

PROMOTING CLIMATE RESILIENT URBAN SANITATION THROUGH COMMUNITY-BASED WASTE MANAGEMENT SYSTEMS: PHASE 2

BACKGROUND

The consumption of firewood and charcoal for cooking in Sierra Leone is unsustainable. The demand for this biomass fuel for cooking already exceeds the regrowth rate of forest cover and this demand will be further increased by projected population growth. This will accelerate deforestation and deplete the nation's 2.726 million hectares of forest and woodland reserves in the coming decades.

The Freetown mudslide in August 2017 served as a stark example of the devastating effect that deforestation can have on people's lives, as deforestation, soil erosion and subsequent landslides wreak havoc. Additionally, deforestation in Sierra Leone has been seen to negatively affect the nation's capacity to produce hydro-electric power, as the reduction in forest cover produces changes in precipitation and river levels. This too has produced significant social and economic losses in effected localities.

In the years to come, households in Sierra Leone will keep using wood fuel as their main source of energy for cooking due to the country's low rate of electrification, lack of oil production, and weak economy. But this pressure on wood resources can be reduced by turning to alternative biofuels such as HomeBiogas.



Stage of innovation



Ideation and piloting



Validation ✓



Scaling

WHAT IS THE INNOVATION ABOUT?

HomeBiogas is a technology whereby organic waste—such as food scraps, animal dung, and human waste—is dumped into a specific bag, and after being broken down by bacteria, produces a gas that can be used for cooking. This gas can be used for cooking. HomeBiogas is an established waste-to-energy method that reduces environmental footprints, which has a positive impact in terms of climate change mitigation and sustainability.

Since January 2023, GOAL has been running the HomeBiogas technology in Freetown, Sierra Leone, as part of its ongoing urban WASH strategy. The innovation introduces vulnerable and hard-to-reach communities to a product that significantly improves their livelihoods, whilst at the same time addressing waste management and deforestation issues through its decentralized concept. As this innovation is aimed at bottom-of-the-pyramid consumers, GOAL is developing a substitute for the Homebiogas imported bags utilising locally available materials that are less expensive than the imported bags.

This locally produced HomeBiogas, is being tested in various sizes to determine which is most effective and suitable for the market. Furthermore, a variety of life-impact business models will be evaluated in order to address the needs and preferences of marginalized communities residing in remote locations.



Kingtom, Sierra Leone
Credits: GOAL

Freetown

IMPACT

During the first phase of innovation development, GOAL Sierra Leone purchased and tested eight HomeBiogas units at the Faecal Sludge Management Plant in Kingtom. The testing process was very successful, with flammable methane gas produced after 10 days activation - adding 400kg of organic waste mixed with water into the HomeBiogas system.

Since the activation process in January 2023, the system has been running to date without any technical challenges, and the feeding is carried out weekly using organic waste from the vegetable market. Moreover, for every 40 liters of waste slurry that is bagged, an equal volume of highly nutritional and pathogen-free effluent is produced. This effluent - called 'bio-fertilizer' - can then be used in agriculture.

So far, this technology has shown promising results, and stakeholder feedback has been very positive. HomeBiogas has the potential to reduce poverty, deforestation, and greenhouse gas emissions from the uncontrolled decomposition of waste, thus contributing to climate-resilient urban communities.

POTENTIAL TO SCALE

The innovation is between the validation and scaling stages. The validation of HomeBiogas units is taking place in Freetown and involves seven end users, including five households (from three informal settlements and two planned areas), one restaurant, and one hotel. The selection process has been facilitated by the Freetown City Council using the following three key criteria: willingness to adopt the technology; availability and quality of waste to feed the technology; and security of the land where the technology will be placed.

The intervention is set to be implemented in different cities of **Sierra Leone starting from Freetown which counts more than 15% of Sierra Leone population.**

Before scaling this innovation, GOAL will assess these units' performance and work to ensure that the technology works well and lasts over time, considering factors such as how often it is fed with organic waste, how much space is needed, how users manage the waste that comes out of it, and how to prevent problems. Moreover, GOAL Sierra Leone is completing the construction of a mobile toilet that will be connected to HomeBiogas to evaluate the effectiveness of the use of faecal matter to feed this technology. Laboratory results will be used to benchmark the performance of HomeBiogas using different types of organic waste and assess related public health issues that may be related.

According to the United Nations 2022 ^[3], in 2020, about 1 in 4 people worldwide - more than 1 billion people - lived in slums or informal settlements and 3.5 billion people lacked access to safe sanitation. HomeBiogas has proven to be an innovative solution that can contribute to transforming these vulnerable and informal settlements into climate-resilient urban communities.



[3] The Sustainable Development Goals Report (2022) Retrieved from <https://unstats.un.org/sdgs/report/2022/>

NEXT STEPS

GOAL Sierra Leone plans to conduct a technology awareness campaign prior to field validation. The campaign aims to collect information about community perceptions, as HomeBiogas is new in Sierra Leone. Social marketing approaches based on this information will aim to engage stakeholders and reduce the risk of the technology being rejected by building awareness, understanding and trust. The campaign will involve government stakeholders including the Ministry of Energy, Ministry of Environment and Climate Change, Freetown Town Council, as well as community members and private sector actors. The campaign will be followed by deployment of seven HomeBiogas units in selected locations.

Based on the type of settlement, economic activity and type of waste generated, end users for HomeBiogas will be identified in the following market segments and respective life-impact business models will be developed accordingly.

- Public spaces that are managed by the private sector under the authority of the Freetown City Council. This may include green entertainment places, public car parks or bus stops, bus terminals and stations, markets, show grounds and public toilets.
- Restaurants and hotels which are deemed to be the main producers of food or organic waste.
- Schools where cooking is required (e.g., boarding schools.)
- Grouped settlements such as apartments where landlords are instrumental in acquiring the technology. The landlords will be encouraged to invest in the technology and adopt the metered system for the gas to distribute gas to tenants who usually have limited purchase power.
- Individual households target individual

compounds and households in high end. Before opportunities are presented to investors, these markets will be tested using the current HomeBiogas bags to see how well they can manage the technology in terms of operations and maintenance.



Kingtom, Sierra Leone
Credits: GOAL

HOW CAN YOU GET INVOLVED?

If you are interested in supporting our innovation with financial contributions or providing technical guidance, please contact:

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Innovating to Overcome Humanitarian Crisis

The GOAL Programme Innovation Lab is a dynamic and collaborative unit established by GOAL to foster innovation within GOAL's programmes and to promote this work both internally and externally with the wider development and humanitarian community.

To get involved or find ways to support our innovations, please visit goalglobal.org/innovation and/or contact: innovationlab@goal.ie



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The GOAL Humanitarian Innovation Fund is designed as a dynamic collaborative process through which strategic partners can engage and provide support to foster innovations which have the potential to enable marginalised populations to overcome humanitarian crisis.

The Innovation Fund is a vehicle for strategic partners who are passionate about how innovation can be applied to overcome humanitarian crisis to support efforts to move communities from Crisis to Resilience. Partners from across the full spectrum of society are invited to engage, including from the those from the private sector, philanthropy, civil society, academic institutions and government bodies.

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