



From Waste to Wealth: Sustainable Wastewater Management in Uganda

Report on Workshop Proceedings 18 July 2013



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Acknowledgements

This workshop would not have been possible without the active participation of all attendees. Rapporteurs for the event were Kate Cave (Canada) and 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.

Welcoming Remarks

Dr. Corinne Schuster Wallace, UNU-INWEH, Principle Investigator, welcomed participants to the workshop and explained the “Waste to Wealth” initiative. The key goal of the initiative is to develop a multi-sectoral strategy for wastewater that is based on the “Waste to Wealth” concept. The joint vision for this workshop was to begin the process of creating a national framework for sanitation and wastewater management solutions by asking two important questions: What do we need? and, How can we implement? The objectives of the inaugural workshop (Appendix I) were to identify i) the 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) understand the distribution of costs and benefits (both financial and social).

The Honourable Maria Mutagamba, Minister of Tourism, Wildlife and Antiquities, acknowledged the participation of representatives from various institutions, both from Uganda and Canada, and emphasised the innovation of the ‘*waste to wealth*’ concept. It was recognised that the Ugandan government works to maintain an enabling environment that underpins various initiatives to provide water and promote sanitation to urban and rural communities in Uganda. However, despite current efforts, there is need for more concerted efforts in the direction of provision of water and sanitation in order to achieve universal coverage. There is only one year left, to achieve the MDG country targets; nonetheless, a lot can be done within the remaining period. Significant funds are spent dealing with health issues related to water and sanitation; funds which could be reduced through developing innovative technologies and reducing health burdens, particularly for women and children.

“Children in particular face undignified health environments both at home and in the schools that they attend. As citizens of this country, they have a right to safe water and sanitation facilities and to a dignifying healthy environment. “

Honourable Maria Mutagamba

As such, this workshop is very timely and participants are encouraged to work together to find solutions for the water and sanitation challenges. Overcoming the global wastewater management challenges entails developing sustainable and socially responsible financial models to support long term solutions. The presence of key players such as National water and Sewerage Corporation (NWSC) is very important for success.

The Honourable Maria Mutgamba concluded her address by appreciating the opportunity created by the workshop. She expressed optimism that the initiatives are here to stay, that the project will receive support from various sections of the community in Uganda and called upon participants to embrace the innovations entailed in the project.

Introduction to the “Waste to Wealth” Initiative

(Chris Metcalfe, Corinne Schuster-Wallace, Mike Theodoulous and Viviane Yargeau)

The “Waste to Wealth” initiative ultimately supports the reduction of environmental pollution from human waste through development of a management framework that harnesses potential post treatment revenue. The objectives of this initial phase are:

- Undertaking a feasibility assessment of biomethane potential;
- Estimating nutrient recovery amounts (especially nitrogen and phosphorous);
- Understanding potential socio-cultural facilitators and barriers;
- Developing outreach materials for education and awareness;
- Developing a business model approved by multi-stakeholder representatives; and,
- Supporting enlightened participants and development of a potential market.

Digesting human waste in an anaerobic environment (without oxygen) can create valuable resources from waste that would otherwise pollute the environment, making water treatment more difficult and expensive and degrading ecosystem services, such as fisheries and natural flood control. Ugandans currently use sludge from wastewater treatment for fertilizer. Anaerobic digestion of organic wastes (both human and solid waste) creates by-products that can be used for fuel (biogas and solid pellets) as well as fertilizers and soil amendment (sludge) which has higher nutrient values than traditional wastewater treatment sludge. Understanding existing technologies and initiatives in Uganda will lead to a harmonised approach towards developing useful and sustainable technologies.

Stakeholder Presentations

Participants were invited to provide short presentations on their organisations, current wastewater management activities and their interest in anaerobic digestion of waste.

Ministry of Water and Environment: The Ministry wishes to create an enabling environment for the promotion of water and sanitation activities, reflected through policy, strategy and direction; goods, products and services; personnel, capacity building initiatives; and, finances. The Ministry identified two ways of ensuring safe interaction with wastes:

1. The commercial way: it is important to communicate the commercial application and value or benefits of wastewater end products to the end-users. For example, we may need to state the commercial value of the biogas produced, of the fertilizers, etc.
2. The social way: explores issues of comfort with the toilets, the privacy, the health benefits, safety, etc.

National Water and Sewerage Corporation (NWSC): Mandated with the responsibility of handling water and sewerage in urban centres (currently 28 towns), wastewater treatment is a big challenge because of the limited sewerage systems and connections. NWSC serves approximately 6% of households, which in Kampala, translates to approximately 10,000 cubic meters of wastewater per day. NWSC is currently working with Makerere University and the Private Emptiers Association with respect to biogas recovery and is looking forward to future collaborations with Kampala Capital City Authority and the local government. NWSC is excited to embrace initiatives that are geared towards commercialisation of waste management.

Ministry of Energy: Promotes the use of biogas and energy efficient technologies through energy and renewable energy policies. A number of institutions are using biogas as a source of energy for lighting and cooking and biogas electrification is being promoted through the Uganda Credit Capitalisation Company. Funds are now available to enable people to carry out research into the feasibility of biogas electrification. The first will be piloted in Gulu and is expected to produce one Megawatt of power back to the national grid.

A number of options for tapping energy resources from various facilities (including oil refineries) are being investigated. In particular, attention is being focused on the discharge of wastes into the environment which ultimately pollute water sources. It will therefore be interesting to see how the different by-products from various facilities across the country (including oil refineries) may be used to produce bio-energy.

Planning Unit, Ministry of Education and Sports: The Ministry welcomes the idea of converting waste to wealth and will be interested in collaborating with other partners in that direction. The ministry has a wide constituency in the form of institutions of learning which could be used to disseminate the idea.

Honorable Maria Mutagamba appreciated the gesture of collaboration extended by the MOE and noted that the MOE is a strategic ally in the initiative. Education is critical in sharing knowledge, building capacity and training the next generation to deal with local problems and should be central in

addressing issues and challenges of sanitation. Honourable Mutagamaba called upon MOE to collaborate with the MWE to see how they can make use of existing global networks, such as the Stockholm Junior Water Prize as one way of engaging young people in finding solutions to challenging problems.

Fisheries Officer, Kiyindi Landing Site: Despite the great sanitation challenges at many of the fishing villages, sanitation solutions have not yet been implemented. Landing sites accommodate so many people within small unit areas but there are no proper plans to manage wastewaters. This occasionally culminates into health complications such as dysentery, cholera, etc. Hopefully the workshop would come up with practical ideas and solutions to address the challenges. Failure to find solutions also leads to environment degradation. Alternative sources of energy (such as biogas) are likely to reduce on the amount of wood used in e.g. smoking fish.

Private Emptier's Association (PEA): PEA started in 1989 and it is on a steady journey of growth; the association owns 45 trucks of various sizes. Private emptiers collect a further 5% of human effluent, preventing it from being discharged into the environment. PEA is pleased to be involved in the waste to wealth initiative and looks forward to contributing to a sustainable framework.

Kampala Capital City Authority Directorate of Public Health (KCCA): KCCA have a number of projects that are specifically focused on waste reuse for generation of energy. Projections suggest that, even by 2033, NWSC will only manage to provide service to 30% of Kampala. This means that 70% will rely on side sanitation, calling for innovative solutions to deal with wastewater disposal. KCCA is particularly focused on serving institutions and informal settlements and are working with a number of partners in this direction. For example, KCCA is in the process of implementing a bio-energy project at Kansanga primary school that has enabled the school to save approximately 30% of its energy expenditure. KCAA is also involved in a project located at Kitezi that is supported by the World Bank and focuses on solid waste reuse to generate bio-energy.

It should be noted that socio-cultural sensitivities exist which affect the demand for the products of human waste and which need to be addressed through education and sensitisation initiatives.

Uganda Water and Sanitation NGO Network (UWASNET): Established in 2000, the Uganda Water and Sanitation NGO Network (UWASNET) is the national umbrella organisation for Civil Society Organisations (CSO's) in the Water and Environment sector. The membership to UWASNET currently stands at 187. Its mission is to strengthen water and sanitation sector NGOs and CBOs as well as the coordination and

collaboration among them and other stakeholders. UWASNET hopes to see all people in Uganda accessing adequate and sustainable safe water and good standards of hygiene and sanitation in partnership with other key sector players such as Government, Development Partners (DP's) and the private sector.

With regards to the conversion of wastes to valuable products, there are a number of activities that are on-going on in various parts of the country by various actors. However, there is lack of documentation and harmonised efforts. UWASNET is in a favorable position to co-ordinate NGOs and CBOs and other actors; to determine the actors and to establish a framework under which players and actors operate and collaborate. Other issues that are central include the streamlining of the policy environment and addressing the social and cultural sensitivities associated with waste reuse. It will be imperative to identify a coordination institution/department to bring all the actors. UWASNET will continue building networks of knowledge bases within the NGO and CBOs

National Environment Management Agency (NEMA): NEMA is the secretariat and one stop centre for all the issues and activities that deal with the protection and preservation of the environment which is polluted by industrial, medical and electronic waste. NEMA handles both wastewater and solid waste management issues, especially as they relate to informal settlements and institutions of learning. There are some encouraging wastewater reuse practices in institutions of learning; Mount St Mary's college Namagunga is one of the schools that use biogas for lighting.

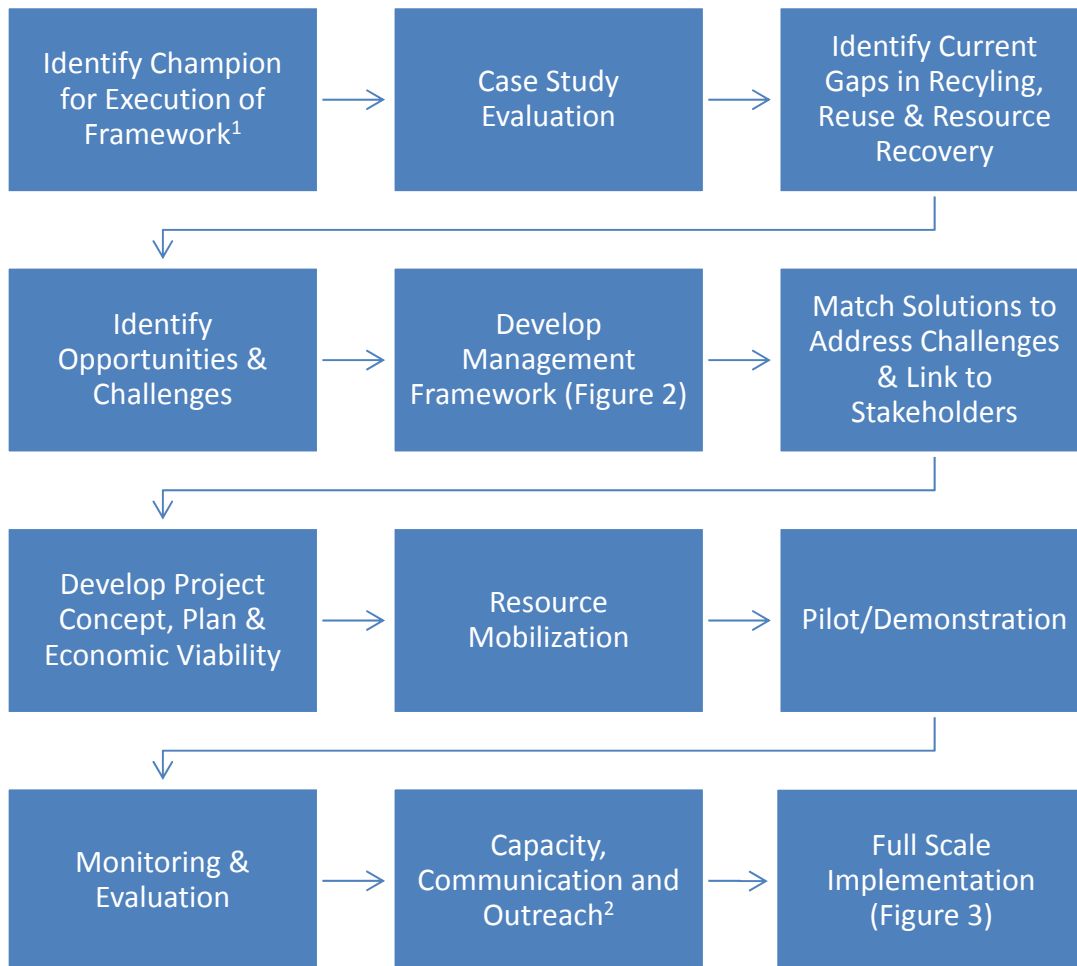
The oil and gas sector is an emerging industry that is likely to affect the environment through large volumes of water for the production of oil and release of by-products. NEMA hopes that the initiatives under discussion could provide some of the needed solutions towards converting the bio-wastes generated in the oil industries into wealth. NEMA will give its full support towards this initiative.

Assessing Wastewater Management in Uganda: What do we have and what do we need?

WHAT WE HAVE	GAPS
Sanitation and Wastewater Treatment Facilities	<ul style="list-style-type: none"> • Maintenance of facilities (How are full systems handled? Are they abandoned?) • Size of facilities required (how much is generated? What is current capacity?) • How do we address wastewater from agricultural activities? • How can we have safe interaction with wastes?
Solid Waste	<ul style="list-style-type: none"> • Needs to be sorted when it is dumped • Education and sensitisation is required to train communities on how to separate organic and inorganic materials • Disposal solutions for sorted inorganics
Institutions MWE (Sanitation Working Group; NEMA; NWSC) M of Energy (Energy Working Group) M of Agriculture M of Health; Natural Resources Committee Post-secondary Institutions Quality Assurance bodies KCCA Private Sector	<ul style="list-style-type: none"> • A framework that harmonises and coordinates activities • Knowledge sharing between the various actors (what has worked; what has not worked; and, what needs improvement)
Laws and Policies Water Act; Public Health Act; National Environment Act; Waste Management Regulation; Renewable Energy Policy; Petroleum Supply Act	<ul style="list-style-type: none"> • Modification of some policies to address current challenges
Education and Outreach	<ul style="list-style-type: none"> • What can be done to ensure that people understand the challenges involved in the use of available but scarce water? • Are people ready to utilise waste by-products?
Wastewater Reuse (Appendix II) Kampala Sanitation Programmes Crest Tanks Appropriate Technology Centre GIZ Heifer International PH Industries Water for People Kakira Sugar Works	<ul style="list-style-type: none"> • What are the options for converting waste into reusable resources? • What projects are currently underway? What is working and what isn't?

Outlining a Framework: What would it look like and how do we do it?

Participants developed the following draft frameworks within the workshop: a process framework (Figure 1); a management framework (Figure 2); and, an implementation framework (Figure 3).



¹Must be anchored by a government; requires identification & buy-in of stakeholders

² Requires communication strategy and education plan; use of media

Figure 1: Draft Process Framework Schematic

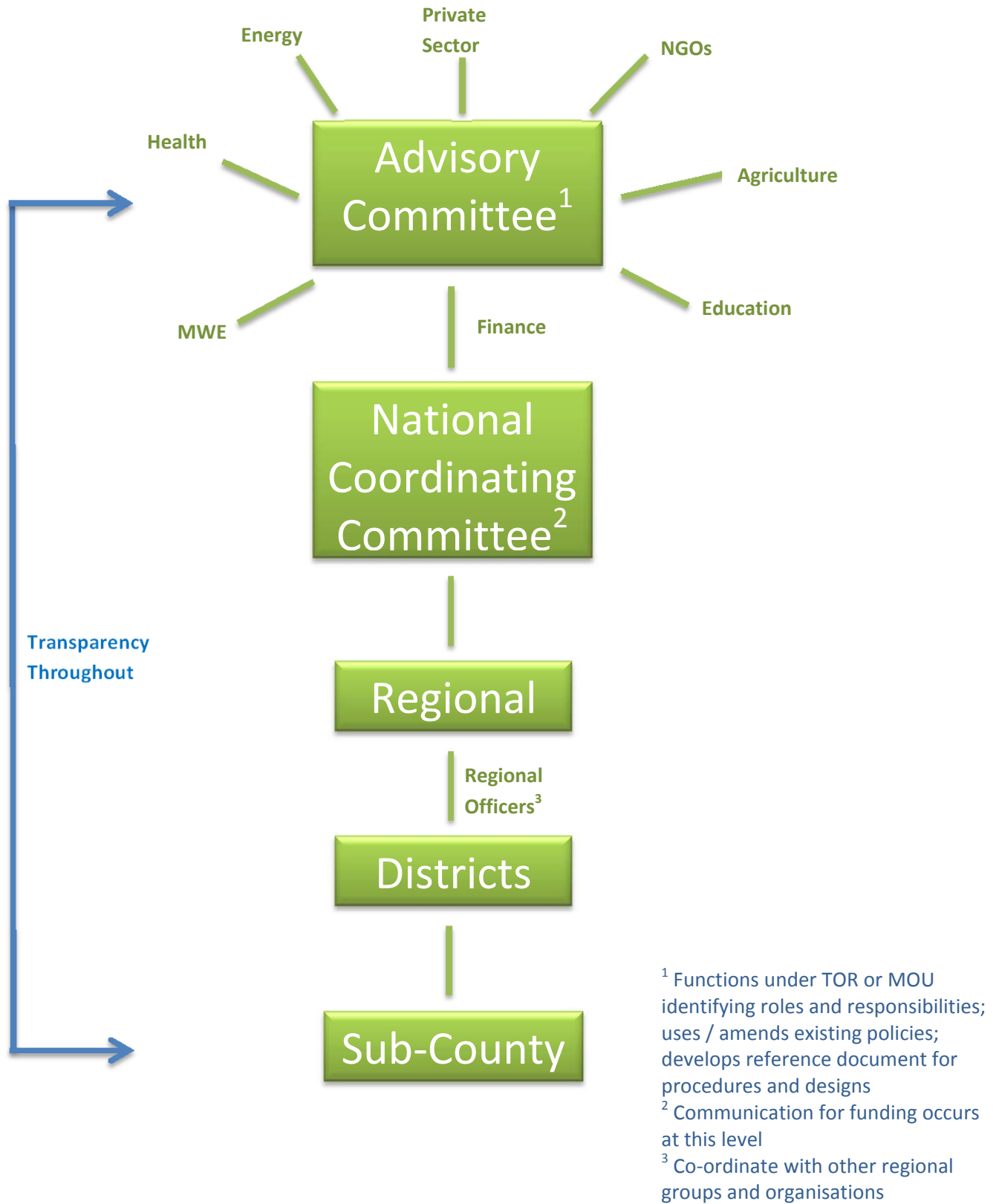


Figure 2: Draft Management Framework Schematic

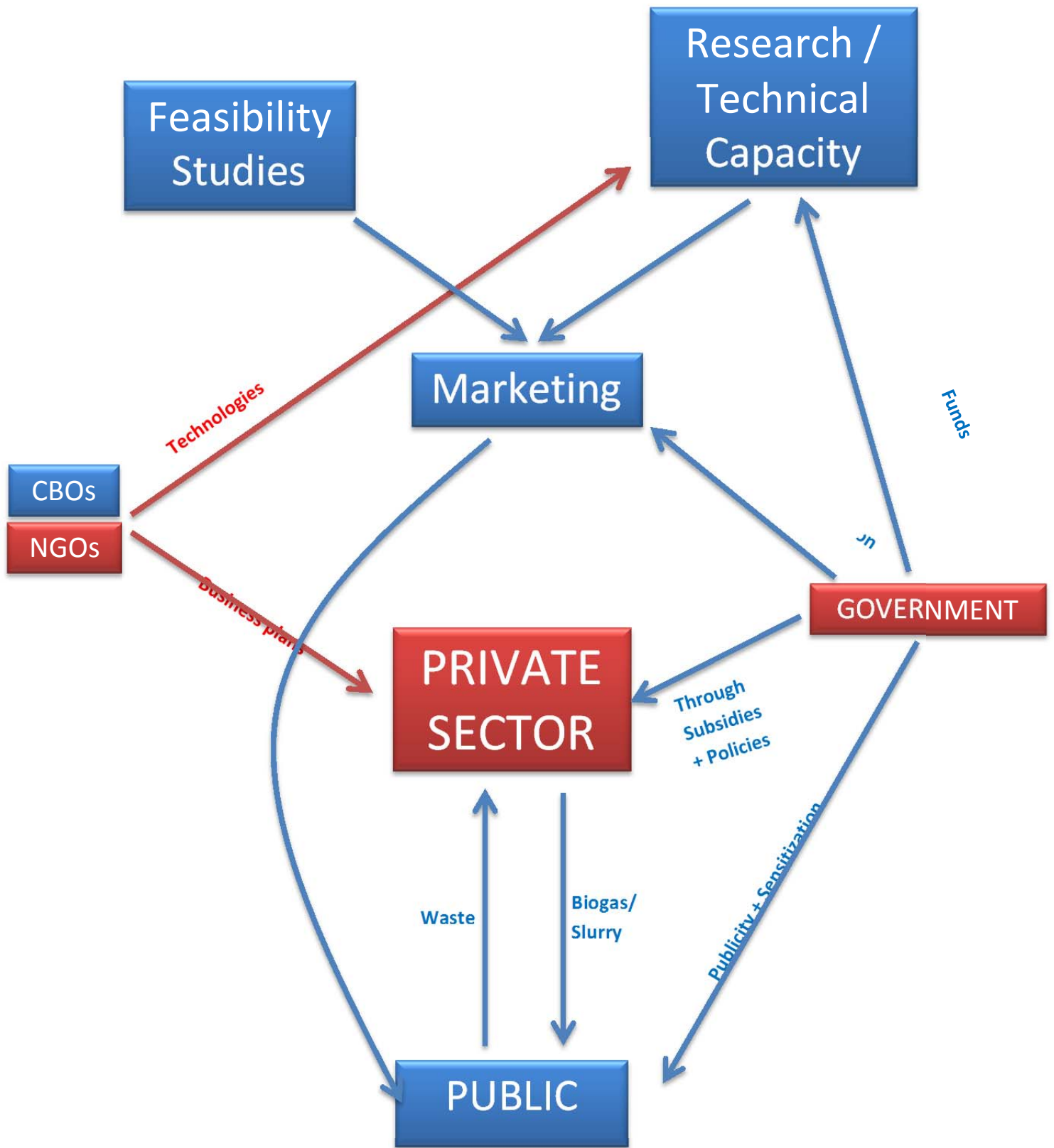


Figure 3: Draft Implementation Framework Schematic

How do we do it?

ACTION ITEM	DESCRIPTION OF TASKS
Develop a comprehensive concept/project plan	Determine what needs to be done, how it can be scaled up and who they champion should be.
Conduct a stakeholder analysis	Conduct a stakeholder analysis of the institutions currently involved in energy initiatives in Uganda. The following is a list of the institutions identified: Electricity Regulatory Authority; Electricity Distribution Company; Rural electrification agency; Uganda electricity Transmission Company; Ministry of Trade and Industry; and, the public.
Set up an advisory committee	<p>Set up an advisory committee to spearhead and harmonise plans and activities. Potential advisory committee members could include: private sector; NGOs; Ministry of health; Ministry of water and environment (MWE); Ministry of energy; Ministry of Finance; Ministry of education; Ministry of agriculture.</p> <p>Develop a Terms of Reference or Memoranda of Understanding to identify roles and responsibilities.</p>
Analyse existing policies and develop new guiding documents	Exploring possibilities to amend existing policies where applicable. Develop guiding documents (e.g., a catalogue or data base for the different designs and protocols for biodigesters).
Establish financing options and opportunities	Identify funds to start up initiatives and to support scale-up projects; encourage private public partnerships; and, explore business opportunities associated with waste management
Create opportunities for research and training	Collection of qualitative and quantitative data on household's biogas potentials and determine the economic viabilities of various options.
Education and Outreach	Use community education and sensitisation initiatives to change mindsets on waste-reuse; promote education and social marketing; implement education plans; appropriate use of media; set up a robust communication strategies Plan for communication/dissemination of results; and set up demonstration units and pilot projects.
Scaling Up and Out	Mobilise resources for up scaling or piloting; examine accessibility/adaptability/uptake of existing technologies within the rural communities; determine challenges and opportunities for scaling up; and, set up monitoring and evaluation plans.

Moving Forward

First, we need to identify a lead agency or a champion for this national framework. Suggestions for a lead agency included, the Ministries of Water and Environment, Agriculture, Energy, Trade and Industry, Health, and Education. However, it was strongly recommended that the Ministry of Water and Environment should take the lead. Other lead agencies that should be involved in the development of a national framework included: the National Environmental Management Agency (NEMA); National Water and Sewerage Corporation (MWSC); and, various electricity Agencies. UWASNET was the only civil society organisation identified.

UNU-INWEH agreed to act as a secretariat, to make consultations, collect information and support collaborative networks. UNU-INWEH will work with core individuals and institutions to undertake various activities including: the development of a working document; the development of a TOR for the core group; to unpack the areas of focus for this framework; to provide guidance on next steps; and to facilitate the discussion on demonstration models for private and public sector on household/small scale and large scale operations.

Participants raised several inter and/or intra sector communication issues and concerns including the importance of bringing major stakeholders together and identifying their roles and responsibilities in the development of the national framework; the need to mainstream activities; and, the sharing of knowledge and experiences/best practices. It was suggested that as we move forward, these communication issues could be addressed through the development of a forum.

Proposed Next Steps

- a. **A systematic review of current initiatives:** collect experiences with existing bio-energy initiatives (including the modes of operation, technology designs, how they are maintained) with the aim of understanding access, costs of operations and marketing options; current gaps in the recycling, reuse and resource recovery; and best practices.
- b. **Development of a communication strategy:** community education initiatives to transform attitudes and shift mindsets to start looking at bio-wastes as a resource; develop resource centres and one-stop information hubs; and, ensure adequate dissemination of the ideas and related innovations.

- c. **Identify stakeholders:** identify stakeholders; promote private sector involvement and participation; determine how the various stakeholders can work together and develop a clear set of responsibilities.
- d. **Undertake sound implementation strategies:** identify projects that could be scaled-up and scaled out; promote sound management skills; outsource for start-up funding; and mainstream activities within each of the sectors/ministries/agencies/institutions.
- e. **Promote training and skills development:** Build capacity to test for biomethane potential (through Waste to Wealth funding).

Appendix I: Workshop Agenda

FROM WASTE TO WEALTH: SUSTAINABLE WASTEWATER MANAGEMENT IN UGANDA

WORKSHOP AGENDA - 18 JULY 2013

- 9:00 – 9:15 Welcome
- Chairs:* Corinne Wallace; Chris Metcalfe
- Facilitators:* Kate Cave; Frederick Kakembo
- Welcome Provided by the Honourable Maria Mutagamba
- 9:15 – 9:30 Project introduction (purpose and objectives)
- 9:30 – 10:30 Series of Short Presentations
- Hon. Mutagamba Video
- 10:30 – 10:45 Break
- 10:45 – 12:00 **Break-out Session:** *What do we need?*
- Feasibility; implementation requirements; gaps and opportunities; capacity
- 12:00 – 1:00 Lunch
- 1:00 – 2:30 **Break-out Session:** *How do we do it?*
- Framework; policy and investment models
- 2:30 – 2:45 Break
- 2:45 – 4:15 **Plenary Discussion:** *Next Steps*
- 4:15 – 4:30 Closing
- 4:30 Cocktails

Appendix II: Current Wastewater Reuse Initiatives

ONGOING PROJECT	DESCRIPTION OF WASTE REUSE INITIATIVES
Kampala Sanitation Programmes	Aimed at overcalling the sanitation structure in Kampala to enable the city to match global standards. Promotes biogas production by increasing the efficiency in collection of wastes.
Crest Tanks	Produces bio-digesters and other materials for collection of wastewaters.
Appropriate Technology Centre	Composts wastes through use of earthworms which digest sludge into compost. Uses urine in agricultural activities.
GIZ	Promotes biogas projects in schools and in informal settlements.
Heifer International	Promotes the development of biogas from cow dung.
PH Industries	Produce power and supply it to the national grid.
Water-for-people	Conducts research on sanitation technologies and uses market based approaches to distribute products. Also deal with pit-latrines emptying from the construction to transporting to treatment.
Kakira Sugar works (SCOUL)	Produces energy from the wastes generated through production of sugar.
UWASNET	Coordinates all NGOs, CBOs and other Civil Society Organizations (CSO's) that deal with water, sanitation in the general environment preservation
Makerere University	Research on waste reuse (spearheaded by Prof Nuwagaba)

Appendix III: List of Participants

No	Name	Institution
1	Joel K. Mwesigye	KCCA
2	Stephen Ssemakula	Uganda Environmental Education Foundation
3	Wolfgang Kresser	HORIZONT 3000/UEEF
4	Micheal Kasinga	Fisheries Resource Department Kiyundi Landing site
5	D. Mukama Mukungu	MWE/DWD
6	Doreen Wandera	UWASNET
7	Micheal Masanza	UCU
8	Ogaram David	NWSC
9	Kayondo Yusuf	Independent Magazine
10	Jane Nabunnya	IRC
11	Tushabe Aug. Ali	Freelance
12	Matovu Jafari	Private Emptiers
13	Cate Nimanya	Water for People - Uganda
14	Luzige. W. Edward	Private Emptiers
15	Idrakua Lillian	Min. Of water and environment
16	Disan Ssozi	Ministry of Water
17	Grace Katuramu	Royal Danish Embassy
18	Samuel Mutono	
19	Aguti Caroline	MEMD
20	Maiteki Miiro James	NWSC

21	Evelyn Lutalo	NEMA
22	Najib B Lukooya	KCCA
23	Maria Mutagamba	MTWA
24	Grace Nankabirwa	MOES
25	Enyimu Amanda	Uganda Christian University (UCU)
26	Suresh	Crestanks Uganda Limited
27	Walugambe Dius	Vision group
28	Jud Jorum Okecth	Vision Group Print
29	Isaac Muteyo	ATC
30	Christine Bbosa	We Consult-Water Supply and Mapping
31	Balyegisawa joseph	DWRM
32	Wita Raymond	MWE
33	Corinne Schuster Wallace	UNU-INWEH
34	Kate Cave	UNU-INWEH
35	Chris Metcalfe	Trent University/UNU-INWEH
36	Mike Theodoulou	Anaergia
37	Viviane Yargeau	McGill University
38	Frederick Kakembo	Uganda project Coordinator