

**NATIONAL SCIENCE, TECHNOLOGY, AND  
INNOVATION COUNCIL  
(NSTIC)**

**Project Theme:**

**Promotion of Innovative Energy Solutions**

**Project Title**

**Development of a Biogas Plant for Conversion of Solid Waste to Gas for Cooking and Heating in  
Kenema**

**-A Demonstration Project-**

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## **1.1 Project implementation**

Activities involved in implementation are presented herein.

### **1.1.1 Site selection**

Main objective of selecting the site of the biogas plant is its suitability for purpose and closeness to dump site including accessibility by both human and vehicular traffic.

### **1.1.2 Construction and installation procedures**

- I. The design and production methods will be flexible and can be easily adapted to the local community and other communities in the country.
- II. The Team will make use of local expertise and knowledge throughout the process, but can collaborate and consult with international experts as and when the need arises.

### **1.1.3 Monitoring and improvement**

- I. Data collection from operators and users of biogas produced and gas cooking stove with the aim of improving efficiency.
- II. Pollution emission monitoring of the system to assess suitability of produced gas on health of users and the environment.
- III. Monitor collection and sorting of wastes and operations of the plant to protect operatives and other relevant workers of the system.

## **1.2 Training and capacity building**

The objective of this section is to: offer training to wastes handling workers, and students in technical colleges and universities.

### **1.2.1 Workshops and training sessions**

- I. Conduct practical training sessions for operatives involved so that repairs and maintenance can be carried out when required.
- II. Conduct workshops for non-technical employees of the plants to highlight importance of wastes and its effects on health and the environment if disposed inappropriately.
- III. Provide internship for students with the aim of increasing skills and knowledge base of the community.

### **1.2.2 Community engagement**

Continuous engagement with the community to provide relevant information regarding skills and knowledge needed to convert wastes into essential products that can be used to generate income

### **1.3 Participation of potential customers/consumers**

The objective is to assess the relevance of engaging with potential customers/consumers as primary stakeholders of the project. The activities involved are presented hereafter.

#### **1.3.1 Community meetings**

Update stakeholders regarding progress of the project through regular community meetings

Collect information from customers on performance of the product in order to make improvements where needed.

#### **1.3.2 Objective: involve the private sector in the project**

Involve private sector businesses to discuss business opportunities and encourage contributions to improve efficiency and effectiveness of the plant.

#### **1.3.3 Technological transfer and collaborative decision-making**

- I. Establish consultative decision-making process to foster better design and improvement in output.
- II. Foster better understanding of the concept and performance of the plant and stove to enable easier replication in other areas of the country for commercial purposes.

### **1.4 Data collection and analysis**

Objective: monitor and analyze performance of the plant and gas cooking stove. Activities involved are as outlined hereunder.

#### **1.4.1 4.5.1. Data collection instruments**

Use sensitive weighing machine to record accurate weights of wastes brought to the site, and install metering devices to monitor and collect data on energy produced.

#### **1.4.2 Data analysis tools**

- I. Use data analyses software such as Microsoft, ANSYS fluent, TRANSYS, HOMER, Statistical Package for Social Sciences to analyse collected data and to make predictions, using the model, for future production and usage.
- II. Both qualitative and quantitative data collection and analyses to determine outcomes of plant and gas cooking stove produced.

### 1.4.3 Data archiving, access and sharing

- I. Adhere to regulations provided by both local and national authorities regarding privacy and compliance on how to share collected data.
- II. Provide access to authorized employees and relevant stakeholders to collected and stored data.
- III. Guarantee ethical standards on policies regarding data retentions and compliance.

## 2 Knowledge Utilization and Dissemination

The target audience includes the academic community, researchers, industries, community members, government officials, policymakers, think tanks, private sector entities, the public, businesses, distributors, online community, and media outlets. The dissemination plan for the project employs a multifaceted approach to share and apply project insights. Scientific publications will target academic communities, contributing to the research domain, while technical reports and guidelines will be crafted for agricultural services and engineers. User-friendly training materials will empower local communities, with public awareness campaigns ensuring broader community understanding. Private sector collaboration will be emphasized through workshops, aiming to facilitate technology transfer. Policy influence is pursued through workshops and briefs targeted at policymakers and community-led advocacy. Media engagement strategies will include press releases and social media campaigns for wider public outreach. Open Access compliance aligns with principles of inclusivity, and making research findings readily accessible. This approach ensures a comprehensive and targeted dissemination strategy to maximize the impact of the solar-powered bioreactor for methane gas generation from solid waste in Sierra Leone.

**Table 1: Awareness/Dissemination Plan for Year 1**

Dates	Activity	Description of the activity
November 2023-January 2024	Building a stakeholder forum	The Team will meet with NSTIC and other Government stakeholders to present this intervention and its benefits to Sierra Leone. The forum will meet every 3 months thereafter for continuous reporting of implementation progress.
February-March 2024	Meeting the local leadership of the implementation region	The Team will meet with Paramount chiefs, locals in villages and Kenema District Councillors of the demonstration region. These meetings and presentations will be held to build support from the local leadership.
April 2024	Community sensitization events	Events to be attended by community members, local leadership. The Team, NSTIC, affected Ministries and other governmental and non-governmental agencies.

<b>Dates</b>	<b>Activity</b>	<b>Description of the activity</b>
May –June 2024	Preparation and presentation of mid-year report on the biogas plant and gas cooking stove development	By the Team.
July-December 2024	Social events around Kenema District	Visit to schools, hospitals, and religious houses of warship, traditional leaders, youth and women’s organizations and other NGOs operating in the region on sensitization activities. By the team.
July-December 2024	Science awareness	Drafting and publishing of high impact journal papers, conference papers, book chapters and books by the Team.
December 2024	Preparation and presentation of yearend report on the biogas plant and gas cooking stove development	By the Team.

**Table 2: Awareness/Dissemination Plan for Year 2**

<b>Dates</b>	<b>Activity</b>	<b>Description of the activity</b>
January-February 2025	Stakeholder forum meeting on the biogas plant and gas cooking stove development	Consolidation of year 1 implementation activities and review of project work plans for year 2.
March 2025	Demonstration event at the chosen project implementation site – biogas plant	Event to be attended by community members, local leadership, and Sierra Leone Government.
April 2025	Demonstration event at the chosen project implementation site – gas cooking stove	Event to be attended by community members, local leadership, and Sierra Leone Government.
May –June 2025	Preparation and presentation of mid-year report on the biogas plant and gas cooking stove development	By the Team.
July-September 2025	Social events	Visit to schools, hospitals, and religious houses of warship, traditional leaders, youth and women’s organizations and other NGOs operating in the region on sensitization activities.
July- September 2025	Science awareness on the biogas plant and gas cooking stove development	Drafting and publishing of journal papers, conference papers, book chapters and books by the Team.
September 2025	Preparation and presentation of project closing report	By the Team.

**Table 3: Monitoring and Evaluation Strategy**

Indicator	Description of the indicator	How the indicator will be tracked over the duration of the project to show impact
Scheduling	Timelines for implementation, dissemination, and reporting	<ul style="list-style-type: none"> <li>Targets for each phase of the implementation and demonstration met and reported on timeously.</li> </ul>
Awareness	Understanding of the value and benefit of the biogas plant and cooking stove by the locals in the implementation region	<ul style="list-style-type: none"> <li>Number of sensitization events held.</li> <li>Number of varied locations for events.</li> <li>Number of community members participating in each event.</li> </ul>
Solid waste collection	Improvement in environmental sanitation from effective collection of solid waste in the implementation region	<ul style="list-style-type: none"> <li>Reduction in harmful effect of decaying solid waste in the demonstration region.</li> <li>Cleanliness of the street drainages of the city of Kenema.</li> <li>Reduction in air pollution from burning solid waste.</li> </ul>
Biogas generation	Collection and storage of biogas from the plant	<ul style="list-style-type: none"> <li>Quantity of biogas collected and stored in large tanks, as reported by the installed gas flow meters.</li> <li>Regularity of maintenance and servicing of the gas plant.</li> <li>Review of tank capacity informed by quantity of gas generated by the plant.</li> </ul>
Gas cooking stove	Generated gas used in the gas stove for cooking and heating	<ul style="list-style-type: none"> <li>Number of households replacing cooking mechanism with gas cooking stove.</li> <li>Level of reduction in deforestation in Kenema district over 5 years from date of introduction of gas cooking stove.</li> </ul>
Environmental impact assessment	Air, land and water pollution from solid waste	<ul style="list-style-type: none"> <li>Regular report of solid waste collection volume.</li> <li>Air quality from reduction in burning of solid waste.</li> <li>Land and water free of decaying solid waste.</li> </ul>

**Table 4: Risks and Mitigations**

Risks	Description	Mitigation
Lack of electricity during installation work	Blackouts, power outages can affect the installation work	Power banks and/or generators will be used by the industry implementation



<b>Risks</b>	<b>Description</b>	<b>Mitigation</b>
		partners. This will also reduce power bills on home dwellers at the installation sites
Theft and vandalism	There is a risk of some community members stealing installed components	Local industry partners will install burglar bars, cages with good protection mechanisms. Community sensitization activities will be held to develop a sense of community ownership of the installations.
Dust and smoke pollution	Due to dusty roads traversed by vehicular traffic and the burning of grass and domestic waste in the villages	The biogas plant and gas cooking stove will be inbuilt with dust proofs, while all filters and flow meters have protective covers. Half yearly maintenance will be undertaken at the installation site.
Religious and traditional practices	Arising from belief systems and cultural practices, some communities may not be open to some developmental activities	The Team has been carefully selected to have members from all regions around the country where installations will take place. They will advise on the belief systems of their communities. The Team will then hold meetings with community leaders, local and traditional leadership, and religious leadership to discuss the benefits of this project to their localities