

# From Waste to Wealth: Sustainable Wastewater Management in Uganda

## Workshop II: Report on Proceedings 13 February 2014



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## Contents

Acknowledgements.....	1
Introduction .....	2
Welcoming Remarks.....	2
Waste to Wealth Update .....	3
Baseline Summary - UWASNET .....	4
Business Scenarios – ANAERGIA INC .....	6
Comments from Participants .....	7
Proposed Structures .....	7
A) Framework .....	7
B) Gaps, Needs and C) Opportunities .....	8
Financing .....	9
The Implementation Focus .....	10
Key Considerations for Phase II .....	11
Proposed Next Steps .....	13
Appendix I: Workshop Agenda .....	14
Appendix II: List of Participants.....	15

## Acknowledgements

This workshop would not have been possible without the active participation of all attendees. Rapporteur for the event was Frederick Kakembo (Uganda). Funding was made possible through a grant awarded to the United Nations University Institute for Water, Environment and Health by Grand Challenges Canada. Thanks to all participating institutions and individuals who support the development of a wastewater management framework.

## Introduction

- 
- ✓ *Conserve and protect the environment*
  - ✓ *Improve quality of life, especially for women*
    - ✓ *Improve water quality*
    - ✓ *Reduce dependency on forests*
- 

The second workshop for the Waste to Wealth initiative was held at National Water and Sewerage Corporation, Kampala in February 2014. The objectives for the second workshop were to:

- 1) Finalize the national framework strategy;
- 2) Identify lead organizations and individuals for phase 2; and,
- 3) Develop a multi-stakeholder implementation strategy (in phase 2).

This was accomplished through a small multi-stakeholder event comprised of plenary and breakout discussions (see Appendices I and II).

## Welcoming Remarks

Dr. Corinne Schuster Wallace, UNU-INWEH, Principle Investigator, welcomed participants to the workshop and provided a project overview and accomplishments to date for the “Waste to Wealth” initiative. This was followed by welcoming remarks from Eng. Ivan Birungi (Ministry of Water and Environment), Dr. Mohamed Babu (National Water and Sewerage Corporation), Dr. Gerald Sawula (National Environmental Management Agency) and Caroline Aguti (Ministry of Energy).

Eng. Ivan Birungi (Ministry of Water and Environment) remarked that his Ministry is supportive of the initiative due to the immense challenges that the country is facing in the area of wastewater management. To be sustainable, there is need to focus on initiatives that support the conversion of waste to wealth. For that reason, the workshop is very timely and very important. The benefits of the initiative will reach out to all line sectors and to larger populations.

Dr. Mohamed Babu (National Water and Sewerage Corporation), remarked that NWSC is a key stakeholder in waste management and sees the workshop as timely. NWSC values partners that could participate in addressing issues and challenges of wastewater management through a multi-sectoral approach. For a long time, wastewater has not been considered as wealth. NWSC will provide a supportive environment and also participate actively in all activities that promise to lead to sustainable management of wastewater because, if we do not take action collectively, our environment will continue to be wasted.

Dr. Gerald Sawula (National Environmental Management Agency) indicated that NEMA appreciates the concept of marketing biogas as an aspect of waste to wealth and reiterated the need to optimize energy efficiency. Biogas has been around for a long time in Uganda but it is yet to be developed to optimum levels. It should not be considered as an alternative energy, but as a mainstream source of energy requiring fulltime conventional investments. NEMA is available as a lead partner in the efforts to make use of existing wastes. It is imperative to break into new virgin areas including, but not limited to, breaking into broad market linkages.

Caroline Aguti (Ministry of Energy) observed that the Ministry welcomes the waste to wealth initiative and added that the ministry currently has a small biogas programme within its structure. Furthermore, the Ministry has small grants available for renewable energy projects which may be leveraged through Waste to Wealth.

## **Waste to Wealth Update**

“From Waste to Wealth” is intent upon turning traditional views of wastewater as an end product to be disposed of on their head by demonstrating the value of wastewater as a resource when subjected to anaerobic Digestion (AD). Our vision is that the economic and social benefits of biogas generation, soil amendment and new livelihoods from wastewater management will be a financial incentive for communities to collect and treat their waste. The initiative focuses on combining wastewater collection services with cutting-edge technologies for biogas production in order to develop a sustainable multi-sectoral strategy for wastewater in Uganda.

In July 2013, the first From Waste to Wealth workshop was held in Kampala in order to identify: i) key players and roles; ii) existing mechanisms to support waste to wealth; iii) the gaps and opportunities for scaling out a national strategy; and iv) to understand the distribution of costs and benefits (both financial and social). Following the first workshop, the project team, with the help of the Ugandan Ministry of Water and Environment, conducted biomethane potential (BMP)

analyses to determine the BMP of different biomass types (municipal wastewater, municipal sludge, water hyacinth, fish guts); developed four community type scenarios (urban, informal, rural, institution) and used for cost-benefit analyses of anaerobic digestion (AD) solutions; and, continued to consult with various key stakeholders in Uganda on the development of a national wastewater management framework. During this process, the rural fishing community of Kiyindi was evaluated to provide a specific case study demonstrating implementation and impact of the rural business model.

Other accomplishments to date have included (Figure 1):

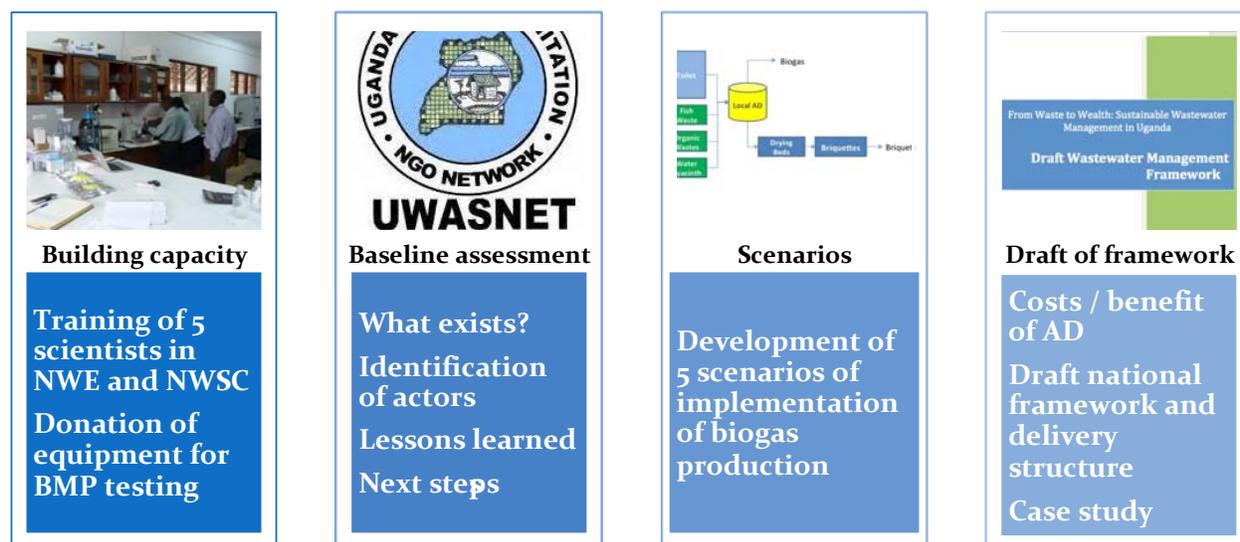


Figure 1: Overview of accomplishments

### ***Baseline Summary - UWASNET***

Uganda Water and Sanitation NGO Network (UWASNET) provided a summary on the Waste to Wealth baseline study. Objectives of the study were to: 1) identify existing actors involved in converting waste to wealth in Uganda and their projects; 2) conduct a SWOT (strengths, weaknesses, opportunities, threats) analysis of select projects; 3) identify best practices and most feasible waste to wealth options; and, 4) establish next steps to support scale-up and out of waste to wealth concept in Uganda. Data were collected from central, eastern and northern Uganda by way of literature reviews, interviews, field visits, and observations.

Currently, AD systems operating in Uganda tend to be at the individual household scale. Most use cow dung as feedstock, although some combine pig manure and one evaluated used human waste. Most systems were 4 cubic metre digester tanks, seen as the best value for

money compared to gas produced. The upfront cost for the system was identified by the majority as prohibitive to establishing a system, leading to a recommendation for financing mechanisms and subsidies to reduce this barrier. Another barrier identified was the socio-cultural perceptions, particularly of using human waste, although it is uncertain as to whether income opportunities would outweigh these perceptions. A final barrier is that of education and outreach materials, which are currently inadequate for advancing AD technology; few exist, are text heavy and are only available in English.

Table 1: SWOT analysis

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> <li>• Biogas systems sustainable under dry and wet conditions</li> <li>• Bio-slurry source of fertiliser for agriculture</li> <li>• No smoke associated with biogas (eliminate in-door air pollution)</li> <li>• Biogas saves time and income compared to traditional biomass</li> <li>• Provides a cheaper alternative source of energy</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of livestock to provide the cow dung needed</li> <li>• Lack of technical knowledge to operate the system</li> <li>• Accessories used for cooking and lighting are not readily available</li> <li>• High initial investment cost</li> <li>• Low O&amp;M by the communities</li> <li>• Limited IEC materials</li> <li>• Land requirements/re</li> </ul>
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> <li>• Potential source of electricity for charging phones and cooling milk</li> <li>• Employment opportunities</li> <li>• Production of biogas for commercial use</li> <li>• Provision of better drying mechanisms for bio-slurry and use for fertilizer</li> </ul>	<ul style="list-style-type: none"> <li>• Poor community perception of biogas being unhygienic</li> <li>• Disposal of bio slurry has high labour requirements</li> <li>• High initial investment cost</li> <li>• Preference of solar systems as the daily demand in terms of follow up and labour are minimal</li> </ul>

The assessment undertaken by UWASNET allowed the identification of key recommendations to scale up of biogas production in Uganda:

- Awareness raising and sensitization, particularly for systems using faeces as feedstock material
- Support in the development of low-cost digester design
- Support to other initiatives, e.g. production of fuel briquettes

- Provision of incentives such as micro-finance loans to finance anaerobic digestion construction
- Target schools (both primary and secondary) and tertiary institutions as well as prisons
- Training of a critical mass of biogas experts at various levels
- Technician level
- Certificate level
- Advanced qualification e.g. Masters and PhD level
- Documentation and dissemination of good practices

### ***Business Scenarios – ANAERGIA INC***

Seven specific business scenarios based on 5 different biogas production scenarios for AD production in Uganda were developed to underpin the proposed framework: i) urban; ii) informal settlements (scenario A and B); iii) rural settlements (scenario A and B); iv) institutional; and, v) institutional with offsetting electricity. A comparative graphic analysis of AD scenarios, value products from AD and specifically the value of bio-slurry as a solid fuel were presented as summarised in Figure 2 (the gray shaded areas define the factors which were varied in each of the five scenarios).

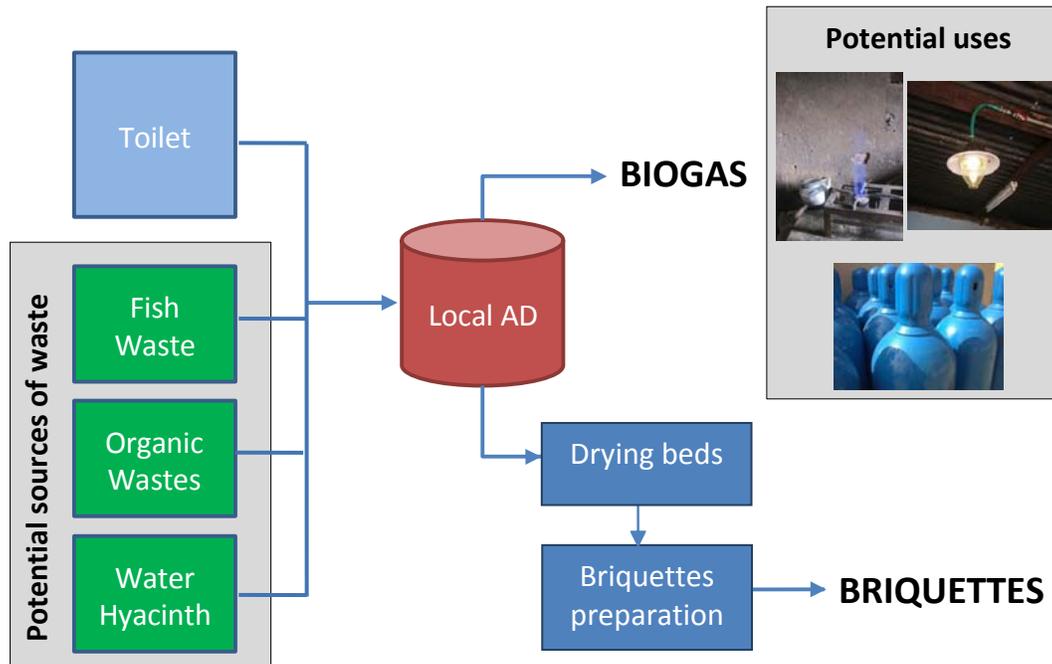


Figure 2: Overview of the biogas production scenarios (gray shaded areas indicate factors varied from between the five scenarios)

## ***Comments from Participants***

Participants were invited to provide remarks on the draft framework, the activities to date and the draft scenarios presented. During the discussion, several opportunities were identified for the definition of potential biogas production scenarios:

- Use of biogas in the manufacture of ice for preservation of fish at landing sites.
- An urban model of co-digestion in which wastes from e.g. abattoirs could be co-digested with wastewater and municipal wastes to improve on the biogas output.
- Generation of electricity and use of dried slurry for industrial firing (for example in clay-works).

Emphasis was placed on the centrality of the private sector in the waste-to wealth concept (and the Professional Emptiers Association in particular).

## **Proposed Structures**

During the workshop the proposed structures (governance, finance and implementation, as presented in Figure 3) were discussed and recommendations were provided. Three discussion points that were identified were; A) framework strengths; B) gaps and needs; and, C) opportunities.

### **A) Framework**

Participants of the workshop proposed that there is need to drift away from an NGO-driven to an entrepreneurship driven model. This calls for governance structures, policies, incentives and training programmes that foster the concept of waste to wealth at municipal and rural levels. One of the issues to explore is the feasibility of local information centers.

The framework should specify the roles, duties, and responsibilities and determine ownership; either government or private sector. Government agencies have a duty to create an enabling environment, but this does not preclude the private sector from taking responsibility for day-to-day operations while government retains the regulatory and oversight functions.

There was lengthy discussion on the question of which Ministry should anchor the Waste-to-Wealth initiative. In the end, many proposed that the Ministry of Water and Environment was best positioned to take on that role, supported through its agencies NWSC and NEMA.

Even when the project is housed in one of the government agencies, there is need for a multi-stakeholder **steering committee** composed of representatives from other line ministries such

as Energy, Education, Agriculture and others as well as other non-government entities. The committee would be responsible for coordination and streamlining functions.

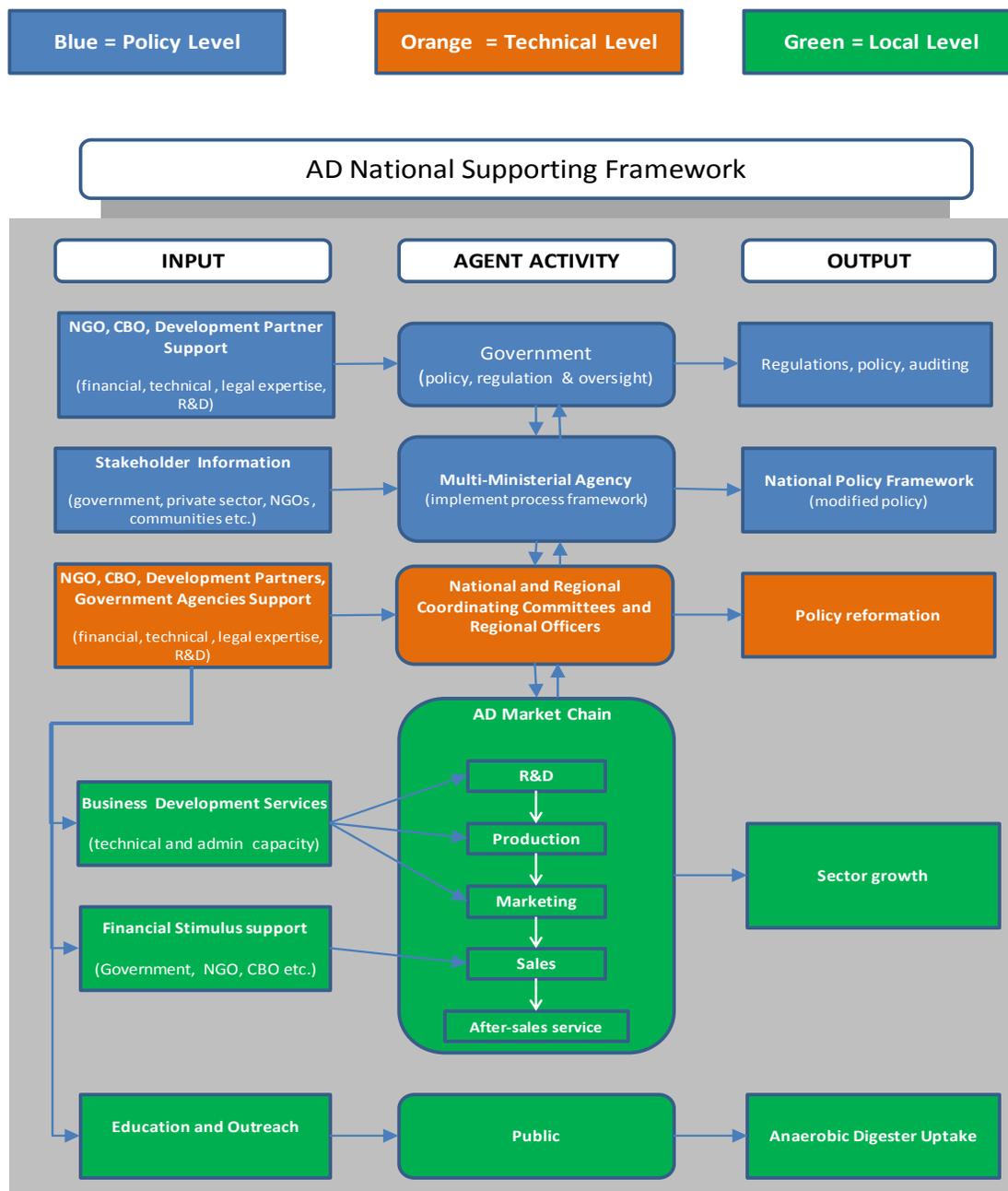


Figure 3: Draft AD National Supporting Framework

### B) Gaps, Needs and C) Opportunities

Table 2 summarizes the gaps, needs and opportunities identified during the breakout sessions held during the workshop.

Table 2: Gaps, needs and opportunities related to the proposed AD framework structures

GAPS	NEEDS	OPPORTUNITIES
<ul style="list-style-type: none"> <li>1) Lack of coordination between ministries (Water and Environment, Energy, Health, Education and Agriculture)</li> <li>2) Lack of coordination between Government and NGOs</li> <li>3) No planning or technical capacity or financial autonomy at local government level</li> </ul>	<ul style="list-style-type: none"> <li>1) Promotion of both social and financial benefits of AD projects</li> <li>2) Policy tools to promote AD projects. Options could include: a) provision of discounts and subsidies; b) tax-exemptions on equipment; and, c) local by-laws.</li> <li>3) Strategies for inter-sectoral collaborations and explore inter-ministerial and inter-sectoral synergies</li> </ul>	<ul style="list-style-type: none"> <li>1) Existence of entrepreneur groups but we need to identify, support and promote their skills in: a) financial management; b) AD engineering and maintenance; and, c) health and safety.</li> <li>2) Existence of private sector foundations or other businesses</li> </ul>

## Financing

The financial matters and considerations for Waste to Wealth rotate around main drivers of i) microfinance institutions; ii) producers; iii) promotion; and, iv) marketing. Government and non-government institutions ought to consider subsidies for operators of start-up businesses.

Other central issues include distribution networks and marketing. One of the key potential barriers includes perceptions towards the use of products from human wastes. Marketing through cooperatives was among the options identified.

The discussions stressed the need for promotion of incentives from government and non-governmental institutions; to organize set-up funding and to provide subsidies to prospective small-, medium- and large-scale actors. Also emphasized was the need for formal financing systems; the need to explore various financing options that may include, among others, micro finance institutions. Another idea raised was exploration of the possibilities associated with carbon offset financing.

## The Implementation Focus

The implementation focus covered the following areas (Table 3):

Table 3: Overview of areas relevant to successful implementation of the AD national framework

<p><b>Education and Oversight</b></p>	<p>The following areas were considered central: 1) Identification of training needs; 2) Ensuring that the training is practical; 3) Collaboration with NGOs and CBOs (crucial for the grassroots communities); 4) Development of related institution/school-based curriculum alongside community-based training.</p> <p>In addition to direct education linked to AD, other identified core in-puts include legal oversight and financing.</p>
<p><b>Stakeholders</b></p>	<p>The need for multi-level lobbying was identified as critical. The proposed framework ought to identify where responsibility for operations of waste to wealth operations should be; ownership could either be by government or by the private sector. The overall framework coordinator needs to be identified within the framework.</p>
<p><b>Feedback and Communication</b></p>	<p>It was proposed to establish review committees or “Biogas Networks” which could incorporate Government, NGOs/CBOs, the private sector and other key players. Among others, the roles of committee would be to a) oversee implementation and operations, b) provide platform for demonstration of best-practices c) communicate success/failures; d) monitor the usage and performance of the waste-to wealth operations technically, socially and economically.</p>
<p><b>Interaction with Existing Policies and Frameworks</b></p>	<p>It is imperative to understand existing complementary frameworks and create opportunities to fit the Waste to Wealth framework into existing plans. Adopting it into existing frameworks increases chances of succeeding; in addition, it was also considered important to fit the framework with urban planning. A number of ministries have existing frameworks to; 1) assess new technologies, 2) introduce new technologies and to maintain guidelines. These opportunities must be leveraged.</p>

<b>Key Implementation Challenges</b>	These were identified to include; a) financial availability, b) land availability (particularly urban) as well as knowledge of land ownership; c) diverse languages; d) lack of technical capacity/capability; e) sustainability-responsibility of the biogas network; f) community acceptance; g) the haphazard nature of informal settlements and the risk to wide scale-out if a solution is seen to be associated with the poor.
<b>Security</b>	How are projects safeguarded; how do projects stay community-based versus becoming a property of a single entrepreneur?
<b>Incentives</b>	The framework needs to explore and reflect pathways for incentives that could be generated locally by government or from the global networks. One of the avenues is to secure carbon credit incentives. It is imperative to know the best practices of achieving the carbon credits in Africa.
<b>Market for Products</b>	The demand for products is influenced by community perceptions and also by availability of information
<b>Distribution of Wealth</b>	How is wealth shown and distributed; It was proposed that there is need to consider the equivalent wealth for the social benefits.  What need to be done differently? Set up initial pilot projects to demonstrate economic and technical feasibility and viability; demonstrating best practices; need for initial support in areas of marketing.

## Key Considerations for Phase II

One of the main objectives of the workshop was to develop ideas for implementing and refining the framework through several demonstration projects. The workshop focused on the following key issues for considerations in the next phase of the project. These included; 1) environmental protection; 2) wealth creation; 3) human health and wellbeing; 4) appropriate and sustainable solutions; 5) public sector leadership in large urban centers; and, 6) recognition that for sustainability, solutions require financial offsets particularly in informal settlements and in other under-resourced areas. Education and sensitization was one of the key issues highlighted in moving forward with the second phase. In particular, identifying broad marketing strategies,

best practices for changing knowledge, attitudes and practices towards the reuse of human wastes, and building demand and social acceptance for change through education and outreach materials were considered very important. Two valuable questions were raised: who is responsible for follow-up in the community? And, what is an appropriate definition of wealth in the context of this project?

Priority areas for the second phase included: institutions of learning or prisons; small towns and villages; and, informal settlements. Upon further discussion, it was identified that the prison system is in need of sanitation solutions, would be receptive of AD, has the capacity for rapid scale out of proven technologies and would be able to integrate technical training into existing prison rehabilitation programmes. Furthermore, small urban centres have become the responsibility of NWSC, which is willing to engage in identifying solutions for these settings. Finally, while informal settlements demonstrate the greatest need from a sanitation perspective, it was felt that greater impact would be achieved through proving and demonstrating the framework in other settings before bringing it back to informal settlements.

While participants agreed that an ongoing dialogue will continue, specific tasks put forward included:

- a. **Build evidence of socio-economic costs and benefits of AD for sanitation coverage.** Based on the various scenarios, the scaling-up should be piloted in the following: i) institutions – prisons; ii) rural small settlements; iii) rural town settings; iv) institutions- schools; v) large urban setting; and, vi) informal settlements.
- b. **Demonstrate sustainable financing models and financial viabilities and explore possibilities for:** i) subsidies; ii) microfinance; iii) public private partnerships (PPPs); iv) reinforcement of AD profit for O&M; and, v) service expansion.
- c. **Develop and showcase ability to market AD products:** i) build demand and social acceptance; ii) develop education and outreach materials.
- d. **Build national capacity to develop technical competence/capacity required for AD scale out:** i) certification curriculum development and approval; and, ii) vocational training for prisoner re-integration.

## Proposed Next Steps

- Approach MWE to anchor framework.
- Establish a working group for development of Phase II proposal.
- Refine scenarios to include household for comparison purposes.
- Add economic analysis of non-financial benefits.
- Understand affordability, willingness to pay and perceptions around use of human waste for fuel.



## Appendix I: Workshop Agenda

*From Waste to Wealth: Sustainable Wastewater Management in Uganda*

*Workshop Agenda – 13 February 2014*

- 9:00 – 9:15 Welcome  
*Chairs:* Corinne Wallace; Chris Metcalfe  
*Facilitators:* Frederick Kakembo
- 9:15 – 9:30 Project introduction (purpose, objectives, project findings, proposal for second phase funding)
- 9:30 – 9:45 Biogas (technology and business models, different scenarios, cost/benefits)
- 9:45 – 10:15 Discussion on Workshop Background Document
- Reviewing and identifying the strengths/weaknesses of business models
  - Discussion on the AD National Supporting Framework
- 10:15 – 10:30 Break
- 10:30 – 12:00 Break-Out Session (technology, policy, demand groups)
- Identify priorities, existing strengths and gaps/needs for strengths
- Facilitators:* Mike, Chris, Corinne
- 12:00 – 1:00 Lunch
- 1:00– 1:15 Report back on sessions
- 1:15 – 2:30 Proposal for Second Phase Funding (policy, technology and outreach)
- 2:30 – 2:45 Break
- 2:45 – 4:00 Phase 2 Proposal Working Session

## Appendix II: List of Participants

	Name	Workplace
1	Ssenyonjo Nicholas	UEEF
2	Stephen Ssemakula	UEEF
3	Wolfgang Kresser	UEEF
4	Ivan Birungi	MWE
5	Matoyu Jafari	PEA
6	William Fotseu	SNV
7	Babu Mohammed	NWSC
8	Aguti Caroline	MEMD
9	Kasinga Michael	Kiyindi
10	Jane Nabunnya. M	IRC
11	Dr. Gerald Sawula	NEMA
12	Irene Mugutoi	NWSC
13	Paddy Twesigye	NWSC
14	Josephine Mugala	UWASNET
15	Mike Theodoulou	ANAERGIA
16	Chris Metcalfe	UNU Canada
17	Viviane Yargeau	McGill University
18	Corinne Wallace	UNU Canada
19	Rhoda Nassanga	Uganda Christian Univ.
20	Frederick Kakembo	National coordinate WWP
21	John Saueu	Water for people
22	Sherina Munyana	Water for people