Final report SLE-25371

March 2026

Informing industrial policy for renewable energy-led SME productivity in Sierra Leone: The economic feasibility of micro-wind technology

Sir Prince Malcolm Nuni

IGC

DIRECTED BY LSE UNIVERSITY OF OXFORD

FUNDED BY UKaid from the British people

Final report: (IGC-2026- SLE-25371)

Month: March 2026

Informing Industrial Policy for Renewable Energy-Led SME Productivity in Sierra Leone: The Economic Feasibility of Micro-Wind Technology

Sir Prince Malcolm Nuni

International Growth Center (IGC)

Table of Contents

List of Figures

List of Tables

List of Acronyms

IGC – International Growth Centre

SME / SMEs – Small and Medium Enterprises

MTNDP – Medium-Term National Development Plan

DRE – Distributed Renewable Energy

IRENA – International Renewable Energy Agency

ECREEE – ECOWAS Centre for Renewable Energy and Energy Efficiency

GIZ – Deutsche Gesellschaft für Internationale Zusammenarbeit

ECOWAS – Economic Community of West African States

EREP – ECOWAS Renewable Energy Policy

MW – Megawatt

PPA / PPAs – Power Purchase Agreement(s)

DFIs – Development Finance Institutions

IEA – International Energy Agency

IFC – International Finance Corporation

SEforALL – Sustainable Energy for All

EDSA – Electricity Distribution and Supply Authority

M&E – Monitoring and Evaluation

JICA – Japan International Cooperation Agency

SL – Sierra Leone

ESCO – Energy Service Company

RBF – Results-Based Financing

PPP – Public-Private Partnership

LPG – Liquefied Petroleum Gas

AFDB – African Development Bank

AIPRO – (As used in reference; likely organization name, context-specific)

TCP – Technology Collaboration Programme

1. Executive Summary

Sierra Leone sits in West Africa. Its economy has not grown much lately. That is mostly because people do not have reliable electricity. The whole country struggles with this energy problem. It hits small and medium businesses hard. These SMEs keep the economy going. They end up paying way too much for power. Over 40 percent of what they spend to run things goes to the shaky national grid or those costly diesel generators. That just eats into their profits.

Figure: 1.1 Sierra Leone on the African Map

Source: Map of Africa Sierra Leone Map of Sierra Leone

The grid is unreliable. Generators cost a lot to keep running. Businesses have to deal with blackouts all the time. It feels like a cycle that is tough to break.

But here is something interesting. The country actually has wind that could be used. Untapped resources in places like the coast and highlands. Wind power might help generate electricity. Still the financial side of micro-wind technology is not clear. No one has really looked into if it makes sense money wise. Are stakeholders even willing to try it or put money in? That part seems unexplored. It might be worth examining.

Figure: 1.2 Map of Sierra Leone

Source: Sierra Leone Maps & Facts: World Atlas

This study was done as part of an IGC fellowship research, and it tries to fill in some gaps with a mixed methods setup. Data was gathered from 78 households, 17 small businesses, and 7 partners working on development, all in Sierra Leone during February and March of 2026. The main point was to look at renewable energy options.

A lot of people want renewables. Out of the households surveyed, 83 percent said they'd be open to using those technologies, and for the SMEs it was even higher at 88 percent. But the big problem isn't that they don't want it, it's the money up front to get started. Financing just isn't there in a way that's easy to grab.

The development partners sounded ready to help with micro-wind projects, but only if things are more stable. Like, they need policies that make sense and don't change all the time, plus clear rules on how the tech should work and proof that projects can actually succeed. Risks they mentioned keep coming up, especially around loans and getting paid back, and also how locals might not have the skills to keep things running long term. That part feels kind of tricky.

Economically, micro wind could work for households and small businesses in Sierra Leone, at least in theory. Still, without the government stepping in to set up some regulations or change those duties on imports, and maybe start a few test projects to show it all works, adoption probably won't happen fast. It might just leave the country behind others in the area when it comes to energy and growing industries. Some people argue it's not that simple though, with all the risks involved.

2. Introduction

For a small West African nation like Sierra Leone, access to reliable and affordable electricity is not merely a development goal but a fundamental prerequisite for economic transformation. The country suffers from one of the lowest electricity access rates on the continent, with only an estimated 21.1% of households connected to the grid (Khan and Koo, 2024). This chronic energy deficit creates a cascade of challenges, most acutely felt by Small and Medium Enterprises (SMEs). As the primary drivers of employment and economic activity, these businesses face a stark choice: either pause operations during frequent power outages or incur crippling costs for diesel generation. A prominent agribusiness CEO recently noted that 42% of his operational expenses are allocated to energy (Awoko Newspaper, 2025), a figure mirrored in the 12-42% range found in this study's SME survey.

While the energy challenge is severe, Sierra Leone is also endowed with significant, untapped renewable resources. ECREEE and GIZ (2020) mapping has identified viable wind patterns along the country's coastal regions and highlands, presenting a potential opportunity for distributed power generation, particularly through micro-wind turbines. Despite this potential, a critical research gap exists: no study has systematically examined the financial feasibility of micro-wind technology for SMEs and households in Sierra Leone, nor has it determined the willingness of key stakeholders -end-users and financiers to adopt or fund such projects.

This research directly addresses this gap by providing primary, policy-relevant data. It aims to inform the Ministry of Trade and Industry and other key stakeholders on the practicalities of integrating micro-wind technology into Sierra Leone's energy mix, with a specific focus on its potential to enhance SME productivity and competitiveness.

2.1 What is a micro-wind turbine?

A micro wind turbine is a small wind turbine that is designed for individual homes, small businesses or remote workshops. It can range in output from 100 Watts to 10 Kilowatts, this may mean powering lights, a freezer or electric tools. Compared with the large wind turbines we all see dotted around on wind farms these can be mounted on roofs or short towers. They will work best where wind speeds are constant and there is no or inconsistent grid supply. These are chosen in order to save on diesel costs or to keep things working where power is needed.

Figure: 2.1 A micro-wind turbine

Source: Sustainable Energy at a Height of 140Meters UASTW Test Micro-Wind

The impetus for this research stems from the nexus of three key policy objectives-(i) improving energy access; (ii) enhancing SME productivity; and (iii) expanding climate-resilient development, both globally and nationally. The government's MTNDP and 'Feed Salone' initiative place significant emphasis on energy access as an underpinning theme of economic transformation and agricultural intensification. Nevertheless, the current policy environment provides little direct support for the promotion and use of distributed renewable energy technologies such as micro-wind for productive uses for SMEs.

This research aims to address the existing policy gap by empirically demonstrating the economic feasibility of micro-wind technologies and identifying the necessary enabling conditions for its uptake. Its approach resonates with international endeavors such as Mission 300 and national policy such as the Energy Transition and Green Growth plan by contributing to diversified and sustainable energy systems.

2.2 Research Questions

This project seeks to answer the following key policy questions:

I. Is micro-wind technology economically feasible for SMEs and households in Sierra Leone?

II. What are the financial mechanisms and policy interventions needed to facilitate its adoption?

2.3 Contribution to MTNDP, Feed Salone, and the Energy-Climate Agenda

It directly supports the "Big Five Game Changers" outlined in the MTNDP, demonstrating how enhanced energy access can translate to lower production costs for SMEs, the development of agricultural value chains (via processing and irrigation), and the implementation of digital governance. The research also aligns with the Feed Salone agenda, showcasing how dependable, affordable energy can decrease post-harvest losses and allow for on-farm, community level, processing. Finally, due to the low-carbon nature of the study's technology, the research aids Sierra Leone's climate resilience efforts, by indicating how it may decrease reliance on costly and polluting diesel generators.

3.0 Background and Literature Review

This section situates the study within the broader literature on energy access, SME productivity, and renewable energy in developing economies.

The Energy Burden on SMEs

It is widely established that energy access can facilitate enterprise development. The high cost of, and unreliability of energy supply, can be a binding constraint on firm growth, by limiting working hours and production time, and constraining firms from investing in technology and labor (World Bank, 2024). Research in Africa has demonstrated that firms, unable to cope with an unreliable grid supply, may dedicate large portions of their revenues to self-generation and that this has been shown to draw capital away from their core business (Amoah et al., 2020). It is not surprising, therefore, that in this sample, respondents spent 10-40% of operating costs on energy.

3.1 Renewable Energy Potential and the Case for Micro-Wind

Distributed renewable energy (DRE) technologies, including home solar systems and mini-grids, have become an essential way to increase energy access across the African continent (IRENA, 2023). While the market is currently dominated by solar, wind energy is an untapped, small-scale technology that could also be highly valuable in this context. Mapping recently undertaken by ECREEE & GIZ (2020) indicates that coastal regions of Sierra Leone and areas within the country's highlands are suitable for the installation of small-scale wind turbines, which is confirmed by the global wind power tracker (Global Energy Monitor, 2025a). Similar wind energy projects have also been successful in other parts of West Africa (e.g., the Taiba N'Diaye wind farm in Senegal (Global Energy Monitor, 2025b)).

Despite the opportunities that DRE could offer, studies also consistently identify key barriers to its adoption including high upfront costs and lack of financing, as well as insufficient government policies and lack of technical standards (IFC, 2025; SEforALL, 2025). The contribution of this thesis is to present primary survey data specifically identifying these barriers within Sierra Leone.

3.2 The Conceptual Framework

This study is based on a framework wherein the introduction of micro wind into the existing renewable energy system, is an outcome of supply side enablers, (policy, financing and technology) and demand side motivators (savings, required reliability and willingness to pay). The model holds that a policy void represents a "wall" which separates a very large unmet latent demand from businesses and homes from a supply side, which lacks supporting financial mechanisms and policies. The end results would then be higher productivity levels of SMEs, cost reductions of households, and environment friendliness.

3.3 Comparative Analysis of Sierra Leone’s Micro-Wind Feasibility Study in the Context of West African Policy Frameworks

The conclusion reached by the micro-wind feasibility study for Sierra Leone mirrors ongoing developments in renewable energy integration within the wider region, but highlights clear policy gaps in relation to already developed policy frameworks in countries such as Ghana and Senegal and in ECOWAS. Three policy documents illustrate how these countries differ.

Ghana's 2019 Renewable Energy Master Plan is one of the most extensive in West Africa. For distributed renewable energy sources it includes targets for both 12MW mini-micro-grid capacity and 325MW utility-scale wind by 2030 (Global Energy Monitor, 2025). Notably, Ghana's policy does address the two barriers highlighted in the Sierra Leone study; high initial costs and absence of standards, through inclusion of financial incentives and standardized power purchase agreements (PPAs). In contrast to this detail, there is a complete lack of policy with regard to micro-wind in Sierra Leone.

Senegal's wind experience is a prime example of successful project development. The 158.7 MW Taiba N'Diaye wind farm, commissioned in 2020, is the first large-scale wind project in West Africa (Aera Group, n.d.). The success factors in Senegal can be split into the three key elements the Sierra Leone study has identified: a strong policy framework operated by the Ministry of Petroleum and Energy; competitive tenders, implemented under the Scaling Solar framework; and blended financing structures provided by D FIs (International Energy Agency, 2024). The IEA states that due to a lack of political risk and stable currency, Senegal secured an average cost of capital for utility-scale renewable energy projects at around 9%, a fraction that of many emerging markets. The lessons for Sierra Leone are that risks concerning both off-takers and grid access need to be overcome to attract private investment.

The ECOWAS Renewable Energy Policy (EREP) provides the framework within which national policies should be aligned. Approved in 2013, the policy outlines target values for wind power at both 318MW grid-connected wind in 2020 and 993MW wind by 2030 across ECOWAS (ECREEE, 2013). A policy update in 2023 restates a target for a 19% total wind and solar mix in 2030 that increases to 48% with hydropower also included (ECOWAS, 2023). Importantly, EREP advocates for stimulation of private sector investment in rural electrification, as well as the achievement of energy security through cross-border coordinated approaches. Sierra Leone has failed to translate regional policy into tangible action on micro-wind by failing to establish any micro-wind framework at all.

While Ghana demonstrates a clear policy road map, Senegal a practical model for financing and project implementation, and EREP a region-wide commitment; Sierra Leone currently has nothing equivalent for micro-wind technology. The regulatory uncertainties and lack of private developer involvement documented in the Sierra Leone study appear to be substantiated by these broader country comparisons, and policy clearly comes before investment.

4.0 Data and Methodology

Mixed Methods Data Collection & Analysis: Data collected were both quantitative and qualitative. These data were gathered in Sierra Leone during the 1st quarter of 2006. Data Sources The following three survey instruments were used for primary data collection. Household Survey: The household questionnaire (n=78) is included in Annex C; data collected ranged from energy expenditures to perceptions regarding renewable energy technologies and hindrances towards adoption of renewable energy sources. SME Survey: Semi-structured interviews were conducted with 17 SME owners involved in manufacturing, retailing, and agriculture among other industries to collect data regarding the impact of the high energy costs on their respective business, their energy expenditure, and their investment potential. Survey instrument is located in Annex A. Development Partners Survey: Interviews were held with 7 key informant development partners that included bilateral donors, multilateral agencies and financial institutions; this survey aimed at identifying current investments and the investment climate for micro wind technology among others. Survey instrument is included in Annex B.

4.1 Data Access and Challenges

Though it was possible to retrieve the needed data, difficulty in obtaining a representative national sample and a general unawareness of micro-wind technology within some segments of the population pose problems. There is also a chance of recall bias as both businesses and households report the data themselves.

4.2 Key Indicators and Variable Construction

Based on the survey answers, we compiled some key indicators such as primary source of power, average number of hours per day that are connected to the grid, cost per month of energy, percentage of operating cost that electricity represents, the receptivity of renewable sources of energy, and the factors that either enable or prevent their adoption.

4.3 Empirical Strategy and Analytical Methods

Descriptive statistics were performed on the survey quantitative data to reveal proportions and patterns. A thematic analysis was carried out on the interview qualitative data to extract the dominant themes, worries, and suggestions.

5.0 Results

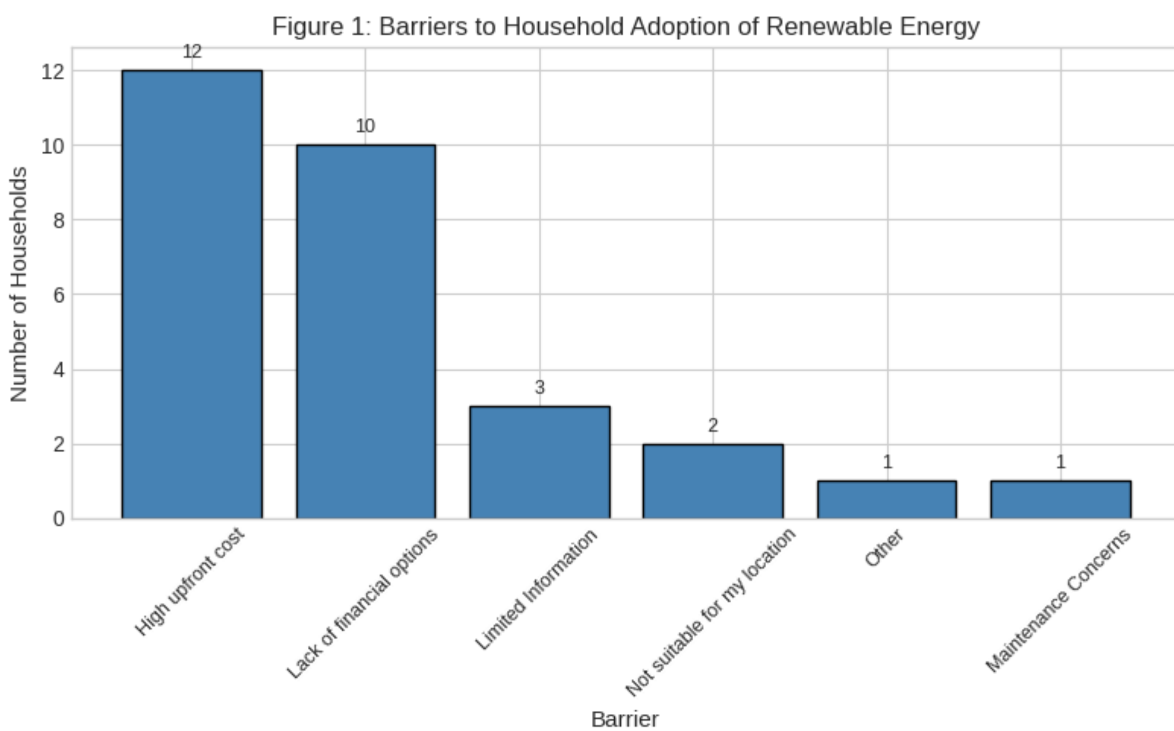
5.1 Household Energy Profile and Demand

The household survey reveals a population heavily reliant on an unreliable national grid, yet possessing a strong latent demand for renewable alternatives.

Table: 5.1 Barriers to Household Adoption of Renewable Energy (n=30)

Characteristic	Finding
Primary Source	87.2% (68/78) rely on national grid (EDSA)
Avg. Daily Grid Supply	6.4 Hours (range: 2-15 Hours)
Monthly energy cost	52.6% spend <Le 300; 24.4% spend > Le 800
Willingness to Adopt	82.1% are "definitely" or "Probably" willing
Primary Barrier	"High upfront cost" (39.7%) and "Lack of financial options" (26.9%)
Top Enabling factor	Government subsidy/grant or affordable loan/payment plan

Figure 5.1: Barriers to Household Adoption of Renewable Energy



Discussion: Despite 87.2 % relying on an unreliable grid (averaging 6.4 hours daily), 82.1% would adopt renewables. High upfront cost (39.7%) and lack of financing (26.9%) are the main barriers – a credit constraint, not unwillingness.

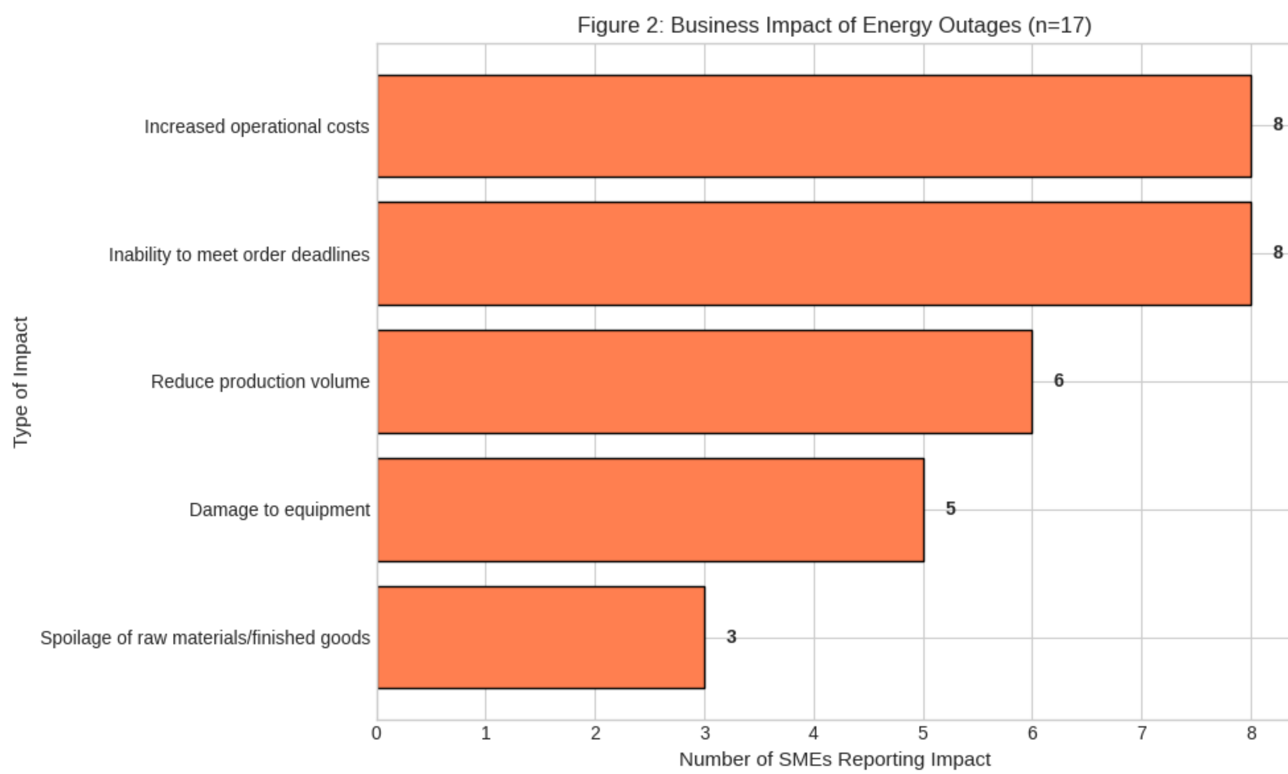
5.2 The SME Energy Burden

For the 17 SMEs surveyed, energy unreliability translates directly into financial losses and operational disruptions.

Table: 5.2 SME Energy Costs and Business Impacts (n=17)

Metric	Finding
Primary Power Source	13/17 (76.5%) use EDSA grid;12/17 (70.6%) also use generator
Energy Cost Burden	14/17 (82.4%) spend 10-40% of operational costs on energy
Monthly energy spent	9/17 (52.9%) spend more than Le 700,000 on fuel and electricity
Business Impact	All 17 reporting outages faced negative impacts; top impacts; top impact: "increased operational costs" (58.8%)
Willingness to Invest	16/17 (94.1%) are willing to invest in wind technology

Figure: 5.2 Business Impact of energy outages (n=17)



Discussion: Energy burden is heavy, 82.4% of the respondents use 10-40% of their total operating cost on energy with 52.9% of it costing more than Le 700 monthly. The consequences of outages include increased operating cost (47.1%), missed deadline (47.1%), decreased production (35.3%). Most surprisingly 94.1% of the respondents will invest in micro-wind with 64.7% saying "Definitely Yes", and many respondents are already paying more for diesel then loan payment.

5.3 Development Partners: Conditional Readiness

Development partners and financiers are willing to finance micro-wind, but their commitment is contingent upon an environment where policy and regulatory structures are stable and predictable.

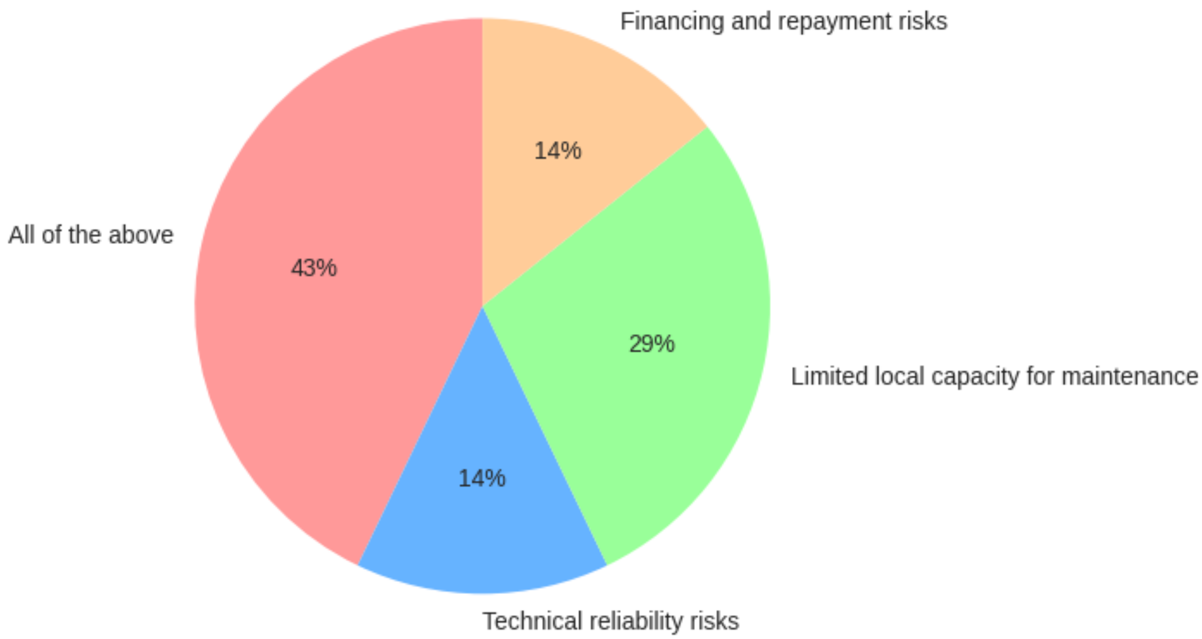
Table: 5.3 Development Partner conditions for Micro-Wind financing (n=7)

The risks considered in the survey are Technical reliability risks, Limited local capacity for maintenance, Market adoption risks, Policy and regulatory uncertainty, Financing and repayment risks.

Organization	Regulatory/ Standards	Key Risk	M&E Requirement
German Embassy	Gradual Introduction	All of the above	Combination
Univ. of Sierra Leone	Mandatory compliance	Technical reliability risks	Combination
University of Makeni	Mandatory compliance	Limited local maintenance capacity	Continuous monitoring
JICA	Mandatory compliance	All of the above	Combination
EcoBank SL	Mandatory compliance	All of the above	Results-based indicators
Access Bank	Flexible	Limited local maintenance capacity	Continuous monitoring
Orange SL	Mandatory compliance	Financing and repayment risks	Combination

Figure: 5.3 Key Perceived Risks to Micro-Wind Investment (n=7)

Figure 3: Key Perceived Risks to Micro-Wind Investment (n=7)



Pie chart showing: "Financing and repayment risks "43%, "Limited local maintenance capacity" 29%, "Technical reliability risks"14%, "All of the above "14%)

Discussion: Of the 7 partners, 86% would insist on mandatory technical standards. Critical risks are financing and repayment (43%), the lack of maintenance capabilities (29%) and the lack of technical reliability (14%), these could be addressed through regulation. Partners are prepared to fund this, but require clear policies.

5.4 Answering the Research Questions

Based on the evidence presented, the study answers its core research questions:

5.5 Is micro-wind technology economically feasible for SMEs and households in Sierra Leone?

Yes, it can, in principle. The resource is available. Household willingness to adopt is 83%, and SME willingness to invest is 88%-in fact, many already spend high monthly amounts on diesel. The problem isn't demand, or payment willingness; it's lack of cash and lack of demonstration projects that show the system really works to both the user and the lender. If it can be done on the right financial basis, then micro-wind has good cash flows to business owners.

What are the financial mechanisms and policy interventions needed to facilitate its adoption?

Critical in this respect is filling the existing policy vacuum. Development partners tie willingness to lend to certainty of regulation. This entails the following interventions:

Regulatory: technical standards, grid connection rules and installer certification systems;

Fiscal: Reclassify import tariffs to favor components over assembled products so as to stimulate local assembly and lower cost;

Financial: Utilize milestone-based grant funding (Millennium Challenge Corporation style) for pilot projects and end user financing mechanisms (loans or lease to own arrangements) that captures present energy consumption payments by households and enterprises.

Policy Implications and Recommendations

The Government of Sierra Leone, with the support of development actors, should address this market to enable micro-wind technologies to be deployed, based on the following three actions:

Develop a Regulatory Framework: The Ministry of Energy, with the EWRC, should develop and publicize quickly technical standards for small scale wind turbines, simple connection rules for grid access (where applicable), and a certification process for local installers. This would mitigate the risk "policy and regulatory uncertainty" pointed by partners.

Reform Import Duties: The Ministry of Finance should review the current import duties and, if necessary, apply tariff reform to reduce initial costs for micro-wind technology. Tariff preference should be applied for micro-wind components, not fully manufactured turbines. This policy would increase the demand for local assembly and maintenance industry, to address the risk of "limited local capacity for maintenance".

Pilot a Project and End User Financing: The government, with support from IGC and development partners should design and finance a pilot program of a small size for the development of micro-wind technology. The pilot program should:

Test feasibility and economic benefits: Install a few micro-wind turbines on selected SMEs located in regions with a higher potential for wind energy, and generate data on the real energy production and economic benefits.

Test a new financing mechanism: Team up with commercial banks, such as EcoBank or Access Bank, to pilot a scheme based on end-user financing (like an ESCO or lease-to-own). Loan reimbursement would be designed in such a way as to be less than current SME costs on diesel fuel.

Strengthen capacity: implement a module to train local technicians for installation, operation and maintenance of wind turbines.

5.6 Financial and Implementation Aspects: This policy agenda must have access to blended finance. The government would be responsible for policy making and possibly providing seed capital or tax incentives. Development partners are willing to participate to a pilot program through co-financing mechanism such as matched grants or results-based finance. Commercial finance will be available after technical and financial viability models are de-risked and proven.

5.7 Stakeholder Engagement and Influence

Engagement Process

This study was conducted as part of the IGC fellowship. Deep engagement with stakeholders. We held a meeting with the Ministry of Trade and Industry, our hosting policymaker, to ensure that research priorities met the needs of the policymaker. By engaging with 17 business owners and 78 households, we were able to gather on-the-ground data that ensures the policy recommendations are relevant and practical. Lastly, we conducted a frank dialogue with 7 development partners, to see risk and opportunity from the point of view of the financial community.

How Findings Inform Ongoing Strategies

These research findings have direct applications to the implementation of the MTNDP and National Energy Compact. The research on the energy burden on SMEs strongly supports focusing "productive use" approaches in energy access projects. The research on developer partner risk perceptions provides direct guidance to the government on de-risking the sector and attracting investment. This is the evidence base upon which a micro-wind specific policy and investment framework can be developed.

6.0 Conclusion and Areas for Further Research

This report concludes micro-wind technology represents an available, though unrealized opportunity to improve energy access and the productivity of SMEs in Sierra Leone. This paper concludes there is demand for micro-wind technology, but the constraint is not in a lack of willingness to pay, rather it lies in the lack of financing and in the lack of policy framework. This same barrier affects households and SMEs alike-capital. Donors are willing to get involved but they need to see that government has reduced policy risks first.

If the policies and interventions described are put in place, they should be able to leverage the demand in the country into bankable projects, and turn the high monthly payment for energy into income generating assets both at the household level and at the business level. If they are not, Sierra Leone will remain in the background as compared to neighboring countries, at both the household level and the industry level.

6.1 Limitations

The sample size is quite small, which, in addition to the location of the sample, limits the extent to which the conclusions can be applied. There is also no operational data from an operational micro-wind project in Sierra Leone, therefore, analysis of economic feasibility relies on estimations of future costs and future savings.

6.2 Areas for Further Research

Future work needs to include:

The detailed technical feasibility study that would include ground-based wind resource estimation at particular pilot sites.

Execution of the pilot study that would provide real world data regarding technical feasibility, economic profitability and social advantages of micro-wind installations at SME level and home use.

Assessing the opportunity to develop local supply chains for production and manufacturing and maintenance of wind turbine components.

6.3 References

Books

Pinto, R. (2020). Wind energy technology. Routledge.

Journal Articles

2. Hur, J. (2019). Energy entrepreneurship and economic development. Journal of Development Entrepreneurship, 24(3). https://doi.org/10.1142/S1084946719500209

3. Amoah, A., Kwablah, E., Korle, K., & Offei, D. (2020). Renewable energy consumption in Africa: The role of economic well-being and economic freedom. Energy, Sustainability and Society, 10(1), 32. https://doi.org/10.1186/s13705-020-00264-3

4. Khan, I., Zakari, A., Dagar, V., & Singh, S. (2022). World energy trilemma and transformative energy developments as determinants of economic growth amid environmental sustainability. Energy Economics, 108, 105884. https://doi.org/10.1016/j.eneco.2022.105884

5. Panja, A., Paul, S., & Jha, P. (2025). Aligning Africa's renewable energy sector with sustainable development goals: Opportunities and challenges. Sustainable Futures, 9(2), 100717. https://doi.org/10.1016/j.sftr.2025.100717

Reports and Working Papers

6. AIPRO. (2020). Renewable energy entrepreneurship in West Africa.

7. Gbadegesin, A. C. B. (2024). Freetown city energy profile.

8. Bacovsky, D. (2024). Bioenergy accelerating to net zero: Chair of the IEA Bioenergy TCP in 2024. IEA Bioenergy.

9. ECREEE & GIZ. (2020). Sierra Leone wind and solar resource mapping. ECREEE.

10. International Energy Agency. (2024). World energy outlook 2024. https://www.iea.org/terms

11. Government of Sierra Leone. (2022). SeeForALL final report.

12. International Energy Agency. (2024). World energy outlook 2024. https://www.iea.org/terms

13. IFC. (2025, October 16). IFC partners with Release by Scatec to boost affordable power in Liberia and Sierra Leone [Press release]. https://www.ifc.org/en/pressroom/2025/ifc-partners-with-release-by-scatec-to-boost-affordable-power-in-liberia-and-sierr

14. International Growth Centre. (2025). Powering inclusive growth. https://www.theigc.org/

15. IRENA. (2023). World energy transitions outlook 2023: 1.5°C pathway. International Renewable Energy Agency.

16. Chang, K. (2024). Addressing systemic electricity distribution and supply issues in Sierra Leone.

17. Khan, S., & Koo, B. B. (2024). Sierra Leone: Beyond connections. World Bank. https://www.worldbank.org/en/topic/energy/publication/beyond-connections-energy-access-redefined

18. Kiley, F., Caulker, D., Collier, W., Fields, N., Blyth, W., Quirós-Tortós, J., & Howells, M. (2024). Energy modelling in Sierra Leone: Data-in-brief specifications table. Zenodo. https://doi.org/10.5281/zenodo.10974793

19. SEforALL. (2023). SeeForAll report 2023.

20. SEforALL. (2025, October 21). SOGREA Initiative launches €22 million facility [Press release]. https://www.seforall.org/taxonomy/term/200?page=0

21. University of Bristol. (2024, November 15). Reducing reliance on traditional fuels. Research Brief.

22. World Bank. (2024). World Bank Sierra Leone economic update 2024.

23. World Bank. (2025). Enhancing Sierra Leone energy access. https://www.worldbank.org/en/country/sierraleone

24. World Bank & AFDB. (2024). National energy compact for the Republic of Sierra Leone.

News Articles

25. AYV News. (2025, October 16). Dr. Yumkella updates Parliament on energy. AYV News. https://ayvnews.com/dr-yumkella-updates-parliament-on-energy/

26. Awoko Newspaper. (2025, June 19). Conteh sounds alarm on infrastructure gaps. Awoko Newspaper.

27. Saur Energy. (2026, January 20). GCL Group, Swiber Africa to develop 4 GW projects in Nigeria. Saur Energy International. https://www.saurenergy.com/solar-energy-news/gcl-group-swiber-africa-to-develop-4-gw-projects-in-nigeria

Policy Documents

28. Global Renewables Congress. (2026). Ghana's renewable energy policy reforms. https://renewablescongress.org/2026/02/ghana-showcases-governance-driven-renewable-energy-transition-at-irena-legislators-and-regulators-forum-2026/

Online Databases and Trackers

29. Global Energy Monitor. (2025). Global wind power tracker. https://globalenergymonitor.org/projects/global-wind-power-tracker/

30. Global Energy Monitor. (2025). Taiba N'Diaye wind farm profile. https://www.gem.wiki/Taiba_N'Diaye_wind_farm6.4 Appendices

6.4 Appendices

Appendix A: SME Energy Use & Renewable Energy Feasibility Survey

Interviewer: Sir Prince Malcolm Nuni, IGC Research Fellow

Date: _________________

Location: _________________ (District)

SME ID: _________

Part A: Business Profile

Business name: _________________________

Sector/primary activity: _________________________

Year established: _________

Number of full-time employees: _________

Estimated annual turnover (Leones):

[ ] < 50 Million

[ ] 50 – 200 Million

[ ] 200 Million – 1 Billion

[ ] > 1 Billion

Part B: Energy Use and Costs

6. What is your primary source of power for machinery/operations?

[ ] EDSA Grid

[ ] Diesel/Petrol Generator

[ ] Solar System

[ ] Battery (Inverter)

[ ] Other: _________

7. If you use the grid, how many hours of power do you receive on a typical day? _________ hrs

8. What is your average monthly expenditure on each of the following?

a. EDSA Bill: Le _________

b. Fuel for Generator: Le _________

c. Other Energy (batteries, charcoal): Le _________

9. What percentage of your total monthly operational costs is spent on energy?

[ ] <10%

[ ] 10-20%

[ ] 20-40%

[ ] >40%

10. How do power outages affect your business? (Select all that apply)

[ ] Reduced production volume

[ ] Damage to equipment

[ ] Spoilage of raw materials/finished goods

[ ] Inability to meet order deadlines

[ ] Increased operational costs

Part C: Renewable Energy Awareness & Feasibility

11. Are you aware of small-scale wind energy systems (e.g., a small turbine for a workshop)?

[ ] Yes

[ ] No

12. If a reliable system could reduce your energy costs by 50% over 5 years, would you consider investing?

[ ] Definitely Yes

[ ] Probably Yes

[ ] Unsure

[ ] Probably No

If No/Unsure, what is the main reason? _________

13. What do you see as the biggest barrier to adopting such technology?

[ ] High upfront cost

[ ] Lack of financing

[ ] Unfamiliar with the technology

[ ] Concerns about maintenance/reliability

[ ] Not suitable for my location

14. What form of support would make an investment possible? (Rank 1-4, 1=most important)

[ ] Government subsidy/grant

[ ] Low-interest loan

[ ] Technical training for my staff

[ ] Warranty and reliable service provider

Part D: Policy and Regulatory Environment

15. Have you imported any machinery or equipment in the last 3 years?

[ ] Yes

[ ] No

If Yes, how would you describe the process of clearing it through customs? _________

16. In your view, what is the single most important action the Government could take to help your business with its energy needs?

____

Thank you for your time and valuable insights

Appendix B: Development Partner Survey

Renewable Energy and SME Productivity – Sierra Leone

Interviewer: Sir Prince Malcolm Nuni, IGC Research Fellow

Date: ____________________________

Location: ____________________________(District)

Name of Development Partner Organization: ____________________________________

Name and Position of Person Interviewed: _______________________________________

Please select the most appropriate response for each question.

1. Does your organisation currently support SME development or renewable energy initiatives in Sierra Leone?

- A. Yes – SME development only
- B. Yes – Renewable energy only
- C. Yes – Both SME and renewable energy
- D. No, but considering engagement
- E. No current involvement

2. Have you funded productive-use renewable energy programmes in comparable markets?

- A. Yes – Multiple programmes
- B. Yes – One or two programmes
- C. Currently exploring opportunities
- D. No prior experience

3. What financing models have proven effective for SME-scale renewable investments?

- A. Grants
- B. Concessional loans
- C. Results-based financing (RBF)
- D. Blended finance (grant + debt/equity)
- E. Public-private partnerships (PPP)
- F. Other (please specify)

4. Would your organisation consider co-funding a matched grant or results-based financing scheme?

- A. Yes – Matched grant only
- B. Yes – Results-based financing only
- C. Yes – Open to either model
- D. Possibly, subject to due diligence
- E. No

5. What safeguards are necessary to ensure accountability in grant-based schemes?

- A. Independent financial audits
- B. Performance-based disbursement
- C. Third-party technical verification
- D. Digital monitoring and reporting systems
- E. All of the above

6. How can renewable energy support broader industrial competitiveness objectives?

- A. Reducing production costs
- B. Improving reliability of operations
- C. Enhancing export competitiveness
- D. Supporting green industrialisation goals
- E. All of the above

7. What role should technical standards and certification play in programme design?

- A. Mandatory compliance requirement
- B. Recommended but flexible
- C. Gradual introduction over time
- D. Limited role at pilot stage

8. How should monitoring and evaluation be structured for impact measurement?

- A. Baseline and endline assessments
- B. Continuous real-time monitoring
- C. Results-based performance indicators
- D. Independent third-party evaluation
- E. Combination of the above

9. What risks do you foresee in supporting micro-wind technology?

- A. Technical reliability risks
- B. Limited local capacity for maintenance
- C. Market adoption risks
- D. Policy and regulatory uncertainty
- E. Financing and repayment risks

- F. All of the above

10. What conditions would make your organisation willing to participate in a pilot initiative?

- A. Clear regulatory framework
- B. Strong local implementation partner
- C. Co-financing commitments secured
- D. Demonstrated technical feasibility
- E. Robust monitoring and accountability mechanisms
- F. All of the above

Appendix C: Household Renewable Energy Consumption Survey

Sierra Leone
Interviewer Name: Sir Prince Malcolm Nuni, IGC Research Fellow
Date: ____________________________
Location: ______________________________(District)
Household Address: ____________________________
Contact (Phone)/Email:__________________________________
Please answer the following questions. Tick the appropriate option where applicable.

Section A: Household Profile
1. Gender of household head:
A. Male
B. Female
C. Prefer not to say

2. Age of household head:
A. 18–30
B. 31–45
C. 46–60
D. 60+

3. Household size (number of people living in the household): _________

4. Main source of household income:
A. Salary/Wages
B. Self-employment/Business
C. Farming/Fishing
D. Remittances
E. Other: __________

Section B: Current Energy Use

5. What is your primary source of electricity?
A. National Grid (EDSA)
B. Diesel/Petrol Generator
C. Solar Home System
D. Battery/Inverter
E. No electricity access
F. Other: __________
6. On average, how many hours of electricity do you receive per day? _________ hours
7. What is your average monthly spending on energy (electricity, fuel, batteries)?
A. Less than Le 300
B. Le 300 – 800
C. Le 800 – 1,500
D. Above Le 1,500
8. What energy sources do you use for cooking? (Select all that apply)
A. Charcoal
B. Firewood
C. Gas (LPG)
D. Electricity
E. Other: __________

Section C: Renewable Energy Awareness and Adoption

9. Are you aware of renewable energy systems such as solar panels or small wind turbines?
A. Yes
B. No
10. Does your household currently use any renewable energy system?
A. Yes – Solar
B. Yes – Wind
C. Yes – Other
D. No
11. If renewable energy could reduce your energy expenses significantly over time, would you consider adopting it?
A. Definitely Yes
B. Probably Yes
C. Not Sure
D. Probably No
12. What is the main barrier to adopting renewable energy in your household?
A. High upfront cost
B. Lack of financing options
C. Limited information
D. Maintenance concerns
E. Not suitable for my location
F. Other: __________

13. What type of support would make adoption possible?

A. Government subsidy or grant
B. Affordable loan or payment plan
C. Technical installation support
D. Warranty and after-sales service
E. Community awareness programmes

Section D: Perceptions and Policy

14. Do you believe renewable energy improves household living conditions?
A. Strongly Agree
B. Agree
C. Neutral
D. Disagree
E. Strongly Disagree

15. In your opinion, what is the most important action Government should take to expand household renewable energy access?

____

____

theigc.org