

Case Studies of the 2005 Seed Award Recipients

Elisabeth Heid

Cows to Kilowatts

Full Version



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About the author

Elisabeth Heid is a Research Associate with the Global Public Policy Institute. Her current research interests include public-private partnerships and transparency initiatives in the extractive industries. Elisabeth is also completing a two year graduate program in international relations offered jointly by Humboldt University Berlin, the Free University Berlin and the University of Potsdam (M.A. expected August 2006). She previously studied political science, sociology and law at the University of Freiburg and at St. Hilda's College, Oxford University. Elisabeth receives a fellowship from the German National Merit Foundation. She can be contacted at eheid@gppi.net.

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For a short version of this case study, please consult the Seed Initiative Partnership Report 2006 "Partnerships for Sustainable Development: On the Road to Implementation" at www.gppi.net/partnershipreport.

Cows to Kilowatts

Cows to Kilowatts is a south-south partnership committed to fighting water pollution and greenhouse gas emissions. Two NGOs and a quasi-governmental initiative in Nigeria have joined forces with a technology institute in Thailand to design, construct, and operate a bio-gas plant in the Nigerian city of Ibadan. The plant will use the waste produced by a local abattoir to produce low-cost household cooking gas and organic fertilizer.

BACKGROUND

Abattoirs, or slaughterhouses, are one of the major sources of water and air pollution worldwide. The anaerobic degradation of abattoir wastewater produces bio-gas: a mixed gas primarily composed of methane and carbon-dioxide. The consequences of abattoir waste pollution are felt by both the environment and humans: Adverse effects on air quality, agriculture, potable water supplies, and aquatic life, in turn, foster a human health tragedy.. Poor, urban communities, in particular, have little choice but to consume water polluted with abattoir waste. This is also true in Nigeria, where standards regulating abattoir water discharge or greenhouse gas emissions are poorly enforced.

Joseph Adelegan, Executive Director of the Nigerian NGO Global Network for Environment and Economic Development Research (GNEEDR), saw the effects that pollution from one particular abattoir, the Bodija Market Abattoir in Ibadan, Nigeria, was having on the local community. Ibadan, the largest indigenous city in sub-Saharan Africa, with a population of over three million. The city has experienced rapid urbanization in recent years, coupled with intensified environmental problems.

In 2000, the Global Network carried out some studies on the abattoir and obtain received a grant from the Pollution Abatement Trust Fund to collect preliminary data on the physicochemical and bacteriological effects of wastewater pollution from the Bodija Market Abattoir.

In the course of this research, the Global Network discovered that the effluent from the Bodija river downstream from the Abattoir had BOD values (biochemical oxygen demand; an indicator of organic pollution) that far exceeded national threshold for food processing industries. The communities located downstream from the slaughterhouse were particularly affected: They used the polluted river water for domestic purposes, such as washing and sometimes even for consumption.

A further strand of research concerned environmental policy reform in Nigeria, which identified the problem that Nigerian effluent standards, while existent on paper, are poorly enforced in practice.

These research findings were presented at a series of international conferences. It was here that the NGO was encouraged to come up with ways with which to address the abattoir problem. The formal responsibility for the matter lies with the government: The government

collects a fee for each slaughtered animal, which, in theory, should be used to enforce effluent standards, through technology, monitoring, or other means. However, this was clearly not being done. As a result, the Global Network began looking for a solution independently.

CREATING THE PARTNERSHIP

Joseph Adelegan's initial idea was to construct an effluent treatment plant, which would treat the abattoir waste, thus preventing it from polluting the Bodija river. He approached two Nigerian organisations whose expertise he thought would be of value to realising the endeavour:

The Centre for Youth, Family, and the Law: Headed by Executive Director John Bamgbose¹, the Centre is a group of lawyers focused on environmental protection. The Centre had previously been a project partner of GNEEDR's. The primary purpose for getting the Centre for Youth, Family, and the Law onboard was to get legal advice on the juridical aspects of the project's implementation.

The Sustainable Ibadan Project (SIP)²: SIP is a quasi-governmental initiative that is part of UN-HABITAT's Sustainable Cities Programme, a programme aimed at capacity building in urban environmental planning and management. GNEEDR's contact at SIP is Adedayo Ayorinde, a project manager. The Ibadan project focuses

¹ John Bamgbose is also a Solicitor and Advocate of the Supreme Court of Nigeria as well as head of O.J. Bamgbose and Co. , a renowned Ibadan law firm.

²

www.unhabitat.org/programmes/sustainablecities/ibadan.asp

on three priority issues, all of which exhibit a high overlap with the treatment plant project: improving waste management, enhancing water supply, and institutionalising the environmental planning and management (EPM) process. The Sustainable Ibadan Project's role in the partnership is to maintain contacts with government (local, regional, national).

Following informal meetings with these partners, Joseph Adelegan began searching for sources of funding. Joseph came across the World Bank's 2003 Global Development Marketplace Competition, which funds local entrepreneurial projects promoting environmentally or socially sustainable growth.

The partners submitted a proposal, entitled "Abatement of Pollution from Abattoirs in Nigeria" to the competition. The project was selected as one of the 183 finalists from over 2,700 proposals submitted from all over the world. On December 3 and 4, 2003, Joseph Adelegan was able to present the project to an international jury and members of the development community at a marketplace event held in Washington, DC. There, the jurors commended the partnership as being highly innovative and feasible, yet they pointed to one critical problem, which would prevent the project from becoming one of the competition's 47 winners.

Namely, an effluent water treatment plant, while solving the problem of water pollution, was creating another: By relying on the anaerobic digestion of waste, such treatment plants emit bio-gas – methane and carbon dioxide – into the

atmosphere, thus contributing to global warming. Methane, in particular, is a particularly potent greenhouse gas: on a kilogram-to-kilogram basis and over a 100-year time period, methane is 23 times as effective at trapping heat in the atmosphere as carbon dioxide is. The jury suggested that if the partnership were able to address the emissions problem by introducing a renewable energy component, the project would be very attractive to donors; particularly ones focus on funding zero-emissions projects.

DEVELOPING THE PARTNERSHIP

Back in Nigeria, Joseph Adelegan called together the partners – GNEEDR, the Centre for Youth, Family, and the Law, and the Sustainable Ibadan Project – to explain the situation to them and to begin brainstorming ways in which the project might address the emissions problem. The methane produced by the anaerobic digestion of abattoir wastewater has several end-use applications: In the form of biogas, methane can be used domestically (for cooking, heating, and cooling), to generate electricity, and as biofuel.

Joseph Adelegan, relying on his contacts as well as the Internet, researched technology that would capture the methane generated by the water treatment plant. He started his research in Nigeria, but though he found a number of researchers who had generated bio-gas from human waste, none had done so at a commercial level. He then began looking outside Nigeria; initially still in Africa. In Kenya and Tanzania, there had been small-scale project deriving bio-gas from animal

waste, yet the technology employed in these was not very stable. Joseph Adelegan then extended his research to the developed countries: In Canada, the International Development Research Centre (IDRC)³. However, the IDRC had also never engaged in commercial bio-gas generation, and they were not willing to launch such an effort in Ibadan.

During further online research, Joseph Adelegan found a Thai institution that had over a decade worth of experience in researching bio-gas technology and applying this technology in industry: the Pilot Plant Development and Training Institute (PDTI) at King Mongkut's University of Technology Thonburi (KMUTT), Thailand.

PDTI researches and develops anaerobic fixed film reactors (AFF) to treat agro-industrial wastes and for the production of biogas to use as biofuel in factory. The Centre has previously applied the technology to commercial scale to treat low-strength wastewater from a vegetable and fruit canning factory and to treat high-strength wastewater from a rice starch factory. In both cases, biogas was produced, which was subsequently turned into electricity.

Joseph Adelegan got in touch with the centre's director, Pawinee Chaiprasert, about the possibilities of applying their technology to the Bodija Market Abattoir. Chaiprasert responded, expressing an interest in joining the partnership. "We have a mission to put our research into practice in the agro-industrial sector and we're particularly glad to be able

³ www.idrc.ca

to transfer our technology to another developing country”, she says.

GNEEDR provided the Pilot Plant Development and Training Institute with details on the waste parameters of the Bodija Market abattoir, including wastewater volume and biochemical oxygen demand. The centre’s researchers then computed the preliminary size and the approximate cost of a biogas plant that uses the anaerobic fixed film technology. The Centre also estimated the cost of building such a reactor at US\$ 328,000⁴ and calculated that it would take up 0,8 ha of land. At a rate of 1000 cows slaughtered per day, the plant would generate approximately 3,600 KWh of electricity per day and reduce carbon-dioxide emissions to 1.4363 t CO₂ per day.

The 2005 Seed Award generated a great deal of publicity for the partnership, now entitled *Cows to Kilowatts*. Nigeria’s national daily newspaper, *The Guardian*, published an article on the project, entitled “Cows to Kilowatts: Nigerian NGO bags 2005 Seed Award”.

The publicity resulted in a range of new contacts for the partnership, which both brought new partners on board and lead to change in the project design: The partners’ initial idea had been to use the bio-gas to generate electricity. However, because doing so requires an internal combustion engine, the project would become very expensive. Darian Stibbe, of the Seed Initiative and the The Centre for the Advancement of

⁴ The cost of construction is approximately US\$ 60 per cubic metre. The figure of US\$ 328,000 is for construction costs only, and does not include maintenance or electricity and water connections and charges.

Sustainable Development Partnerships (CASDP), put Joseph Adelegan in contact with GVEP – the Global Village Energy Project (United Kingdom). GVEP does not, unfortunately, work in Nigeria, so they are not able to provide any direct support to the Cows to Kilowatts project.

However, GVEP did suggest that if they were able to fund a similar project elsewhere, they would prefer a project that generated household cooking gas instead of electricity. This alternative is less costly, because it does not require that an internal combustion engine be purchased for generating electricity. The option is particularly attractive in Nigeria, where the demand and price for cooking gas has been increasing steadily, especially as electric power situation in the country remains epileptic.⁵

Over 1,000 cows are slaughtered at the Bodija Market abattoir on a daily basis, which would provide 1,500 cm³ of bio-gas (900 m³ of pure methane) per day. This, in turn, amounts to 5400 cylinders of cooking gas per month. The would-be consumers of this gas are the approximately 2000 households within a 10 km radius of the plan that use compressed gas for cooking, as well as local fast food restaurants and caterers. A sales point could be established at the Bodija market. Cooking gas could be sold at US\$ 7.50 for a 25-litre cylinder; well below the current market price for

⁵ On the other hand, there is a risk of competition in the cooking gas sector, as the national government is embarking on a liquefied natural gas project. This may, in time, cause a drop in the unit cost of the cooking gas.

cooking gas.⁶ This low price is explained by the fact that the abattoir waste generates “almost free” raw materials for bio-gas production.

The sludge from the bio-gas reactor can be used as organic fertiliser. The plant would generate about 1,750 litres of organic fertiliser per day, which could be sold to the Oyo State Fertiliser Board, a governmental agency that markets fertiliser. In turn, the fertiliser could be sold to urban low-income farmers at a reduced price of US \$ 1 for 10 litres; about 5% of the standard price of chemical fertilizer in Nigeria. Electricity could be sold at 3 US cents per KWH, which is approximately 50 percent of the current tariff. However, the partnership’s current plans focus on the production of cooking gas.

The Seed Initiative also brokered a meeting between UNDP Nigeria and the Cows to Kilowatts partners. The partners presented the project to Emmanuel Oladipo of UNDP in August 2005. UNDP expressed its interest in the project, and stated that they would be able to provide they partners with US\$ 300,000 in start-up funding as part of its Nationally Executed Programme in Energy and Environment.

However, this money needs to be channelled through the Nigerian Federal Ministry of the Environment. The Nigerian Government under President Olusegun Obasanjo is very supportive of independent power producers, having signed a Power Reform Bill on 20 March 2000, which enables private companies to

participate in power generation, transmission, and distribution.

Nigeria’s Minister of the Environment invited the partners to present the partnership to the Ministry in Abuja. An ensuing meeting in Ibadan brought together staff from UNDP Nigeria, GNEEDR, the Sustainable Ibadan Project, the Centre for Youth, Family, and the Law as well as from the Government of Oyo State. Here, the decision that the Federal Ministry of the Environment would channel UNDP’s start-up funding to the project was finalised.

UNDP did, however, express its reservation about the partners’ plans to have the quasi-governmental Sustainable Ibadan Project manage the bio-gas plant, preferring a profit-oriented business enterprise. This suggestion will be adopted: once operating, the bio-gas plan will be handed over to the Cows to Kilowatts Partnership Incorporated, a business venture. A comparatively small staff will be required to run the enterprise, which has the advantage of reducing overhead costs. On the other hand, recruiting experienced technical staff may pose a challenge as will obtaining technical support locally. The Cows to Kilowatts partners, including the Sustainable Ibadan Project, may continue their involvement as members of the Board of Trustees.

The partnership subsequently organised a meeting with the Ibadan North Local Government (the district in which the bio-gas plant is located) and UNDP Nigeria which included a visit to the Abattoir. Following the meeting, the Ibadan North Local Government offered to provide the partnership with the land needed to construct the bio-gas plant free-of-

⁶ The price for cooking gas fluctuates (by season) from US\$ 25 to \$30.

charge. Initially, the partners were a bit hesitant about this proposal, fearing that this would make the ownership status of the biogas plant unclear. Accordingly, the partnership and the local government are currently negotiating a Deed of Entitlement and Certificate of Ownership which will secure the land to the partnership, rent free, for a period of fifteen years.

In order to ensure broad stakeholder participation, the partners have also met the head of the Oyo State Butcher's Association and the Bodija Market Development Association. Both groups were very positive about the plans for cleaning up the animal waste, because the waste is otherwise not disposed. An idea that emerged from this meeting is to have the Cows to Kilowatts Incorporated sell the compressed gas to these associations at a reduced price. Moreover, about 40 local youth could be employed in the construction of the bio-gas plant, and later, in the bio-gas plant's operations and management, conditional on qualifications.

A Business Plan created for the partnership with the support of the Seed Initiative puts forth a schedule for implementation: In the 9 months following the creation of the Business Plan, the partners will focus tasks that need to be completed in order to issue a Notice to Proceed:

First, stakeholder integration: This includes hosting a stakeholders workshop, that brings together GNEEDR, the Centre for Youth, Family, and the Law, the Sustainable Ibadan Project, the Oyo state government, the local government, the Nigerian Butcher's Association, the Nigerian Fertilizer Board, and the

Bodija Market Association. The workshop will have two objectives: to formally introduce the project to the local community and to negotiate and finalise the roles individual stakeholders will play within the partnership.

Second, the Cows to Kilowatts must be registered as a business enterprise.

Third, legal documents on the land and property of the bio-gas plant must be completed.

Fourth, the bio-gas plant (wastewater treatment and bio-gas generation systems) must be designed, a process that is expected to take six months: This requires the Thai partners from the Pilot Plant Development and Training Institute come to Nigeria and visit the Ibadan site in order to carry out a detailed assessment for the slaughterhouse. Afterwards, the design of the facilities will commence in Thailand.

During the design process, four stakeholders from Nigeria will go to Thailand: Joseph Adelegan of GNEEDR, Adedayo Ayorinde of the UN Habitat-Sustainable Ibadan Project, and two representatives from the Nigerian Federal Ministry of Environment They will receive a training course in the start-up and operations of the bio-gas system. The Pilot Plant Development and Training Institute will receive a consultancy fee of 5% of total budget costs for this service. The expenses for the trips (the Thai partner coming to Nigeria and the Nigerians going to Thailand) will be drawn from the fund being provided by UNDP.

Subsequently, a Notice to Proceed can be issued, which allows actual

construction to proceed (12 months). Joseph Adelegan of GNEEDR will take the leadership role in the engineering, procurement, and construction process. A final thirteenth months will be spent on commissioning.

INSTITUTIONALIZING THE PARTNERSHIP

Structures

The four partner organisations that make up the Cows to Kilowatts project are the Global Network for Environment and Economic Development Research (GNEEDR), the Centre for Youth, Family, and the Law, the Sustainable Ibadan Project (all in Ibadan, Nigeria), and the Pilot Plant Development and Training Institute (PDTI) at King Mongkut's University of Technology Thonburi (KMUTT) (Thailand). There currently exists no MOU between the partner organisations. The Pilot Plant Development and Training Institute and GNEEDR expect to sign an MOU formalising their relationship on the occasion that Pawinee Chaiprasert visits Nigeria to engage in the evaluation required to design the biogas plant.

The Cows to Kilowatts Partnership will be registered as a business enterprise in Nigeria. This process will cost a one-time fee of US\$ 2,000. With the monetary support of the Seed Initiative, a Nigerian team composed of business, finance, and technology experts, is writing a business plan for the partnership. A first draft was submitted in January 2006.

As a registered NGO, GNEEDR is required to submit details of its activities to the government every

two years. The quarterly meetings of GNEEDR's board of directors is another time at which the organisation must account for its past and planned activities. A more rigorous form of accountability will be put into place when the partnership receives funding for building the bio-gas plant, at which point the partners will become accountable to their donor.

Procedures

The partners in Nigeria have meetings, both formal and informal, in which the partnership's progress is discussed and future action is planned. For financial reasons, it has not been possible to bring together all the partners from Nigeria and from Thailand in a face-to-face meeting. However, the SEED Initiative has enabled Joseph Adelegan (GNEEDR) and Pawinee Chaiprasert (KMUTT) to meet in person to discuss their plans once, at an IUCN Congress in Thailand in November 2004. The partnership is led by the Global Network for Environment and Economic Development Research (GNEEDR). The other partners acknowledge this leadership, since GNEEDR had initiated the project.

Finances

The estimated capital input for the project is US\$ 480,000. This figure includes costs for the construction and design of the bio-gas plant including visits and consulting fees, transportation, administrative costs (including staff salaries and operation expenses for the first year) and costs for holding a stakeholder's workshop.

While UNDP Nigeria is providing a start-up fund of US\$ 300,000, further funding (US\$ 180,000) is

required to cover the entire project. The partners are looking into other means of securing funding, including money from investors and grants from donor organisations. The project business plan calculates that the biogas plant, operating as a business enterprise, will achieve a return on investment within approximately three years (2 years 9 months).

DEFINING AND MEASURING SUCCESS

The Cows to Kilowatts partners hope to be able to commission the biogas plant by March 2007. The plant is calculated to have a useful lifetime of fifteen years. Its actual service lifetime may well exceed that.

Plans are underway to replicate the project in other Nigerian major cities. GNEEDR also has close contacts with an NGO in Cameroon, who have expressed an interest in exploring whether such bio-gas plants could be built in their country. The National Government of Nigeria is considering including the Cows to Kilowatts model of generating biogas from slaughterhouse waste into its National Environmental Sanitation Policy. This means that if the "pilot project" in Ibadan proves to be successful, it would be replicated in other Nigerian major cities with the support of the government.

(Information as of April 2006)

About GPPi

The Global Public Policy Institute (GPPi) is an independent, non-profit think tank located in Berlin focusing on global governance. We receive project funding from foundations as well as our project partners from the public and private sectors.

GPPi engages in three lines of work:

Research. GPPi explores new approaches to effective and accountable governance. Our topics include the reform of international organizations and public-private partnerships.

Consulting. GPPi advises governments, international organizations, foundations, NGOs, and companies. We assist them in developing effective strategies for operating in the new governance environment.

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Contact Us:

Global Public Policy Institute (GPPi)
Reinhardtstr. 15
10117 Berlin
Germany

General: +49-30-2759 59 75 - 0

Fax: +49-30-690 88 200

Email: gppi@gppi.net

About the Seed Initiative

The Seed Initiative (Supporting Entrepreneurs for Environment and Development) is a global network for action on sustainable development partnerships. The Initiative aims to inspire, promote and develop the capacity of locally driven entrepreneurial partnerships that contribute to the agreed goals contained in the Millennium Declaration (MD) and the Johannesburg Plan of Implementation (JPOI).

The Seed Initiative responds to the challenges that many sustainable development partnerships face, including the need for both technical and financial support in the early stages of developing and building partnership until it enters into implementation, a need to focus on the wide variety of small initiatives, driven by local actors, in addition to large-scale partnerships, and the need for effective "communities of practice and knowledge" that allow mutual learning, support and collaboration.

In order to accomplish its goal, the Seed Initiative has chosen three main areas of focus:

- Promote partnerships (through a biennial international award scheme; events and publications): Encourage small scale partnerships that exist on the ground and that directly benefit local communities; mobilize collective action that provides practical interventions in environmental, social and economic development in developing countries; and demonstrate that the wide variety of small partnerships driven by local actors make a positive contribution to sustainable development;
- Support nascent partnerships (through offering tailor-made support services for winners of the Seed Awards): Deliver bottom-up demand driven partnership support by

responding strategically to the need of locally driven partnerships for technical and financial support in early stages of development, mitigating the potential risk of failure;

- Increase the understanding of partnerships (through research activities and developing learning tools): Capture, profile and disseminate information on exemplary partnerships that could be used for sustainable development elsewhere; advocate the need for effective communities of practice and knowledge that allow mutual learning, support and collaboration; and integrate best practice examples of successful local partnerships into high level decision making processes.

The Seed Initiative delivers these actions through a lean operational structure that aims to deliver this focus by coordinating and partnering with likeminded organizations and networks that are delivering - or are willing to engage in - promoting, supporting and understanding of sustainable development partnerships.

Since its launch in January 2004, the Initiative has broken ground in revealing the wealth of entrepreneurial partnership activity taking place on the ground. During the Commission on Sustainable Development (CSD) of the United Nations in New York held during April 2005, five winners were announced that were selected by an international jury to be the recipients of the first cycle of Seed Awards, awarded biennially by the Seed Initiative. The award scheme provides dedicated institutional capacity and support to partnerships in the alpha stage of development - focusing on maximizing the opportunity for these partnerships to succeed during the more difficult development and early implementation phases.

Furthermore, it has effectively publicized the partnership approach to sustainable development, given advice to over seventy new partnerships and extensive support to twelve, supported five

winning partnerships on the ground and engaged in a cutting-edge programme of research and learning to track the evolution of new partnerships to assist both policy makers and practitioners.

Seed Initiative Secretariat

Mr Francois Rogers, Project Coordinator

World Conservation Union (IUCN), World Headquarters

28 Rue de Mauverney, CH-1196 Gland, Switzerland

Tel: +41 (0) 22 999 00 00/01, Fax: +41 (0) 22 999 00 02

E-mail: francois.rogers@iucn.org

Website: <http://seedinit.org>

Implementing Partners:

UNDP: Mr. Arun Kyshap, arun.kyshap@undp.org

UNEP: Dr. Cornis van der Lugt, cornis.lugt@unep.org

IUCN – World Conservation Union: Dr. Gabriel Lopez, gabriel.lopez@iucn.org

Supporting Organizations and Members of the Board:

The governments of Germany, The Netherlands, Norway, the UK, the US; and Swiss Re.