



## Cows to Kilowatts

### Ibadan, Nigeria



#### Partners

Global Network for  
Environment and Economic  
Development Research, Nigeria  
(NGO)

Biogas Technology Research  
Centre, KMUTT, Thonburi,  
Thailand (Research Institute)

Centre for Youth, Family and  
the Law, Nigeria  
(Community-based  
Organization)

Sustainable Ibadan Project,  
Nigeria (UN-HABITAT  
Programme)

**A local NGO and a community-based organization join with technology innovators from Thailand and the Sustainable Ibadan Project to install a biogas plant running on abattoir effluents to create a source of domestic energy, abate pollution and mitigate greenhouse gas emissions.**

Greenhouse gas emission and pollution are two serious environmental side-effects of abattoirs. Abattoir effluent critically impacts human health, agriculture, potable water and the ecology of aquatic species and has become a significant problem for many urban communities in Nigeria.

There are currently no waste treatment plants for abattoirs in Nigeria. Legislation for the protection of water sources is inadequate and there is no clearly established, coordinated policy framework to tackle water pollution and greenhouse gas emission.

The partnership aims to abate pollution and mitigate greenhouse gas emission by constructing a biogas plant. The plant treats wastewater and produces biogas (mainly methane and carbon dioxide) using the anaerobic fixed film (AFF) biogas technology. The biogas will be upgraded, compressed and used as a substitute for natural gas in household cooking. It could also be used to generate electricity. The sludge from the reactor will be used as organic fertilizer.

It is estimated that the biogas produced would cost households half the current market price of natural gas. The pilot plant in Ibadan will be the first in the world to simultaneously treat abattoir effluent and provide domestic energy and organic fertilizer.

Each partner in this cross-continental collaboration has a clearly defined role. The NGO initiated and coordinates the project. The plant will be designed by the Thai research institute and the construction of the plant will be carried out using local manpower and materials. The community-based organization is working to engage local stakeholder groups. Once the construction of the plant is complete, it will be managed by the Sustainable Ibadan Project, a UN-HABITAT initiative.

The biogas plant is expected to return a profit on the initial investment within three years and will have a productive life of fifteen years. It has tremendous potential to be replicated in other urban areas of Nigeria, across Africa, and beyond.



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<b>Project Investment Appraisal and Financial Sustainability Analysis using using Discounted Pay-back Method</b>	
<b>Nature of the Abattoir</b>	<b>Design Parameters</b>
Chemical Oxygen Demand (COD)	4,000 mg/l
Wastewater Volume	3,500 m <sup>3</sup> /day
Size of the AFF Biogas Reactor	5000 m <sup>3</sup>
Estimated Land Area Required	0.08 Hectares
Biogas Production Rate	1,500 m <sup>3</sup> /day
Equivalent Volume of Biogas (Pure Methane)	900 m <sup>3</sup> /day
Equivalent Volume of Compressed Biogas (Pure Methane)	4.5 m <sup>3</sup> /day (4,500 Litres/day)
Size of Household Gas Cylinder	25 Litres
Total Number of 25 Litres Gas Produced	180 No. of 25 Litres/day
Price of 25 Litres Compressed Natural Gas in Nigeria	USD 30
Proposed Price of 25 Litres Compressed Biogas	USD 7.50
Cost of the AFF reactor Biogas Reactor	USD 60 / m <sup>3</sup> of the Reactor
Cost of the 5000 m <sup>3</sup> AFF reactor Biogas Reactor	USD 300,000
Cost of Appurtenances for the Biogas Plant	USD 120,000
<b>Total Cost of the Biogas Plant</b>	<b>USD 420,000</b>
<b>Capital Budgetting</b>	<b>Cash Flow</b>
Estimated Daily Revenue from the Household Cooking Gas	USD 1,350
Estimated Monthly Revenue from the Household Cooking Gas	USD 32,400
Estimated Annual Revenue from the Household Cooking Gas	USD 388,800
Proposed Annual Operation and Maintenance (O &M) Costs	USD 77,760
	<b>Present Value of Cash Flow</b>
Discounted Annual Revenue (Less Annual O & M) Costs (20%)	
1st year of operation	USD 282,735
2nd year of operation	USD 256,919
3rd year of operation	USD 233,591
Discounted pay-back period (years)	<b>2 years</b>