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Overcoming Energy Poverty: The Role of Sierra Leone's Legal System in

Advancing Renewable Energy Solutions

Area of Law: Renewable Energy Law

Abstract

Sierra Leone faces significant energy poverty, with only 27.5% of its population having access to electricity, while rural areas lag even further at 4.9%. The heavy reliance on imported fossil fuels and biomass wood exacerbates economic strain, environmental degradation, and social inequalities. This paper argues that Sierra Leone's legal system can accelerate renewable energy adaptation to enhance energy sovereignty by expanding rural electrification, reducing tariff costs, and mitigating climate change. The study examines the country's renewable energy potential, including hydropower, solar, and bioenergy, and analyzes the fragmented legal and policy frameworks governing the sector. Challenges such as high initial costs, reliability issues, and technological gaps are explored, alongside lessons from Bangladesh's successful off-grid solar initiatives. Recommendations include enacting a dedicated Renewable Energy Act, establishing public-private partnerships, and leveraging international climate finance. By addressing these barriers, Sierra Leone can achieve its goals of 85% renewable energy capacity by 20230, fostering sustainable development and energy independence.

Keywords – Energy Poverty; Renewable Energy Law; Off-grid Solar; Energy Sovereignty;

Sierra Leone

Introduction

Sierra Leone's poor energy security hinders its efforts to advance from the ranks of the least developed countries.¹ The country's electricity production ranks 171 out of 190 countries globally.² Its total energy capacity is less than 150 MW, with only 27.5% of its 7.5 million population having access to electricity, and the percentage in rural areas is just 4.9%.³ However, 60% of the population lives in rural areas.⁴ Despite being significantly lower than demand, the electricity supply remains relatively expensive compared to other countries in the sub-region.⁵ Imported fossil fuel products used for power generation account for 18%, while a large portion of the population continues to rely on fuelwood biomass, which constitutes 80% of the market's energy consumption.⁶

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¹ Alphaeus Koroma and Wang Rongcheng, The Challenges of Energy Supply for Sierra Leone's Economic Development, *Journal of Economics and International* Vol. 1(7) (2009).

² The Global Economy.Com, Electricity production capacity - Country rankings (Mar. 4, 2025, 4:50 PM) https://www.theglobaleconomy.com/rankings/electricity_production_capacity/.

³ Department of Commerce United States, Sierra Leone Country Commercial Guide: Energy Infrastructure (Mar. 2, 2025, at 4:23 ET) <https://www.trade.gov/country-commercial-guides/sierra-leone-energy-infrastructure>; Statistics Sierra Leone, 2021 Mid-Term Population and Housing Census (Apr. 2, 2025, at 4:56 ET) <https://www.statistics.sl/index.php/census/mid-term-population-census.html>.

⁴ Statistic Sierra Leone, 2021 Mid-Term Population and Housing Census (2021).

⁵ Lucas Davies, Prospects for Energy Efficiency in Sierra Leone's Power Sector (Mar. 30, 2025, 2:30 ET) <https://www.energyeconomicgrowth.org/publication/working-paper-prospects-energy-efficiency-sierra-leones-power-sector>.

⁶ Ministry of Energy – Republic of Sierra Leone, SDG7 Cleaner Cooking Energy Compact of Sierra Leone (2021) (Mar. 23, 2025, at 7:30 ET) https://www.un.org/sites/un2.un.org/files/2021/09/energy_compact_for_sierra_leone.pdf.

These statistics illustrate the profound impacts of the nation's energy poverty across all areas of its establishment. The government's heavy reliance on fossil fuels for electricity, combined with substantial burdens from electricity-related subsidies, places pressure on the national budget.⁷

Resources that could be allocated to other sectors hinder agricultural potential, thereby stifling economic growth, undermining educational opportunities, worsening health crises, and contributing to environmental harm.⁸ Population growth, extreme poverty, high electricity costs, considerable public debt in relation to low domestic revenue, and limited private investment intensify these issues.

Addressing the issue of poor energy security is crucial for Sierra Leone to achieve middle-income status by 2039.⁹ Rebuilding the state's energy security after its eleven-year civil war, which ended in 2002 and devastated every aspect of the country's infrastructure, has been a formidable task. Steps have been taken in developmental reforms to enhance energy governance and regulation, aiming to attract public and private sector investment in the industry.¹⁰ However, progress has been slower than intended, as the nation's abundant renewable energy resources remain untapped.

The paper argues that Sierra Leone's legal system can accelerate renewable solutions through legislation, regulations, and policy because renewable energy will enhance the country's

⁷ Franklin Bendu, A Case for Removing Subsidy on Petroleum in Sierra Leone, Politico SL (Mar. 23, 2025 at 3:12 ET) <https://www.politicosl.com/articles/case-removing-subsidy-petroleum-products-sierra-leone>.

⁸ IMF-E Library, Sierra Leone: Technical Assistance Report-Climate Policy Diagnostic (Apr. 23, 2025, at 12: 21 ET) <https://www.elibrary.imf.org/view/journals/019/2024/105/article-A001-en.xml#:~:text=The%20agriculture%20and%20forestry%20sectors,agriculture%2C%20urbanization%2C%20and%20logging..>

⁹ *Id.*

¹⁰ Herbert Smith Freehills, Energy, Investing in Sierra Leone (Mar. 12, 2025, 1:34 ET) <https://www.investinginsierraleone.com/energy/>.

energy security and sovereign independence by reducing reliance on global crude oil geopolitics. It also claims that producing and distributing renewable energy will be more cost-effective for the state than fossil fuel energy. Furthermore, the paper asserts that renewable energy will improve access to electricity for rural communities that often struggle to connect to the national grid due to inadequate road infrastructure and the isolation of their villages and towns. Moreover, the paper contends that renewable energy will support the state's vision of a healthy environment and assist in the battle against climate change, which aligns with the state's efforts to fulfill its Nationally Determined Contributions under the Paris Agreement.

To achieve this aim, the paper is divided into five sections. Part one provides a comprehensive overview of the prospects and challenges of renewable energy in Sierra Leone, examining various types, including solar energy, hydropower, wind energy, biomass, and bioenergy. Part two addresses the legal framework that governs renewable energy. Part three presents the argument for renewable energy: energy sovereignty, cost-effectiveness, rural electrification, and environmental benefits. Part four examines renewable energy's challenges: high initial costs, reliability issues, and technological and maintenance. Part five presents a case study on Bangladesh's success in this area and concludes with recommendations.

Part 1: Overview of The Prospects and Challenges of Renewable Energy in Sierra Leone, Examining Various Types, Including Solar Power, Hydropower, Wind Energy, And Biomass Bioenergy

The paper begins this section with an ambitious policy statement from the Government of Sierra Leone regarding its vision for renewable energy: 'Increasing renewable energy capacity is

central to the government's energy, climate, and development plans, with a target to achieve 85 percent renewable energy capacity by 2030.¹¹

Sierra Leone's renewable energy potential, which encompasses a combination of hydropower, solar, bioenergy, wind, and biomass, shows promise for addressing its energy deficiency and creating opportunities for electricity export.¹² According to the Renewable Energy Statistics 2023 by IRENA, the country's current total renewable energy capacity is 116 MW, of which 53% is hydroelectric, 18% is solar, and 28% is bioenergy.¹³

Hydroelectric energy is the primary one due to the extensive network of rivers and tributaries that conservatively provide a hydroelectric power potential estimated at 1,200 MW.¹⁴ The latest and more ambitious estimate, a 2013 UNIDO study, covers 300 potential sources and estimates the figures at 5,000 MW.¹⁵ This study was preceded by a 1996 study by the German Bundesministerium für Wirtschaft und Energie, which estimated the capacity at 2,000 MW based on 27 potential hydro sources.¹⁶

The Bumbuna Hydro plant is the largest hydropower facility in the Tonkolili District, located in the northern part of the country. It generates 50 MW during the rainy season and 8 MW

¹¹ Sustainable Energy for All, Country work - Sierra Leone (Apr. 2, 2025, 2:23 ET) <https://www.seforall.org/our-work/country-engagement/country-work-sierra-leone#:~:text=Sierra%20Leone's%20energy%20transition,sector's%20development%20is%20equally%20important>.

¹² Department of Commerce United States, Sierra Leone Country Commercial Guide: Energy Infrastructure (Mar. 2, 2025, at 4:23 ET) <https://www.trade.gov/country-commercial-guides/sierra-leone-energy-infrastructure>; Statistic Sierra Leone, 2021 Mid-Term Population and Housing Census (Apr. 2, 2025, at 4:56 ET) <https://www.statistics.sl/index.php/census/mid-term-population-census.html>.

¹³ INTERNATIONAL RENEWABLE ENERGY AGENCY: INTERNATIONAL RENEWABLE STATISTICS (2023).

¹⁴ GLOBAL ENERGY ALLIANCE FOR PEOPLE AND PLANET, COUNTRY PROFILE: SIERRA LEONE (2022).

¹⁵ Energypedia, Sierra Leone Energy Situation (Mar. 12, 2025, 2:21 ET) https://energypedia.info/wiki/Sierra_Leone_Energy_Situation.

¹⁶ *Id.*

in the dry season.¹⁷ The facility features a 161 kV transmission line that stretches 250km between Bumbuna and the capital, Freetown. Ninety percent of the power produced by the Bumbuna hydroelectric dam serves Freetown.¹⁸ Meanwhile, the city of Makeni, located in the north along the transmission line, receives power from the shield wires.¹⁹ It is important to note that the conception of the project began in 1975. By May 1997, 85% of the construction was complete, but work paused during the country's civil war. Construction resumed in 2005 and was completed in 2009.²⁰ Funding for the Bumbuna project came from the government of Sierra Leone and various development partners, including the World Bank, the African Development Bank, the Italian Government, and OPEC, totaling 327 million dollars.²¹ It is important to note that part of the vast hydropower potential mentioned earlier is the Bumbuna Phase II Project, which, if completed, will generate 350 MW and is estimated to cost 750 million US dollars.²²

Additionally, there are two other smaller hydropower plants: Bankasoka and Charlotte. The Bankasoka hydro dam, located in Port Loko in the northern part of the country, produces about 2 MW at a cost of 60 million United States dollars and began operating in 2017.²³ This project supplies electricity to 30,000 households in a township of approximately 40,000 residents.²⁴ It was

¹⁷ Energy Monitor, Bumbuna Hydroelectric Power Station, Tonkolili District (Mar. 3, 2025, 3:12 ET) <https://www.energymonitor.ai/projects/bumbuna-hydroelectric-power-station-tonkolili-district/?cf-view>.

¹⁸ Foday Conteh ET. AL, Long-Term Forecast of Sierra Leone's Energy Supply and Demand (2019–2040): A LEAP Model Application for Sustainable Power Generation System (Apr. 12, 2025, 3:34 ET) <https://www.mdpi.com/2071-1050/15/15/11838>.

¹⁹ Lucas Davies, Prospects for Energy Efficiency in Sierra Leone's Power Sector, Energy and Economics: Applied Research Program (Mar. 30, 2025, 2:30 ET) <https://www.energyeconomicgrowth.org/publication/working-paper-prospects-energy-efficiency-sierra-leones-power-sector>.

²⁰ *Id.*

²¹ *Id.*

²² *Id.*

²³ Herbert Smith Freehills, Energy, Investing in Sierra Leone (Mar. 12, 2025, 1:34 ET) <https://www.investinginsierraleone.com/energy/>.

²⁴ The President's Recovery Priority, Energy Minister Launches Port Loko Power Transmission and Distribution Project, State House (Mar. 23, 2025 at 5:23 ET) <https://www.presidentsrecoverypriorities.gov.sl/single-post/2017/01/31/energy-minister-launches-port-loko-power-transmission-and-distribution-project-2>.

funded by the Government of China and the UN Industrial Development Organization.²⁵ The Charlotte Dam is a 2.2 MW hydroelectric facility in the capital city's rural western region. Completed in 2016, it received funding from the Chinese government at a cost of 9.7 million US dollars.²⁶ However, all these sources experience variations in water flow rates between the wet and dry seasons, consequently limiting their overall output.²⁷

Evidently, the total combined hydroelectricity of less than 60 MW at their peak of operations underscores a mishap between the country's hydropower energy potential and its output.

Bioenergy is the second-largest renewable energy source. However, like other sources, its potential has not been fully harnessed.²⁸ According to the IRENA Report, the country has a gas capacity of 33 MW.²⁹ Currently, Sunbird Bioenergy Sierra Leone, an integrated agricultural estate and renewable energy company located in Mabilifu, Bombali District, Northern Province, produces bioethanol (biofuel), potable alcohols (ENA), and renewable power from sugarcane and cassava: 85 million liters of renewable fuel, 10 million liters of potable ethanol products, and 275 GWh of renewable power.³⁰

²⁵ Herbert Smith Freehills, Energy, Investing in Sierra Leone (Mar. 12, 2025, 1:34 ET) <https://www.investinginsierraleone.com/energy/>.

²⁶ Energy Catalyst, Country Guide: Sierra Leone (Mar. 23, 2025, 2:32 ET) <https://energycatalyst.ukri.org/wp-content/uploads/2020/12/Country-guide-Sierra-Leone.pdf>.

²⁷ Energypedia, Sierra Leone Energy Situation (Mar. 12, 2025, 2:21 ET) https://energypedia.info/wiki/Sierra_Leone_Energy_Situation.

²⁸ INTERNATIONAL RENEWABLE ENERGY AGENCY: INTERNATIONAL RENEWABLE STATISTICS (2023).

²⁹ *Id.*

³⁰ Sunbird Bioenergy Sierra Leone, An integrated agricultural estate and renewable energy company located in Mabilifu, Bombali District, Northern Province (Mar. 23, 2025, at 4:23 ET) <https://www.sunbirdbioenergy.com/sierra-leone-bioenergy>.

Solar is the next major renewable energy source.³¹ Research conducted in this area reveals that the country enjoys 187 hours of sunlight annually, translating to approximately 5 hours and 59 minutes of sunlight per day, with sunny conditions occurring about 49.9% of daylight hours.³²

In the capital city, Freetown, the government launched a 60 MW solar project supported by the World Bank with an indicative price of less than US\$0.07 per kWh. In the provinces, there are several mini-grid power operations.³³ Under the Renewable Energy Empowerment in Rural Sierra Leone (RESL), solar mini-grids have been established in 30 communities and at 94 mini-grid sites across Sierra Leone, providing power to over 7,000 customers.³⁴ The project is divided into three phases. Phases 1 and 2 focus on the Port Loko, Karene, Kambia, and Moyamba Districts of Sierra Leone. Additionally, it includes the installation of a total of 50 smaller (6-36KW) mini-grids and 40 larger (>36KW) mini-grids located at health facilities.³⁵ The third phase involves constructing and commissioning 17 of these mini-grid sites (800 kW). The project is supported by the UK's Foreign, Commonwealth, and Development Office (FCDO) and implemented by UNOPS.³⁶ Furthermore, the Ministry of Energy in Sierra Leone installed 8471 solar streetlights in the fourteen-district headquarters across the country by 2017.³⁷

Considering the above, Sierra Leone has significant renewable energy resources but faces challenges in fully utilizing them due to structural, financial, and policy constraints. The goal is to

³¹ Energypedia, Sierra Leone Energy Situation (Mar. 12, 2025, 2:21 ET) https://energypedia.info/wiki/Sierra_Leone_Energy_Situation.

³¹ INTERNATIONAL RENEWABLE ENERGY AGENCY: INTERNATIONAL RENEWABLE STATISTICS (2023).

³² Climate. Top, Sunshine & Daylight Hours in Freetown, Government of Sierra Leone (Apr. 2, 2025, 5:32 ET) <https://www.climate.top/sierra-leone/freetown/sunlight/>.

³³ SLIPEA, Sierra Leone: An Investor's Guide A Private Sector Perspective on the Investment Landscape (2019) https://www.sliepa.gov.sl/media/userfiles/subsite_198/files/resource-library/sierra-leone-an-investors-guide.pdf.

³⁴ Power Leone, Power Leone, founded in 2018, is Energycity's Sierra Leonean subsidiary, Energycity (Mar. 23, 2025, at 2:21 ET) <https://energycitycorp.com/power-leone/>.

³⁵ *Id.*

³⁶ *Id.*

³⁷ *Id.*

achieve 85% renewable energy capacity by 2030,³⁸ yet the country's current installed capacity stands at just 116 MW.³⁹ This is well below the estimated hydro potential of 5,000 MW, as well as the strong solar irradiation (5.9 hours per day) and opportunities for bioenergy.

Part 2: Legal Framework that Governs Renewable Energy

There is no single legislative framework for renewable energy, but there is legislation regarding the Energy Sector that borders on renewables. Regarding policy, there are regional and national frameworks in Sierra Leone concerning renewables.

Energy Law

Following the civil war, the government launched legal reforms to enhance governance and regulations, aiming to attract both foreign and private investment in the energy sector.⁴⁰ Key reforms include the National Electricity Act 2011, which resulted in the unbundling of the vertically integrated National Power Authority (NPA) into two separate entities: the Electricity Generation and Transmission Company (EGTC) and the Electricity Distribution and Supply

³⁸ Sustainable Energy for All, Country work - Sierra Leone (Apr. 2, 2025, 2:23 ET) <https://www.seforall.org/our-work/country-engagemnt/country-work-sierra-leone#:~:text=Sierra%20Leone's%20energy%20transition,sector's%20development%20is%20equally%20important.>

³⁹ IRENA, Renewable Energy Statistics 2023 (Apr. 1, 2025, at 4:23 ET) <https://www.irena.org/Publications/2023/Jul/Renewable-energy-statistics-2023.>

⁴⁰ Herbert Smith Freehills, Energy, Investing in Sierra Leone (Mar. 12, 2025, 1:34 ET) [https://www.investinginsierraleone.com/energy/.](https://www.investinginsierraleone.com/energy/)

Authority (EDSA).⁴¹ Furthermore, the Finance Act of 2017 provides duty waivers for imported solar products that meet IEC standards.⁴²

Regulatory Institutions

Diverse institutional setups regulate the renewable energy sector. The Electricity Act of 2011 established a regulatory body known as the Energy Commission to oversee utility service providers in the electricity and water sectors.⁴³ This indicates that renewable energy providers fall under the commission's mandates. Additionally, there is a private sector association, the Renewable Energy Association of Sierra Leone (REASL), which was formed by 30 members in 2018.⁴⁴

Energy Policy

Sierra Leone's renewable energy policies are grounded in both global and regional agreements. Under the Paris Agreement, the Nationally Determined Contributions seek to enhance access to affordable, reliable, and clean energy, thus improving citizens' livelihoods.⁴⁵ Consequently, Sierra Leone has initiated an energy transition that encompasses its energy, climate, and development plans, aiming for 85 percent renewable energy capacity by 2030. This commitment includes a focus on the off-grid and mini-grid sectors, as well as the development of low-cost hydroelectric power.⁴⁶

⁴¹ National Electricity Act 2011.

⁴² Finance Act 2017.

⁴³ The Electricity Act of 2011.

⁴⁴ REASL, Who Are You?, Renewable Energy Association of Sierra Leone (Apr. 1, 2025, at 3:21 ET) <https://reasl.com/>.

⁴⁵ Sustainable Energy for All, Country work - Sierra Leone (Apr. 2, 2025, 2:23 ET) <https://www.seforall.org/our-work/country-engagement/country-work-sierra-leone#:~:text=Sierra%20Leone's%20energy%20transition.sector's%20development%20is%20equally%20important.>

⁴⁶ THE REPUBLIC OF SIERRA LEONE, UPDATED NATIONAL DETERMINED CONTRIBUTION (2021).

At the regional level, with the agreement of ECOWAS member states to develop National Renewable Energy Action Plans (NREAPs)⁴⁷ and SE4ALL Agendas, Sierra Leone has outlined its objectives within these agendas.⁴⁸ These objectives include the electrification of all district headquarters towns, increasing installed power capacity to 1.229 MW by 2030, and expanding access to renewable off-grid solutions.⁴⁹ Additionally, they set goals for improved access to cooking technologies and enhanced charcoal production.⁵⁰ The targets are specified for 2020 and 2030, respectively.⁵¹ It is important to note that the field of policy is polarized; therefore, the paper highlights key guiding policy frameworks:⁵² Sierra Leone National Energy Policy (NEP 2009) >Sierra Leone National Energy Strategic Plan (September 2009) >Economic Community of West African States (ECOWAS) > Renewable Energy Policy and Energy Efficiency Policy (2012) >EU > UK Energy Africa Compact (May 2016) >National Renewable Energy Policy of Sierra Leone (draft).⁵³

In light of the points mentioned above, it is evident that Sierra Leone has made strides in its renewable energy (RE) policy and regulation. However, the current legal framework is fragmented, some provisions are outdated, and it does not adequately support large-scale renewable energy initiatives. Establishing a comprehensive and cohesive Renewable Energy Law would consolidate these policies under a single legal framework and eliminate inconsistencies among various regulations. More importantly, it would provide legal assurance to investors.

⁴⁷ REPUBLIC OF SIERRA LEONE NATIONAL RENEWABLE ENERGY ACTION PLAN (NREAP) (2015).

⁴⁸ Sierra Leone Presidential Initiative on Climate Change, Renewable Energy and Food Security, Ministry of Energy (2021) <https://www.seforall.org/system/files/2025-02/SEforALL-Sierra-Leone-etip-report-FV-2-webversion.pdf>.

⁴⁹ *Id.*

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² Sustainable Energy for All, Increasing Energy Access in Sierra Leone, UNOPS (2021) <https://www.seforall.org/system/files/2021-05/Energy-Access-SierraLeone-SEforALL.pdf>.

⁵³ *Id.*

Without such legislation, Sierra Leone risks falling behind regional peers like Ghana and Senegal, which have strong renewable energy laws,⁵⁴ potentially jeopardizing its clean energy targets for 2030.

International Agreements

Sierra Leone's energy laws and policies discussed above, particularly the policies, have been shaped by its participation in various international renewable energy agreements aimed at promoting sustainable energy development and addressing climate action.

The primary agreement is the Paris Agreement, the leading global treaty on climate, which aims to limit global warming to below 2 degrees Celsius, and preferably to 1.5 degrees Celsius.⁵⁵ Based on the information mentioned above, Sierra Leone has its Nationally Determined Contributions (NDCs) outlining its climate action plan, with a strong emphasis on expanding renewable energy, targeting a 5% reduction in CO₂ emissions by 2025, a 10% reduction by 2030, and a 25% reduction by 2050.⁵⁶

Sierra Leone is also a signatory to the Economic Community of West African States (ECOWAS) (EREP 2012), a policy that targets 35% renewable energy through solar and hydro in the region by 2023.⁵⁷ As a result, under its mandates, the country developed the National Renewable Energy Action Plans (NREAPs) highlighted above.⁵⁸

⁵⁴ SENEGAL RENEWABLE READINESS ASSESSMENT (2012).

⁵⁵ UNFCCC, The Paris Agreement Related News Related Documents Related Links What is the Paris Agreement? (Apr. 28, 2025, 3:21 ET) <https://unfccc.int/process-and-meetings/the-paris-agreement>.

⁵⁶ THE REPUBLIC OF SIERRA LEONE UPDATED NATIONAL DETERMINED CONTRIBUTION (2021).

⁵⁷ ECONOMIC COMMUNITY OF WEST AFRICAN STATES (2012).

⁵⁸ REPUBLIC OF SIERRA LEONE NATIONAL RENEWABLE ENERGY ACTION PLAN (NREAP) (2015).

Furthermore, the African Union supports the Africa Renewable Energy Initiative (AREI 2015). This initiative aims to achieve 300 GW of renewable energy on the continent,⁵⁹ under which Sierra Leone is projected to benefit from funding for the Bumbuna hydropower phase II.⁶⁰

Part 3: The Case for Renewable Energy: Energy Sovereignty, Cost-Effectiveness, Rural Electrification, And Environmental Benefit.

Sierra Leone can achieve energy sovereignty, lower costs, ensure access, and enhance climate resilience by harnessing its abundant resources in solar, hydro, and bioenergy. The necessary legal framework could facilitate transitioning from fossil fuel dependency to a diversified, sustainable renewable energy approach.

The state's expense of generating fossil fuel-based electricity compromises its energy security. Each year, the state invests millions in imported diesel and heavy fuel oil for backup generators and thermal plants—money that could be better allocated to local solar, hydro, and bioenergy initiatives.⁶¹ For instance, the Ministry of Finance data regarding 2023 subsidies illustrates this point.

Total subsidies disbursed to EDSA for the first half of 2023 amounted to NLe274.6 million (US\$13 million), including NLe263.2 million paid to Karpowership and NLe11.4 million to Transco/ CLSG. In addition, an amount of NLe29 million was also disbursed to the EGTC for the supply of fuel for running Government-owned generators in Freetown and the provinces.⁶²

⁵⁹ RENEWABLE ENERGY INITIATIVE (2015).

⁶⁰ Energy Monitor, Bumbuna Hydroelectric Power Station, Tonkolili District (Mar. 3, 2025, 3:12 ET) <https://www.energymonitor.ai/projects/bumbuna-hydroelectric-power-station-tonkolili-district/?cf-view>.

⁶¹ Foday Conteh ET. AL, Long-Term Forecast of Sierra Leone's Energy Supply and Demand (2019–2040): A LEAP Model Application for Sustainable Power Generation System, MDPI. Vol 15, Issue 15 (2023).

⁶² Sallieu Kanu, 'Govt Spends US\$ 13m on Electricity,' Premier Media Group (Apr. 12, 2025, at 3:21 ET) <https://www.premiermedia-sl.com/govt-spends-us-13m-on-electricity/>.

Furthermore, transitioning to renewable energy would reduce the state's dependence on imported fuel, insulating it from fluctuations in global oil prices.⁶³ This is highlighted in the Ministry of Finance's policy paper addressing systemic electricity distribution and supply issues in Sierra Leone

The Government of Sierra Leone has had to provide subsidies to the electricity sector of over 2 billion NLe from 2018-2023 to keep the lights on. The lack of significant state-owned electricity generation assets has caused Sierra Leone to rely on expensive and dollar-denominated power imports from Côte d'Ivoire through an interconnector built in 2021, and from the heavy fuel oil ship Karpower which also exposes Sierra Leone to volatile oil prices amidst the ongoing war between Russia and Ukraine. The continuously depreciating Leone does not help the currency mismatch issues faced by EDSA, with the distribution utility collecting revenues in Leones while paying most of its costs in dollars that are getting more expensive by the day.⁶⁴

Moreover, decentralizing renewable energy would enhance the economy by creating jobs in installing and maintaining sources like solar panels.⁶⁵ For instance, through the Rural Renewable Energy Electrification project, Barefoot College trains illiterate or semi-illiterate women and equips them with essential skills to become solution providers in their rural communities.⁶⁶

As previously mentioned, despite significant subsidies, Sierra Leone has one of the highest tariffs in the sub-region.⁶⁷ Also, the country is among the least developed nations, with a majority

⁶³ Ministry of Finance, Addressing Systemic Electricity Distribution and Supply Issues in Sierra Leone (2024) <https://mof.gov.sl/wp-content/uploads/2025/02/Addressing-Systemic-Electricity-Distribution-and-Supply-Issues-in-Sierra-Leone.pdf>.

⁶⁴ *Id.*

⁶⁵ EIS Council, Beyond the Grid: The Case for Decentralized Energy Systems (Apr.12, 2023, at 3:12 ET) <https://eiscouncil.org/beyond-the-grid-the-case-for-decentralized-energy-systems/#:~:text=However%2C%20the%20transition%20isn't,shape%20a%20resilient%20future%20together.>

⁶⁶ Lisa Burell, The sky is the limit: Sierra Leone's 'Barefoot' Women Solar Engineers, UNIDO (Apr. 12, 2025, at 3:34 ET) <https://www.unido.org/stories/sky-limit-sierra-leones-barefoot-women-solar-engineers>.

⁶⁷ Lucas Davies, Prospects for Energy Efficiency in Sierra Leone's Power Sector, Energy and Economics: Applied Research Program (Mar. 30, 2025, 2:30 ET) <https://www.energyeconomicgrowth.org/publication/working-paper-prospects-energy-efficiency-sierra-leones-power-sector>.

of its population living below the poverty line.⁶⁸ Transition to sustainable energy is essential for the government to ensure that energy access reaches those who cannot afford the expensive electricity costs, especially since necessities like food and housing take precedence.⁶⁹ Furthermore, this transition would alleviate the government's financial strain, currently burdened by millions of dollars spent on imported fuel; these funds could instead be allocated to health, education, and agriculture.⁷⁰ Furthermore, the government spent \$13 million in 2023 on Karpowership and fuel imports, which could have redirected funds to renewable infrastructure.⁷¹ By providing cheap and accessible energy, it would also entice foreign investment in manufacturing.⁷²

Another key element of the transition is that democratizing renewable energy can provide access to 60% of the population living in rural areas, where fewer than 5% have electricity.⁷³ Many of these communities are not connected to larger grids due to inadequate road infrastructure. Renewable solar energy, for instance, has specific requirements for energy storage, demand stimulation, operation and maintenance, and community education.⁷⁴

⁶⁸ World Bank, Country Poverty and Equity Brief: Sierra Leone (2020) https://databankfiles.worldbank.org/public/ddpext_download/poverty/987B9C90-CB9F-4D93-AE8C-750588BF00QA/SM2020/Global_POVEQ_SLE.pdf.

⁶⁹ UNDP, What is the Sustainable Energy Transition and Why is it Key to Tackling Climate Change? (Apr. 12, 2025 at 6:23 ET) <https://climatepromise.undp.org/news-and-stories/what-sustainable-energy-transition-and-why-it-key-tackling-climate-change#:~:text=Therefore%2C%20the%20sustainable%20energy%20transition,sustainable%2C%20inclusive%20and%20resilient%20future.>

⁷⁰ IRENA, The Renewable Energy Transition in Africa (Apr. 5, 2025 at 2:01 ET) https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/March/Renewable_Energy_Transition_Africa_2021.pdf.

⁷¹ Sallieu Kanu, 'Govt Spends US\$ 13m on Electricity,' Premier Media Group (Apr. 12, 2025 at 3:21 ET) <https://www.premiermedia-sl.com/govt-spends-us-13m-on-electricity/>.

⁷² IRENA, The Renewable Energy Transition in Africa (Apr. 5, 2025 at 2:01 ET) https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/March/Renewable_Energy_Transition_Africa_2021.pdf.

⁷³ Department of Commerce United States, Sierra Leone Country Commercial Guide: Energy Infrastructure (Mar. 2, 2025, at 4:23 ET) <https://www.trade.gov/country-commercial-guides/sierra-leone-energy-infrastructure>; Statistic Sierra Leone, 2021 Mid-Term Population and Housing Census (Apr. 2, 2025 at 4:56 ET) <https://www.statistics.sl/index.php/census/mid-term-population-census.html>.

⁷⁴ EBSCO, Sierra Leone's Energy Infrastructure (Apr. 3, 2025, at 3:21 ET) <https://www.ebsco.com/research-starters/power-and-energy/sierra-leones-energy-infrastructure#:~:text=Only%2029.4%20percent%20of%20the,unreliability%20of%20its%20electric%20system.>

Additionally, the transition will replace carbon-intensive energy sources from diesel generators, significantly reducing emissions.⁷⁵ For instance, the proposed 27 MW Betmai hydropower project is expected to generate 132 GWh of electricity annually, enhancing the country's power generation capacity by at least 10% and increasing renewable capacity by over 27%.⁷⁶ After just five years of operation, the Betmai project is anticipated to reduce emissions by at least 675,000 tons of CO₂e. This decrease is comparable to removing more than 146,000 US passenger vehicles from the roads for one year.⁷⁷ Therefore, renewable energy represents a solution to achieving the country's goals of reducing CO₂ emissions to 5% by 2025, 10% by 2030, and 25% by 2050, as specified in the Nationally Determined Contributions under the Paris Agreement.⁷⁸

Part 4: Examines Challenges of Renewable Energy: High Initial Costs, Reliability Issues, and Technological Maintenance

To achieve its ambitious goal of 85% renewable energy by 2030,⁷⁹ Sierra Leone must address challenges such as high initial costs, reliability issues, and technological and maintenance hurdles.

The first significant challenge is that the high initial costs of renewable energy projects require substantial upfront investments, posing a considerable hurdle for Sierra Leone due to its

⁷⁵ IRENA, The Renewable Energy Transition in Africa (Apr. 5, 2025, at 2:01 ET) https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/March/Renewable_Energy_Transition_Africa_2021.pdf.

⁷⁶ Global Energy Alliance for People and Planet, County Profile: Sierra Leone (Mar. 27, 2025, at 3:21 ET) <https://energyalliance.org/powering-people-planet-2023/hydropower-to-lower-fossil-fuel-dependency-in-sierra-leone/>.

⁷⁷ *Id.*

⁷⁸ THE REPUBLIC OF SIERRA LEONE UPDATED NATIONAL DETERMINED CONTRIBUTION (2021).

⁷⁹ Sustainable Energy for All, Increasing Energy Access in Sierra Leone (Apr. 2, 2025, at 3:23 ET) <https://www.seforall.org/system/files/2021-05/Energy-Access-SierraLeone-SEforALL.pdf>.

limited financial resources and high public debt.⁸⁰ For example, large-scale hydropower projects like Bumbuna Phase II (estimated at \$750 million) and solar mini-grid installations require considerable funding. Sierra Leone depends heavily on international donors, including the World Bank, the AfDB, and China, for such projects; however, delays in financing and bureaucratic inefficiencies impede implementation.⁸¹

Secondly, the paper discovers the private sector's hesitation. Investors perceive significant risks due to the lack of a comprehensive legal framework and fragmented policies, leading to instability.⁸² Moreover, currency depreciation causes the Leones to be ranked among the weakest currencies in Africa. Combined with high poverty rates, this diminished purchasing power discourages private capital despite incentives such as duty waivers on solar imports.⁸³

Thirdly, reliability issues associated with renewable energy stem from intermittency and seasonal fluctuations, affecting the stable supply of power.⁸⁴ For instance, the Bumbuna hydro plants generate 50 MW during the rainy season but drop to 8 MW in the dry season, creating instability.⁸⁵ Climate change exacerbates this situation due to unpredictable rainfall patterns.⁸⁶ Regarding solar limitations, although solar irradiation is strong (5.9 hours/day), the high cost of storage solutions like batteries, along with many mini-grids lacking the capacity for round-the-

⁸⁰ *Id.*

⁸¹ Energy Monitor, Bumbuna Hydroelectric Power Station, Tonkolili District (Mar. 3, 2025, 3:12 ET) <https://www.energymonitor.ai/projects/bumbuna-hydroelectric-power-station-tonkolili-district/?cf-view>.

⁸² Herbert Smith Freehills, Energy, Investing in Sierra Leone (Mar. 12, 2025, 1:34 ET) <https://www.investingsierraleone.com/energy/>.

⁸³ *Id.*

⁸⁴ Energypedia, Sierra Leone Energy Situation (Mar. 12, 2025, 2:21 ET) https://energypedia.info/wiki/Sierra_Leone_Energy_Situation.

⁸⁵ Energy Monitor, Bumbuna Hydroelectric Power Station, Tonkolili District (Mar. 3, 2025, 3:12 ET) <https://www.energymonitor.ai/projects/bumbuna-hydroelectric-power-station-tonkolili-district/?cf-view>.

⁸⁶ UNDP, Sierra Leone: Strengthening Climate Information and Early Warning Systems in Africa for Climate Resilient Development and Adaptation to Climate Change (Mar. 23, 2025 at 3:23 ET) https://www.adaptation-undp.org/sites/default/files/resources/ews_slone_project_brief_guidelines_fact_sheet_pdf.pdf.

clock supply, presents challenges.⁸⁷ Furthermore, mini-grids integration encounters obstacles because the country's underdeveloped transmission infrastructure cannot efficiently distribute power generated from renewable energy, leading to losses and inefficiencies.⁸⁸

The fourth issue is the barriers related to technology and maintenance, where limited technical expertise and insufficient maintenance capacity hinder the sustainability of renewable energy. For example, a skills gap exists: only a few local technicians are trained to install and repair renewable energy systems.⁸⁹ Although initiatives like Barefoot College's solar training for women have a positive impact, they remain on a small scale.⁹⁰ Additionally, there is concern about dependence on foreign expertise, as many existing renewable energy projects rely heavily on external contractors, which presents long-term sustainability challenges. The Chinese-funded Bankasoka Dam exemplifies this issue.⁹¹ Lastly, the maintenance challenges of mini-grids and solar systems often stem from a lack of spare parts, weak community ownership, and inadequate after-sales support. For instance, due to neglect, several rural solar projects fail within a few years.⁹²

Part 5: A Case Study on Bangladesh's success in this area

⁸⁷ Energypedia, Sierra Leone Energy Situation (Mar. 12, 2025, 2:21 ET) https://energypedia.info/wiki/Sierra_Leone_Energy_Situation.

⁸⁸ Sierra Leone Presidential Initiative on Climate Change, Renewable Energy and Food Security (Mar. 24, 2025 at 3:21 ET) <https://www.seforall.org/system/files/2025-02/SEforALL-Sierra-Leone-etip-report-FV-2-webversion.pdf>.

⁸⁹ *Id.*

⁹⁰ Lisa Burell, The sky is the limit: Sierra Leone's 'Barefoot' Women Solar Engineers (Apr. 12, 2025 at 3:34 ET) <https://www.unido.org/stories/sky-limit-sierra-leones-barefoot-women-solar-engineers>.

⁹¹ Sheriff Mahmud Ismail, Bankasoka, Makali and Charlotte Dams are over 80% funded by the Chinese and not by UNIDO, Cocorioko (Mar. 23, 2025 at 3:21 ET) <https://cocorioko.net/ambassador-omrie-golley-presents-credentials-to-south-korean-president/>.

⁹² Sierra Leone Presidential Initiative on Climate Change, Renewable Energy and Food Security, State House (Mar. 24, 2025 at 3:21 ET) <https://www.seforall.org/system/files/2025-02/SEforALL-Sierra-Leone-etip-report-FV-2-webversion.pdf>.

This section explores Bangladesh's success in renewable energy as a reference for Sierra Leone to achieve energy sovereignty by reducing reliance on fossil fuels and decreasing carbon emissions.

Bangladesh is a mid-income country with the eighth-largest population in the world.⁹³ Energy security is crucial for any country's economy, and Bangladesh's significant improvements in energy sovereignty through renewable sources have contributed to its economic growth.⁹⁴ The choice to use Bangladesh also resonates with the fact that both countries share the same colonial legacy as former British colonies. At independence, both countries had a similar least-developed status; Sierra Leone achieved independence in 1961,⁹⁵ ten years earlier than Bangladesh, which gained independence in 1971.⁹⁶ However, while currently, Bangladesh needs to improve its energy security to achieve developed country status,⁹⁷ Sierra Leone, on the other hand, must do the same to reach mid-income country status.⁹⁸

⁹³ European Union, Country Profile: Bangladesh (Mar. 30, 2025 at 3:23 ET) https://international-partnerships.ec.europa.eu/countries/bangladesh_en#:~:text=Bangladesh%2C%20ranking%20as%20the%20world's,I ncome%20Country%20status%20by%202026.

⁹⁴ Faysal Ahamed Akash et al, Greening the grid: A comprehensive review of renewable energy in Bangladesh (Mar. 23, 2025 at 4:00 ET) <https://www.sciencedirect.com/science/article/pii/S2405844024035084#:~:text=The%20ongoing%20technological%20innovation%20in,in%20the%20country%20%5B29%5D>.

⁹⁵ Department of State, A Guide to the United States' History of Recognition, Diplomatic, and Consular Relations, by Country, since 1776: Sierra Leone (Mar. 21, 2025, at 3:21 ET) <https://history.state.gov/countries/sierra-leone#:~:text=The%20United%20States%20recognized%20Sierra,been%20previously%20under%20British%20sovereignty>.

⁹⁶ The Nation, On March 26, 1971, Bangladesh Declared its Independence (Mar. 22, 2025, at 2:21 ET) <https://www.nationthailand.com/blogs/news/world/40047905>.

⁹⁷ Energy and Mineral Resources Division, Energy Scenario of Bangladesh (Apr. 2, 2025, at 2:21 ET) https://hcu.portal.gov.bd/sites/default/files/files/hcu.portal.gov.bd/publications/ae775b7e_b63d_491d_81e4_b317ff8e11ca/2024-07-15-09-11-d13a3451b969fb9a3c5c74e9130c9f6c.pdf/

⁹⁸ Sustainable Energy for All, Increasing Energy Access in Sierra Leone (Apr. 2, 2025, at 3:23 ET) <https://www.seforall.org/system/files/2021-05/Energy-Access-SierraLeone-SEforALL.pdf>.

Bangladesh boasts 100 percent access to electricity, an impressive statistic that surpasses the average among middle-income countries, including those in its South Asian region.⁹⁹ Renewable energy has enhanced the country's energy security by promoting electricity access through solar and wind power in areas not connected to the grid.¹⁰⁰ This approach utilizes the country's vast potential for renewable energy, unlike Sierra Leone, which has failed to do so. Its renewable energy resources include hydropower, solar, and wind power.¹⁰¹ However, this research focuses exclusively on the country's solar power initiatives to enhance its energy security.

According to a 2021 World Bank Group study, Bangladesh has the largest off-grid solar power initiative, providing electricity access to over 20 million people.¹⁰² The Bangladesh Solar Home System (SHS) project began in 2003 with a pilot phase involving 50,000 households. By its completion stages 15 years later (2018), it was responsible for 16% of rural electrification.¹⁰³ Because of this, the 2021 World Bank Group study stated that 'the program (solar) in the world offers experiences and lessons for other countries to expand access to clean and affordable electricity.'¹⁰⁴

This solar power project model is based on Bangladesh's constitutional mandate for energy security, which requires the government to maintain state ownership of energy and mineral

⁹⁹ Faysal Ahamed Akash et al, Greening the grid: A comprehensive review of renewable energy in Bangladesh (Mar. 23, 2025 at 4:00 ET) <https://www.sciencedirect.com/science/article/pii/S2405844024035084#:~:text=The%20ongoing%20technological%20innovation%20in,in%20the%20country%20%5B29%5D>.

¹⁰⁰ *Id.*

¹⁰¹ Sierra Leone Presidential Initiative on Climate Change, Renewable Energy and Food Security (Mar. 24, 2025 at 3:21 ET) <https://www.seforall.org/system/files/2025-02/SEforALL-Sierra-Leone-etip-report-FV-2-webversion.pdf>.

¹⁰² World Bank, Bangladesh Solar Home Systems Provide Clean Energy for 20 Million People (Apr 1, 2025 at 4:32 ET) <https://www.worldbank.org/en/news/press-release/2021/04/07/bangladesh-solar-home-systems-provide-clean-energy-for-20-million-people>.

¹⁰³ *Id.*

¹⁰⁴ *Id.*

resources.¹⁰⁵ In accordance with this, the 1972 Constitution mandates that the state, under the fundamental principles of State policy, ensure electricity access to rural areas.¹⁰⁶ However, with the rise of free-market capitalism, the SHS operates as a public-private partnership led and implemented by the Infrastructure Development Company Ltd (IDCOL), alongside partner organizations (POs).¹⁰⁷ IDCOL contributed its expertise in infrastructure financing, leveraging Bangladesh's pioneering efforts in micro-financing and private-sector solar electrification initiatives to develop a scalable off-grid electrification business model. POs market, sell, finance, and service the SHS to households across Bangladesh.¹⁰⁸ The manual of the SHS describes a typical solar home system in Bangladesh as

Comprises a 10–300 Wp photovoltaic (PV) module (or two or more modules referred to as an array) mounted on a roof or a pole, tilted toward the south and facing the sun; a 12 V rechargeable battery for energy storage (mainly tubular plate lead-acid battery); a charge controller; and several lights (initially fluorescent tube lights [FTLs], later compact fluorescent lights [CFLs] and light-emitting diode (LED) lights).¹⁰⁹

The funds were provided by the World Bank under the Rural Electrification and Renewable Energy Development (RERED) Project, which ended in 2018. However, additional tranches of financing continued from the World Bank and other development partners, extending to the RERED II Project, which ended in 2021.¹¹⁰

Part of the executive statement in *Living the Light: The Bangladesh Solar Home System Handbook* could catalog the SHS's general successes: 'About 14 percent of the Bangladesh population (2011 Census), about 20 million people, obtained electricity services through the SHS

¹⁰⁵ Bangladesh Constitution 1972, art 143 (1) (b).

¹⁰⁶ Anil Cabraal et al, *Living in the Light: The Bangladesh Solar Home Systems Story* (Apr. 2, 2025 at 2:21 ET) <https://openknowledge.worldbank.org/entities/publication/150caf44-f47b-554d-bdd3-c0a1eedca65a>.

¹⁰⁷ *Id.*

¹⁰⁸ *Id.*

¹⁰⁹ *Id.*

¹¹⁰ *Id.*

Program.’¹¹¹ Juxtaposing this figure of 20 million to Sierra Leone, with less than 8 million people, a similar drive in the latter would guarantee 100% access to electricity. Amongst the specific benefits of the SHS in Bangladesh are: The SHS provides faster access to electricity, doubling the speed of access compared to the anticipated wait period for joining the electricity grid, which was projected to be achievable 30 years later; huge social impacts in rural families including educational benefits as it allowed pupils to study an average of 10-12 minutes longer than those without solar.¹¹² Also, it provided a greater sense of security as it improved safety, comfort, and convenience compared to non-SHS households; these houses gained economic benefits as SHS households had easier and lower-cost access to TV, radio, fans, and mobile phone charging.¹¹³

It also follows that SHS boosted enterprise and social services, which include educational institutions (3,700), restaurants (270), retail shops (10,600), mosques (177,300), and other enterprises (4,600), by providing better-quality light, extended operating hours, and power for small appliances.¹¹⁴

The SHS contributed to technological advancements by promoting the development of the solar PV industry, which includes SHS retailers, service providers, financiers, and manufacturers. Likewise, the competitive business model enabled SHS consumers to take advantage of technological improvements, particularly the transition to more efficient LED lighting and direct current (DC) appliances.¹¹⁵

¹¹¹ *Id.*

¹¹² *Id.*

¹¹³ *Id.*

¹¹⁴ *Id.*

¹¹⁵ *Id.*

Another important benefit is environmental management. The World Bank Study Group recorded that

Between 2003 to 2018, the project reduced greenhouse gas (GHG) emissions by approximately 9.6 million tonnes of CO2 equivalent. The program helped reduce indoor air pollution by avoiding the consumption of 4.4 billion liters of kerosene.¹¹⁶

Recommendations

The insights from Bangladesh’s success with SHS, which provided electricity to 20 million people through off-grid solar, present a proven model for Sierra Leone to achieve energy sovereignty—improve access to energy, reduce fossil fuel dependency, and meet its 2030 renewable energy target. Below are the tailored recommendations.

Introduce a Legal & Policy Framework for Off-Grid Solar

- ❖ Sierra Leone should implement a constitutional amendment to ensure that the state has a mandate to provide access to electricity.
- ❖ Sierra Leone should amend the Electricity Act of 2011 to recognize off-grid as a national priority.
- ❖ Sierra Leone should enact a dedicated Renewable Energy Act to consolidate policies, clarify tariffs, and attract private investment. Additionally, it should improve and consolidate the duty waivers for solar equipment under the Finance Act and implement quality control standards to prevent substandard imports.

Establish a Public-Private Partnership Entity for Off-Grid Solar

¹¹⁶ World Bank, Bangladesh Solar Home Systems Provide Clean Energy for 20 Million People (Apr 1, 2025 at 4:32 ET) <https://www.worldbank.org/en/news/press-release/2021/04/07/bangladesh-solar-home-systems-provide-clean-energy-for-20-million-people>.

- ❖ Establish a Sierra Leone Renewable Energy Development Authority (SLREDA) under the Ministry of Energy to oversee off-grid solar expansion.
- ❖ Partner with microfinance institutions (e.g., Sierra Leone Commercial Bank, BRAC Sierra Leone) to offer affordable consumer loans for solar systems.
- ❖ Leverage existing mini-grid programs (e.g., RESL project) and expand them nationally.

Leverage Climate Finance & International Partnerships

- ❖ Sierra Leone can apply for solar electrification grants from the Green Climate Fund (GCF).
- ❖ Sierra Leone can partner with UNDP, UNOPS, and the AU's Africa Renewable Energy Initiative.
- ❖ Sierra Leone can seek South-South cooperation with Bangladesh for technical training.

Conclusion

Sierra Leone's severe energy poverty, with only 27.5% of its population having access to electricity (and a mere 4.9% in rural areas), remains a critical barrier to economic growth, social development, and climate resilience. The country's heavy reliance on imported fossil fuels (18%) and biomass wood (80%) strains national finances, exacerbates environmental degradation, and perpetuates energy insecurity. Despite significant renewable energy potential, including 5,000 MW of hydropower and strong solar irradiation (5.9 hours daily) as well as bioenergy resources, the country has tapped only 116 MW of renewables, far below its target of 85% clean energy. The paper demonstrates that legal and policy reforms can accelerate Sierra Leone's transition to renewables by addressing four key areas:

- I. Energy Sovereignty – Reducing dependence on volatile fossil fuel imports and foreign power suppliers, such as the Karpowership.
- II. Cost-Effectiveness – Redirecting millions spent on fuel subsidies such as the \$ 13 million in 2023 toward local solar, hydro, and bioenergy projects.
- III. Rural Electrification – Leveraging off-grid solar mini-grids like Bangladesh’s Solar Home Systems to reach remote communities.
- IV. Environmental Benefits – Cutting Co₂ emissions by 675,000 tons through the Betmai hydropower to meet its Paris Agreement commitments.

However, legal and structural challenges such as the fragmented legal framework, high upfront costs, seasonal hydropower fluctuations, and lack of cohesive renewable energy law can hinder progress. Based on this, Bangladesh’s Solar Home System success offers a blueprint through public-private partnerships and microfinancing that enabled 20 million people to access off-grid solar. Additionally, the constitutional mandates and dedicated policies ensured rural electrification.

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