical Minerals Strategy (for the Energy Transition)

Detailed Description

This measure build on the 2022 Mines and Minerals Development Act and emerging governance and transparency frameworks under the Extractive Industries Transparency Initiative (EITI) and UNDP's Mining Governance Programme.

A national strategy to position Sierra Leone as a responsible supplier of **critical minerals** for global low-carbon technologies, while maximizing domestic value-addition and minimizing environmental harm. The strategy delivers: (i) **geoscience & market mapping** of priority minerals; (ii) clear, transparent **permitting & ESG** standards aligned with international best practice; (iii) **value-addition policy** (beneficiation where viable, renewable power for processing, skills & industrial parks); (iv) **responsible-sourcing & traceability**; and (v) a public **Critical Minerals Dashboard** tracking production, ESG performance, local content, and revenue transparency.

The strategy would link to renewable-powered beneficiation zones, the Energy Transition and Green Growth Plan, and national efforts to develop industrial parks and local value chains. This would turn the proposal from a policy aspiration into a practical roadmap for responsible and climate-smart mineral development.

Note: The strategy prioritizes minerals based on robust geological data, market demand, ESG risk, infrastructure feasibility, and fiscal returns—without pre-judging specific deposits.

Policy Instruments

- Policy/Legal: Critical Minerals Policy & Guideline; streamlined permitting with clear ESG requirements; land-use coordination for infrastructure.
- Finance/Industry: Industrial park(s) with RE supply; investment facilitation; training pipelines with universities/TVET.
- Traceability: Digital chain-of-custody; mine-to-market reporting; grievance redress.
- Transparency: EITI-aligned contract and revenue disclosure; public dashboard.

Implementation Agency

Lead: **MMMR/NMA**; partners: **MoE**, **MoT&I**, **EPA-SL**, **SLIEPA**, **Stats SL**, Universities/TVET.

15.5 Treatment of Liquid Waste in the IPPU Sector

Detailed Description

A national policy requiring high-strength industrial wastewater producers (e.g., beverages, food processing, tanneries, pulp/paper, chemicals, abattoirs) to capture and treat organics to reduce CH_4/N_2O and improve water quality. The measure mandates pre-treatment, anaerobic digestion (UASB/covered lagoons) with biogas capture and energy use (boilers/CHP) or compliant flaring, followed by aerobic polishing (nitrification/denitrification) to control N_2O and meet effluent standards. Includes sludge handling, odor control, and monitoring.

It should contextualised within Sierra Leone's existing Environmental Protection Regulations, Industrial Pollution Management Framework, and ongoing UNIDO/UNDP-supported cleaner production initiatives.

Policy Instruments

- **Regulation:** Effluent standards with **COD/N load triggers** requiring anaerobic capture; mandatory covered lagoons/UASB for high-strength streams; flare/CHP performance standards.
- **Economic:** Duty relief for digesters, CHP, gas treatment; RBF per verified tCO_2e avoided and kWh generated; concessional loans/guarantees.
- **Compliance & Support:** Technical assistance facility; standardized design templates; phased compliance timelines; penalties for chronic non-compliance.

Implementation Agency

Lead: **EPA-SL** and **MoECC** (standards & MRV) with **Local Councils** (permits), **MoE** (grid interconnection where applicable), **Standards Bureau**.


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