

Energy from Waste Workshop (E.f.W)



Final Report



25-26 October 2010

Index

SECTION 1

1.	BACKGROUND AND CONTENT	4
1.1	Workshop Objectives	4
1.2	Workshop Structure	5
2.	OPENING WORDS OF MS. MARITZA MARIN - MEMBER OF THE BOARD OF	
	DIRECTORS OF ACEPESA.	5
3.	MR. CHRISTIAN SCHLOSSER, UN-HABITAT, NAIROBI WORKSHOP GUIDELINES.	5
4.	OVERVIEW OF GLOBAL ENERGY NETWORK FOR URBAN SETTLEMENTS (GENUS)	6
5.	PRESENTATIONS	6
5.1	Potential of biomass energy	6
5.2	Instituto Internacional de Recursos Renovables, A.C. Biodigestores	12
5.3	Biodigesters. A way to mitigate climate change, and generate social, environmental and political	
	responsibility.	16
5.4	Tackling the energy production of household waste in Bolivia. Digesters	18
5.5	Production of biogas at industrial scale. ITCR – slaughter plant experience Biodigesters	20
5.6	Experiences in biogas and renewable energies in CA-SNV.	23
5.7	Innovations of bio-digesters in Latin America. BioLAC network training. Caitlyn Peake.	
	Greenempowerment- Nicaragua	28
5.8	Total Conversion of Waste without Colateral Impact to the Environment. An integral	
	Sustainable Development and Social Development for Municipal Waste Management.	
	Biodigestors	32
5.9	Experiences in the Production of Biogas from Waste in Brasil and Haití	35
5.10	Regional Programme for Energy Efficiency in Central America. Support for EfW Activities	
	in Latin America. Biodigestors	38
6.	CONCLUSIONS AND DISCUSSION: CHALLENGES, PRINCIPAL ACTORS, POTENTIAL	
	PILOT PROJECTS.	41
ANN	VEXES	43
SEC	TION 2	
Ann	ex 1. Aide-Memoire	1
1.0	Introduction	2

2.0	The process of the generation of energy from waste	.2		
3.0	Objectives of the EfW workshop	.3		
4.0	Expected Results	.3		
Annex 2. Ag	enda	.4		
Annex 3. Pa	Annex 3. Participant's List			

FOR A BETTER URBAN FUTURE

Energy from Waste Workshop (E.f.W)



San José, Costa Rica

1. BACKGROUND AND CONTEXT

The Energy from Waste workshop (EfW) was held in San José, Costa Rica October 25th and 26th, 2010. The organization of the workshop was a joint effort of the Asociación Centroamericana para la Economía, la Salud y el Ambiente (ACEPESA), UN-Habitat Nairobi and UN-Habitat Costa Rica.

The activity is carried out within the framework of the Global Energy Network for Urban Settlements (GENUS), established by the United Nations Programme for Human Settlements (UN-Habitat) as a new global partnership programme that seeks to encourage and support the design and implementation of access to energy programmes and projects for the urban poor worldwide.

GENUS is a network for the exchange and dissemination of knowledge and best practices on access to energy for the poor around the world. It aims to have a dynamic new partnership and collaboration with multiple institutions and stakeholders including the public and private sectors, governmental and non-governmental organizations, grassroots groups, national and international development agencies, working in the urban energy sector.

The GENUS programme is operating in three regions: Latin America and the Caribbean, Africa and Asia, and addresses three key contemporary themes of access to urban energy. 1) Energy from waste (EfW) in Latin America and the Caribbean. 2) Slum Electrification in Africa. 3) Improved Urban Mobility for the poor in Asia.

The workshop in Costa Rica was to launch the GENUS network and the programme of work on energy from solid waste. The activity included representatives of agencies, institutions and stakeholders involved in Nicaragua, Bolivia, Honduras, Haiti, Brazil, Mexico, Peru, and Costa Rica (unfortunately, the representative of the Ministry of Health who is responsible for solid waste management was not able to attend).

The presentations given, including one via Skype from Argentina, facilitated the exchange and integration of the best practices, experiences and lessons learned, challenges and opportunities in different alternatives of energy generation from waste among the participants

1.1 Workshop Objectives

The objectives of the workshop are as follows:

- The general review of the political, environmental and commercial interests that may influence waste management policies in typical municipalities in developing countries.
- Elaboration of themes concerning the recovery of materials (recycling) versus energy recovery and the context in which the preference for one over the other can be defined.
- Presentation of typical EfW technologies, the context of their uses, the successes and limitations of each.
- Presentation of case studies of successful EfW plants and the management factors that can contribute to their success or failure.
- Development of the exchange of ideas on the economic and financial viability of the various technologies.

- Exchange of ideas on issues of policies and regulations with reference to the possibility of extending the EfW programme.
- Discussion of the social and environmental goals of the EfW programme.
- Development of a work plan with the steps to follow to introduce and consolidate the GENUS network in Latin America and the Caribbean.

1.2 Workshop Structure

The workshop took place over two days, October 25th and 26th, 2010. The development of the workshop was divided into seven thematic sessions. The first day included presentations that covered possible approaches, challenges and opportunities encountered, as well as EfW policies in countries, case studies and project experiences.

The second day was used to analyze the regional perspectives for the generation of energy from waste (EfW) and the possibility of bilateral and multilateral cooperation to promote the programme. As one of the final activities, the GENUS approach was presented and the steps to follow for the development and consolidation of GENUS in the Latin America and the Caribbean region were discussed in the plenary session.

2. OPENING WORDS OF MS. MARITZA MARIN - MEMBER OF THE BOARD OF DIRECTORS OF ACEPESA.

The workshop was initiated with the opening words from Ms. Maritza Marin, Member of the Board of Directors of ACEPESA. Ms. Marin welcomes and comments that the present Integrated Management of Solid Waste Program in Latin America and this event are complementary efforts and constitute a new dimension of the global waste management. She announced that in the previous week, a network for management of liquid waste in Latin America was also established.

3. MR. CHRISTIAN SCHLOSSER, UN-HABITAT, NAIROBI WORKSHOP GUIDELINES.

Mr. Christian Schlosser, Chief, Urban Transportation Section of UN-Habitat in Nairobi, presented the most important guidelines for the workshop.

In his presentation Mr. Schlosser explained the organization of the workshop within the framework of a new programme known as the Global Energy Network for Urban Settlements (GENUS) and its objectives. He explained the different aspects of GENUS in three regions, the areas of work for each and the need to establish partners in the region in order to meet the established goals.

Once the network is established in the three regions there will be an interregional workshop to formally launch the GENUS programme as a global platform on access to energy for the urban poor worldwide.

Mr. Schlosser explained the most important results that were expected of the workshop were:

- ✤ Introduce the GENUS network and present its objectives and goals.
- Develop an understanding of key issues, technological, economic and regulatory challenges and opportunities for the generation of energy form solid waste and make it available in poor and informal settlements.
- ♦ Identify key stakeholders in Latin America to be included in the emerging GENUS network.
- ◆ Formulate a broad agreement on the structure of the GENUS in Latin America and the Caribbean

network.

- Identify potential anchor institutions for the GENUS activities in Latin America.
- Develop by means of a broad agreement a comprehensive GENUS operative plan and objectives in Latin America.

4. AN OVERVIEW OF GLOBAL ENERGY NETWORK FOR URBAN SETTLEMENTS (GENUS)

Ms. Marianela Mora, the workshop facilitator, officially opened the workshop with a presentation explaining what the Global Network on Energy for Urban Settlements (GENUS) is about and its objectives.

Ms. Mora explained how GENUS is developed in the three regions: Latin America and the Caribbean, Africa and Asia and the Pacific. Each region develops specific aspects according to their different needs:

- ✤ Asia- Improved Urban Mobility for the Poor.
- ✤ Africa- Slum Electrification
- ◆ Latin America and the Caribbean- Energy from Waste (EfW)

The GENUS objectives are:

- To promote the design and implementation of access to energy programmes for the urban poor worldwide.
- To operate a platform for the exchange and dissemination of knowledge and best practices on the issue of access to energy for the poor worldwide.

GENUS operates in three regions with specific topics for each: Latin America and the Caribbean with energy from waste; Africa with electrification of the marginal settlements; Asia and the Pacific with access to transportation

5. PRESENTATIONS

5.1 The potential of biomass energy. Luis Diego Jimenez g. - Costa Rica - consultant – UN-Habitat.



Photographer, Marvin Soto, journalist ACEPESA, EfW Workshop, San José 2010. © ACEPESA all rights reserved.

Mr. Luis Diego Jimenez Gongora gave a presentation titled, The potential of biomass energy with emphasis on Costa Rica. He gave an overview of the electrical coverage in Central America and Costa Rica in particular.

* Electric coverage in Central America



Illustration # 1: Electric coverage in Central America, taken from the presentation, "Potential of Biomas from Energy" M.Sc. Luis Diego Jimenez Gongora, October 2010, San José Costa Rica, EfW Workshop, © M.Sc. Luis Diego Jimenez Gongora all rights reserved.

The chart presented shows Costa Rica as one of the countries with most electric coverage in Central America, followed by Panama, Guatemala, El Salvador and finally Nicaragua.

Energy Consumption

During the period 1980-2000 the national energy consumption was triplicated, moreover consumption climbed 4.2% thanks to the electrification processes. Also the consumption of petroleum products increased significantly (9.2%).



Illustration # 2: Electric coverage in Central America, taken presentation, "Potential of Biomas from Energy "M.Sc. Luis Diego Jimenez Gongora, October 2010, San José Costa Rica, EfW Workshop. Source: DSE. National Energy Balance, 2009, ©M.Sc. Luis Diego Jimenez Gongora all rights reserved.

As shown in the graph above, the two most important consumers of energy are industry and transport, followed by residential, services, public, commercial and agricultural, among others.

***** Sustainability in relation to resource management

For a more sustainable relationship between the management of resources the following can be done:

- 1. Avoid the generation of waste at the source (reducing the consumption of products that produce waste)
- 2. Waste reduction
- 3. Recycling and utilization of reusable human material.
- 4. Waste treatment
- 5. Waste elimination

***** Types of Biodegradable Waste

- 1. Environmental residues
- 2. Agricultural residues
- 3. Livestock residues
- 4. Industrial residues (agro industrial and agro alimentation)
- 5. Sewage and industrial sludge
- 6. Urban solid residues
- 7. Sewage and sludge

***** Decomposition of organic material

Organic material has different ways decomposing, some of them are:

- 1. Aerobic decomposition (oxidation)
- 2. Anaerobic decomposition (fermentation)
- 3. Semi aerobic decomposition (nitrification and incomplete denitrification).

✤ Disadvantages of combustion

Just as combustion has certain advantages, it also has certain disadvantages. Many times it can have an impact on the environment, as well as animal and human health. Some disadvantages of combustion are:

1. The generation of fine particles that is harmful to humans.

- 2. Incomplete combustion generates carbon monoxide and soot and complete combustion generates nitrogen oxide from other components.
- 3. When you have materials that have been treated by agrochemicals (wooden pallets, furniture and fabrics) in combustion the production of dioxins and furans is inevitable, therefore it is not recommended to use impacted biomass burning ovens.
- 4. The value of the raw material for the organic fertilizer production is lost.

Conversion to Secondary Energy Resources



Illustration # 3: Electric coverage in Central America , taken presentation, "Potential of Biomas from Energy "M.Sc. Luis Diego Jimenez Gongora, October 2010, San José Costa Rica, EfW Workshop, © M.Sc. Luis Diego Jimenez Gongora all rights reserved.

Thermo chemistry

Thermo chemistry has a process called gasification. Gasification involves partial combustion:

- 1. Oxygen (gas from synthesis): carbon monoxide, carbon dioxide, methane and water.
- 2. Air (gas poor): methane, water and nitrogen.

* Advantages of Gasification

Gasification is a process that has certain advantages in regard to combustion. Some of the advantages of this process are: it is more efficient than direct combustion, especially in the transport of biomass combustion; it causes less pollution because it releases fewer particles, different raw materials with ash and moisture can be used. It is possible to produce liquid fuels.

* Pyrolysis

Pyrolysis is a high temperature process, with restricted availability of air and products in fractions liquid, gas and solid.



Illustration # 4: Electric coverage in Central America , taken from the presentation, "Potential of Biomas from Energy "M.Sc. Luis Diego Jimenez Gongora, October 2010, San José Costa Rica, EfW Workshop, © M.Sc. Luis Diego Jimenez Gongora all rights reserved.

* Biotechnological: Anaerobic

This process involves waste, anaerobic digestion and bacteria to produce energy. An example is illustrated: below with the production of bio-fuels.



Steps for the production of bio-fuels.

Illustration # 5: Electric coverage in Central America , taken presentation, "Potential of Biomas from Energía "M.Sc. Luis Diego Jimenez Gongora, October 2010, San José Costa Rica, EfW Workshop., ©M.Sc. Luis Diego Jimenez Gongora all rights reserved.

* Energy Supply from Biomass Waste.

The following illustration presents the bio-medical waste that is used in the production and supply of energy. Mr. Jimenez took this information from the Biomass Resource Survey conducted in 2006.



Illustration # 6: Electric coverage in Central America , taken presentation, "Potential of Biomas from Energy" M.Sc. Luis Diego Jimenez Gongora, October 2010, San José Costa Rica, EfW Workshop, © M.Sc. Luis Diego Jimenez Gongora all rights reserved.

* Bio-energy Technologies available in Costa Rica

Currently Costa Rica uses different technologies for the production of energy (such as those presented above). The following are some of the technologies and their uses.

- 1. The biomass gasification: coffee, mainly in COOPEDOTA the southern zone -producing sector.
- 2. Biogas digesters ($< 50 \text{ m}^3$): this is the technology used for the development of bioenergy. Used waste from piggeries and dairies.
- *3. Ponds or outdoor plants treatment*: this form of production is mainly used in coffee-producing areas.
- 4. *Grid/suspension bed dryers/ovens*: it is used in rice farming and coffee plantations; it produces between 44-400 kilowatts.
- 5. Bagasse cogeneration (1-20 MW): the sugar industry is very interested in this type of generation.
- 6. Landfill gas plants (< 5 MW): presently produced in the Río Azul landfill which is not operating anymore.

***** Barriers and opportunities for the use of bioenergy in Costa Rica.

Technical category: there are different opportunities for implementing Bioenergy in the countries at different levels, there are several pilot projects. The main barriers are the lack of trained personnel as well as lack of knowledge among the population.

Market category: there is more interest on the part of international investors and the resources allow for energy autonomy and export. But the market barrier is the existing State monopoly and restricted access to technology.

Institutional category: the ICE (Instituto Costarricense de Electricidad) is considering bioenergy projects as well as different NGOs that are presently using bio-energy in different communities of the rural sector.

Political category: the Government has a great interest in the use of renewable energy sources and also has a number of requirements for the correct disposal of waste. The problem is that the policies developed for implementation are somewhat confusing.

Category of energy resources: there is a large amount of biomass in the territory; the food industries sector has waste with high energy potential. One of the existing barriers is the existence of many other hydroelectric projects already in operation.

Social, cultural and behavioral category: there is an expected growth in the population that uses energy. The technologies must adapt to the needs of the current population and their potential growth.

Conclusions

Costa Rica currently does not take advantage its different energy resources, especially the biomass that is produced in the agricultural industry. There are different resources for the use of technologies for generation on site to bio-fuels. With the opening of the energy sector to public generators the country's potential forms of energy production can be developed.

5.3 International Institute for Renewable Resources, A.C. Bio-digesters *Alexander Eaton. REDBioLac, México.*



Photographer, Marvin Soto, journalist ACEPESA, EfW Workshop, San José 2010, © ACEPESA all rights reserved.

The second presentation was given by Mr. Alexander Eaton, President of the National Institute for Renewable Resources of Mexico, titled, "Program scales for domestic Bio-digesters in Latin America".

The International Institute for Renewable Resources, A.C IRRI, is a non-profit organization, whose purpose is to promote the sustainable management of renewable resources by means of courses and projects, giving priority to the most needed areas.

The Institute's mission focuses on supporting rural and marginal communities through the generation and development of local resources, with the aim of achieving a better quality of life.

Among the courses and projects that IRRI develops are the following:

* Courses

- 1. Suitable technologies for the Developing World
- 2. Solar Photovoltaic Energy (3 modules)
- 3. Biodigestor and Biogas
- 4. Technology and Water Management

* Projects

- 1. Acquisition of Pluvial Water Urban Island, SEMARNAT, Schools in SMA
 - 2. Biodigestor for Rural Communities
 - 3. Savings, Conservation and Water Treatment
 - 4. Water Fair (workshops, conferences, demonstrations, family activities, etc.)

In the biogas project, various problems that occur in the environment by not giving adequate use to waste and benefits from the use of the bio-digesters are explained; these problems and benefits are seen clearly in the comparative table:





The objective of the Biogas project is to create a culture of using waste for energy, in other words a culture that does not have waste, where waste treatment has a high value and has high standards for treatment systems and energy production, a culture that is clear in the issue that energy generation from waste is not a technology of the poor.

To encourage the citizens to use the bio-digesters, IRRI within the biogas project promotes pilot projects which consist of demonstrative systems installed in communities as an example for the zone.

IRRI Mexico in its biogas programme generated a database with all projects; in such a way that they maintain close contact in order to better provide maintenance and more training.

The International Institute for Renewable Resources, A.C. has installed digesters in 11 States of Mexico, and countries as Costa Rica, Peru, Ecuador and Nicaragua.

In Mexico 52 digesters have been installed from 2008 to date, and 25 more are in process, which are distributed as follows: one in Mazamitla city in the state of Jalisco, one in Guanajuato in the locality of Los Baños, La Hoja. In Michoacán in the cities of Erongaricuaro and Tinzingaro in the state of Mexico there are 15 digesters, in the cities of Xochimilco, Tiáloc Topilejo, Puebla there are 9 digesters, in the State of Chiapas in the towns of Tziscao, Buena Vista Pachan and San Cristóbal de las Casas, in the State of Tabasco in Villahermosa, and last but not least in the State of Yucatán in Chemax city.

In regard to climate change IRRI registers all projects with Micro Energy Credits, which generate Eco-Securities offset. Offsets funds cover monitoring, education and maintenance of applications.



Bio-Bag System

Illustration #8: Bio-bag systems, taken presentación titled, "Bio-digestors" Alexander Eaton. REDBioLac International Institute of Renewable Resources, A.C. Bio-digesters, San José Costa Rica, 2010. EfW Workshop, © Alexander Eaton. REDBioLac International Institute of Renewable Resources, A.C. Bio-digesters all rights reserved.

Among the field of biodigestor there are many and different types, but the elements that make the Bio-Bag System unique are:

- 1. Material: Containers are made from high density polypropylene / polyethylene.
- 2. Adaptability: The design uses 4 "or 6" PVC at the entrances and exits, so the system can receive

wastes from anywhere with ease, and 1 "or 2" PVC for gas output.

- **3.** Modular and unfoldable: This system is designed for easy packing and shipping. It is folded and packed in its own material. There is no waste packaging since it is used as a protective system at the time of installation.
- 4. **Durable**: It is a material with a 20 year warranty.
- 5. Malleable: The system is designed for manual agitation.
- 6. **Resistant**: The system can be placed in a ditch or with a wall.
- 7. A complete system: Includes gas reservoir, relief system, sulfuric hydrogen filter and burner.
- **8. Small applications**: The system is designed for farms and small families with a capacity of up to 30 cubic meters. You can install multiple systems for larger farms.
- **9.** Made in Mexico: The system is a product registered in Mexico, manufactured in volume efficiently and without waste.

In the State of Puebla there is an example of the bio-digesters installation cases, where the Ministry of Rural Development (SDR), promoted the bio-digesters and paid for 65% of the system and installation costs. The users have to pay the remainder. The SDR technicians are trained by IRRI technicians to install systems and their monitoring. The funds that are generated by the sale of carbon offsets are used to pay for future monitoring, education and promotion of technology. Among the objectives is the installation of 30 systems over a period of three months, representing pilot projects in all the critical regions. These tens of thousands of small ranchers in the State of Puebla could benefit from the bio-digesters.

With the installation of bio-digesters the International Institute for Renewable Resources, A.C. has certain objectives planned that would make it possible to achieve in the short and medium term, the training of more technical Government, develop groups and civil organizations to install and maintain systems of bio-digesters. Promote and develop large offset projects that can add thousands of small digesters, reducing the Mexico carbon footprint, increasing the capacity of renewable energy in the country and providing benefits outside the agricultural sector projects. The generation of small businesses in rural areas with the installation and maintenance of bio-digesters and the development of micro-credit options to facilitate the purchase of bio-digesters are other tasks to be achieved.

***** Economic Balance for the Final User Costs

- 1. Initial capital investment
- 2. Low annual maintenance (\$ 65-130 MX)
- 3. Waste supply

Economic Benefits

- □ Energy generation/offset
- □ Generation/offset fertilizer
- □ Generation of emission reduction
- \Box Health benefits
- \Box Benefits in quality of life (QOL)

□ Environmental Services

Paying off of the smaller system (without allowance) = \$8,900 MX initial cost / (\$3,600 energy/year + \$1,800 fertilizer/year + \$500 SR/year + health + QOL) = +/-1 year.

(Known range of 8-24 months based on normal conditions with less time return to large systems).

5.3 Biodigestor. A way to mitigate climate change, and generate social, environmental and political responsibility. *Diana Dominguez. CARE- Ecuador.*



Photographer Marvin Soto, journalist, ACEPESA, EfW Workshop, San José 2010, © ACEPESA all rights reserved.

Ms. Diana Dominguez, from CARE- Ecuador presented the following topic, "The conversation of slaughter house waste in Ecuador", as a part of the EfW Workshop.

* Partners

The NGO, CARE from Ecuador has the following partners for their project:

- 1. Owners: the direct beneficiaries and also responsible for the maintenance.
- 2. *Authorities and the CARE*: these two instances are the generators of local policies and institutionalized processes.
- 3. Universities: they are dictated to doing research and systematizing of their results.

* Types of Biodigestor

Ecuador uses two types of bio-digesters. The one known as Hindu is used for the production of biogas with minimal visual impact and the Sausage type preferably used for the production of biogas and bio-fertilizer.

* Location

The bio-digesters are located in three locations:

- 1. Integrated Farms
- 2. Tourist Companies
- 3. Municipal Slaughterhouses

Research Sites

CARE conducts research at different points where they have deployed applications. Some of the parts where investigations are carried out are: Hostería "Bosques de Paz" el Limonal, Granja La Pradera UTN, Pontificia Universidad Católica del Ecuador, Hostería La Merced Baja "Zuleta", Empresa Municipal de Faenamiento de Antonio Ante, Comunidad Chaupi Guarangui and Asociación de Campesinos Agroecológicos de Intag (ACAI)

- ***** The bio-digesters have served as:
- 1. An alternative to generate development
- 2. A means of improving agriculture
- 3. An option for the development for the Organization.
- 4. As a space for the Organization of workers
- 5. Research of existing sources
- 6. Use to improve local policies
- 7. An alternative to join efforts.



Photo of an Ecuadorian working in a biodigestor, taken presentation, "Biodigestor. A form of mitigating climate change and generate social, environmental and political responsibility Diana Dominguez. CARE- Ecuador, San José Costa Rica, 2010. EfW Workshop, © Diana Dominguez. CARE- Ecuador all rights reserved.



Photo of green peas produced with biodigestor, taken presentation, " Biodigestor. A form of mitigating climate change and generate social, environmental and political responsibility, Diana Dominguez. CARE-Ecuador, San José Costa Rica, 2010. EfW Workshop, © Diana Dominguez. CARE- Ecuador all rights reserved.

✤ Impact

Thanks to the use of bio-digesters, communities where CARE Ecuador works have had different impacts. Tourism has increased on farms where digesters are used since tourists consider that this form of power generation is very good. The Biol is used as fertilizer in fruit fields and pastures have significant savings.

The use of bio-digesters is a good way to mitigate the impact of climate change and at the same time is a responsible way of generating energy. Is it also treated jointly with municipal authorities as a way to use waste from swine production and existing slaughterhouses.

The use of digesters in slaughterhouses has reduced diseases caused by flies and rodents that were previously in the waste deposits. Also both slaughterhouses as well as swine producers offer a better service to their clients by having a way to treat their waste better. There is an idea proposed so that municipal digesters are created and the municipality fills the needs of residents and then these services are charged.

5.4 Tackling the energy production of household waste in Bolivia. Digesters. *Matthias Nabholz. Swisscontact- Bolivia*



Photographer Marvin Soto, journalist ACEPESA, EfW Workshop, San José 2010, ©ACEPESA all rights reserved.

Mr. Matthias Nabholz, Swisscontact Project Manager in Bolivia, presents the following topic, "An approach to the producing of energy from domestic waste in Bolivia", Swisscontact experiences.

The **"Tackling of energy production of domestic waste in Bolivia" project** is the responsibility of the Swisscontact Foundation, an entity responsible for the technical development of Swiss cooperation. In cooperation with local counterparts they promote sustainable development (sustainable economic, social, political and environmental) programmes and projects in certain countries of South and East Bolivia, according to the principle of **help for self-help**.

The foundations experience in the issue of waste collection in Bolivia can be presented in the following table:

1999-2005	Reduction of Ozono depleting substances.
2001-2008	Integrated Hospital Waste Management System.
2006-2008	PET Recycling
2009-2012	Eco-neighborhoods- Work done with commu- nity.
2009-2010	Design of a Integrated Solid Waste Management system for 4 municipalities.

Ilustration # 9: The phases of waste collection in Bolivia, taken presentation, "*The approach to Energy Production from Domestic Waste in Bolivia. Biodigestor* "*Matthias Nabholz. Swisscontact- Bolivia, San José Costa Rica, 2010.* EfW Workshop, © *Matthias Nabholz. Swisscontact- Bolivia* all rights reserved

Statistics demonstrate that Bolivia generates 3,530 tones of solid waste per day, 0.35 kg per capita per day (10 million inhabitants), 86% of this waste is generated in cities. It also indicates that in all of Bolivia there are only 2 landfills, in which there was not a differentiated collection or source separation.

The Eco-vecindarios project initiated in 2009 aims to promote education and awareness, through the promoting of a collection system and proper treatment of the organic and electronics waste. One of the achievements obtained at the end of 2009 is the installation of 58 Eco-vecindarios OTBs, a total of 30000 families with public awareness, the involvement of 55 local collectors, a total of 21 storing centers involved in the project and a total of 120000 kg in collected recyclable material.

They also work in "Eco-mercados" projects which are major generators of organic products. The population is identified and is participating in the system of differentiated collection.



Biodigestor pilot project

Photo of a bioidigester pilot plant, taken presentation, "*The approach to Energy Production from Domestic Waste in Bolivia. Biodigestor*" Matthias Nabholz. Swisscontact- Bolivia, San José Costa Rica, 2010. EfW Workshop, © Matthias Nabholz. Swisscontact- Bolivia, all rights reserved

The design of the bio-digesters pilot plant, presented by Mr. Johann Reichl, has the ability to treat 25 tons daily of organic waste to produce energy in the form of biogas and/or electricity, producing liquid bio-fertilizers "Biol" and reduce environmental pollution.

There are three different bioreactors that support the micro-biolology:

- Round bioreactor or mixture tank- aerobic reaction
- ✤ Anaerobic bioreactor with con kinetic mixer
- Bioreactor with a giant kinetic mixer (aerobic)



Photo of a birreactor, taken presentation, "The approach to Energy Production from Domestic Waste in Bolivia. Biodigestor "Matthias Nabholz. Swisscontact-Bolivia, San José Costa Rica, 2010. EfW Workshop, © Matthias Nabholz. Swisscontact-Bolivia, all rights reserved.

The results and achievements obtained can be summarized in the following: production of between 600 and 750 m3 of biogas (25 ton of organic / day), the consumption of electricity and biogas plant energy produced which are approximately 20% of the process needs, and the volume of biofertilizer produced (Biol) is a maximum of to 5 tanks per day.

The Foundation has concluded that the biodigesters pilot plant seems feasible since the amount of investment has a recovery period of 3 years of operation, the 2 products (Biol, Biogas) are very useful for the city and its environment, and the bio-digesters pilot plant represents a good alternative investment due to the great benefits to society and the environment that it produces.

5.5 Production of biogas at industrial scale. ITCR – slaughter plant experience Biodigestor. *Ronny Cascante, Bun-ca- Costa Rica. Wilfrido Paniagua. ITCR- Costa Rica.*



Photographer, Marvin Soto, journalist ACEPESA, EfW Workshop, San José 2010, © ACEPESA all rights reserved

Mr. Ronny Cascante, representative of Bun - Ca Costa Rica, presented the following topic, "Experiences in energy generation from slaughter house waste" a Project developed in conjunction with the Instituto Tecnológico de Costa Rica and Bun - CA, as part of the EfW Workshop". BUN-CA is a non-government organization established as a Foundation that has been active in Central America since 1991 and which focuses on two areas of work: Renewable Energy and Energy Efficiency.

The BUN-CA Foundation facilitates the development of favorable policies, in turn also provides a platform for the dissemination of information, knowledge and the generation of a portfolio of large and small business projects.

Slaughter House Plant Project

The bio-digesters project is based on a strategy that seeks a cultural change towards one of energy efficiency and which is planned as follows:

- A technological vision: in seeking a replacement of inefficient equipment and use of new sources of energy
- An economic vision: since the energy efficiency project is presented as a profitable business in the short, medium and long term.
- An educational vision: in order to train users in good practices for the end use of electricity



Photo Slaughter house at the Instituto Tecnológico de Costa Rica, taken presentation ". *Production of biogas on an industrial scale. ITCR Experience – Slaughter house* ", Ronny Cascante, Bun-ca- Costa Rica. Wilfrido Paniagua. ITCR- Costa Rica, *San José Costa Rica, 2010*, EfW Workshop, © Ronny Cascante, Bun-ca- Costa Rica. Wilfrido Paniagua. ITCR- Costa Rica all rights reserved

Originally the purpose of the project was the development of a meat laboratory for the academia, know the purpose is more of academic interest and a way of linking the Costa Rica Institute of Technology with society.

The current situation of the plant is reflected in the table below:



Cattle and swine slaughter Trend 2009-2010 Slaughter Plant- ITCR.

Illustration # 10:Statistics of cattle and swine sacrifices, slaughter house, Instituto Tecnológico de Costa Rica, taken presentation ". *Production of biogas on an industrial scale. ITCR Experience – Slaughter house* ", Ronny Cascante, Bun-ca- Costa Rica. Wilfrido Paniagua. ITCR- Costa Rica, *San José Costa Rica, 2010*, EfW Workshop, © Ronny Cascante, Bun-ca- Costa Rica. Wilfrido Paniagua. ITCR- Costa Rica all rights reserved.

The current problems associated with the slaughter plant are linked with waste that leave the plant, these wastes include excreta of bovine animals and swine (solids and liquids), stomach materials of bovine animals and swine gastric contents, blood, viscera and wastewater.

Given these issues presented at the plant, the project proposes the objective of reforestation and compost and biogas production as a mechanism for decontamination in the ITCR slaughter plant



Photo reforested area of the slaughter house, Instituto Tecnológico de Costa Rica, taken presentación ". *Production of biogas on an industrial scale. ITCR Experience – Slaughter house* ", Ronny Cascante, Bun-ca- Costa Rica. Wilfrido Paniagua. ITCR- Costa Rica, *San José Costa Rica, 2010*, EfW Workshop, © Ronny Cascante, Bun-ca- Costa Rica. Wilfrido Paniagua. ITCR- Costa Rica all rights reserved

The bio-digesters project is presented as a great alternative for the treatment of waste, since the ITCR slaughter plant, has great potential for the production of biogas, the quantity and quality of waste generated in the process.

In addition there is an important caloric energy demand, heating of water (4 m3/day), the cooking of viscera (1 m3/day), burning of the pigs hairs (20-30 per day) and a demo kitchen for the public and students.

Studies indicate that the type of Bio-digester to be used is the Hindu model or flow continuously, because it is easier to build at a lower-cost, but at the same time this model has limitations that make it extremely vulnerable and its utile life is very short.

In actuality the plant production capacity is for three bio-digesters: 12 m long and 1.59 m diameter with 68, 4 m3 total volume and the production of biogas are approximately 4.5 m3/day.

In conclusion the use of bio-digester as decontamination mechanisms must be sustained by the demand for biogas and the usability of this fuel.



Photo of personnel of the plant producing organic fertilizer at the slaughter plant, Instituto Tecnológico de Costa Rica, taken presentación *Production of biogas on an industrial scale. ITCR Experience – Slaughter house* ", Ronny Cascante, Bun-ca- Costa Rica. Wilfrido Paniagua. ITCR- Costa Rica, *San José Costa Rica, 2010*, EfW Workshop, © Ronny Cascante, Bun-ca- Costa Rica. Wilfrido Paniagua. ITCR- Costa Rica all rights reserved

5.6 Experiences in biogas and renewable energies in CA-SNV. Bella Sosa- SNV Honduras



Photo, Marvin Soto, journalist ACEPESA, EfW Workshop, San José, © ACEPESA all rights reserved The sixth presentation during the workshop was done by Ms. Bella Sosa from SNV (Netherlands Development Organization) consultant from Honduras, with the topic, "Experiences in Biogas production in Central America.

***** Feasibility studies on the production of biogas in Nicaragua and Honduras.

SNV conducted biogas production feasibility studies in both Nicaragua and Honduras. After these studies the following conclusions were obtained: biogas and the bio-digester constitute an alternative for cooking food in rural kitchens in these countries. This type of power generation is not necessarily targeted to the poor; it could apply to other groups. In Nicaragua the generation of biogas is more feasible than in Honduras due to payment availability and the extent of the farms. On the other hand, Honduras uses it mostly in its industrial sector. Also it has been proven that it is more profitable to use a bio-digester than to buy firewood.

In regards to financial aspects both countries would have problems to get the credit needed for installing applications, also it requires that in country services be developed. The lack of technical proficiency has made it so that countries cannot fully develop the use of bio-digesters or renewable energies.

It is important to highlight that more than 400,000 homes in Nicaragua use wood as the main source of energy and in Honduras 87.5% of the energy consumed comes from firewood.

A study was done for UNDP in Honduras to identify the potential of developing biogas at a productive level in the country.

The study had the following objectives in order to make the link with the carbon market, these goals were: Characterize the production of raw materials in different productive sectors and their development potential (coffee, sugar cane, African Palm); identify the technologies that could be applied; estimate the implementation costs for each type of technology and the possible providers; analyze the different uses that the biogas can have for each sector and determine the potential for their participation in the carbon market.

Other Renewable Energy projects are: Ethanol production, biogas and bio-fertilizer from the waste processing of coffee production in Marcala and Copan in Honduras and CoopeVictoria in Grecia and San Isidro in Costa Rica. Marcala COMSA produces 15,000 quintals of gold coffee, of which 7,000 are organic coffee. COMSA stores in oxidation ponds its wastes pulp mucilage and its juice. Production of oil from Jathropa and Jicaroa in Choluteca, Honduras and in the northern part of Nicaragua, a Cleaner Production Process is used in HONDUPALMA (palm sector).



Photo, workerse of a biogas plant in Hondupalma PL, taken presentation ". *Experiences in Biogas and Renewable Energy in CA-SNV*", Bella Sosa-SNV Honduras, San José Costa Rica, 2010. EfW Workshop, © Bella Sosa-SNV Honduras all rights reserved



Photo, workers in Bioetano plant Coope Victoria Costa Rica, taken presentation ". Experiences in Biogas and Renewable Energy in CA-SNV ", Bella Sosa- SNV Honduras, San José Costa Rica, 2010. EfW Workshop, © Bella Sosa- SNV Honduras all rights reserved

Photo, workers in the compost beds in the Hondupalma PL gas plant ,taken presentation ". *Experiences in Biogas and Renewable Energy in CA-SNV ", Bella Sosa- SNV Honduras, San José Costa Rica, 2010.* EfW Workshop, © *Bella Sosa- SNV Honduras* all rights reserved



***** Renewable Energy from Jathropa curcas and Jícaro





Illustration # 11: Renewable energy processes from the production of (Jathropa y Jícaro) products, taken presentation, "Experiences in Biogas and Renewable Energy in CA-SNV", Bella Sosa-SNV Honduras, San José Costa Rica, 2010. EfW Workshop, © Bella Sosa-SNV Honduras all rights reserved

26

SNV Biogas programmes in Asia and Africa

SNV began in 1989 in Nepal then continued their interventions in Vietnam, Laos, Pakistan and Indonesia.

Objective: Dissemination of bio-digesters as a source of sustainable energy through the development of a commercial sector focused on the market.

Objectives common to all of the programmes: increase the number of domestic applications, ensure the continuous operation of the bio-digesters built, and maximize the operation of the bio-digesters built and its use, strengthen the development capabilities of the production sector and industry.

- 1. *Related aspects in biogas programmes*: some of the aspects that biogas programmes have are the following: preparation and facilitation within the context of use, long-term programme objective must be in a sustainable sector (commercial). Also the goals of impact and development capabilities should be articulated, promote a market-oriented approach and that the various actions be undertaken by different actors.
- 2. *Technical factors*: the temperature should be above 20 °, you must have at least 20 kg of manure, build bio-digesters, the place of construction must be accessible, start in high potential areas, use local materials and designs adapted to the needs of the town.
- *3. Economic factors:* you must have an active demand for services; there must be companies interested in providing products and services. There needs to be a shortage of oil or high oil prices.
- 4. *Environmental factors:* it is intended to help mitigate: deforestation, overgrazing, erosion, the water pollution and global warming.
- 5. *Programme factors:* the programme is a rural extension with lines of credit to develop; it has an institutional structure for the operation and coordination. It is also expected to involve women, integrate development and technical education in rural initiatives.
- 6. *Political Context:* the Government must take on the challenge of promoting and facilitating the market regulation to make production sustainable. You need stability in the rural areas and the commitment from the Government of the country.

Preparation and participatory facilitation context

It is intended that there be a sustainable sector for the biogas production, sustained by capable actors and without any sustainable financing over time. The biogas producing companies must offer commercial services that will allow for the market to develop. The biggest challenge is to find long term donors.

Long-Term Objective: To establish a sustainable industry. It aims to have a sustainable production of biogas industry, supported by actors who, without have sustainable funding over time. For the development of the market, biogas companies must offer the services commercially. The challenge we have is to obtain long-term donors.

Impact targets relate to the number of households having access to energy produced by applications at the same time that there is an institutional strengthening and development of these Programme Activities.

Program Activities

Pre-construction information and promotion, training and user capacity building, subsidy, extension, staff training as well as technicians, supervisors, and community leaders, private sector development, research and development, import of equipment and utensils that are necessary and planning are efforts made during the implementation of this programme

* Potential risks of the programme in Asia

Some of the risks that SNV has when implementing these programmes in Asia are: the absence of quality control, there are very little or no possibility of financing, very little commitment to collaborate with stakeholders, there can also be competition between them. Financial and institutional sustainability may not be the most appropriate. There is also the risk of having small manure production to feed the bio-digester.

5.7 *Innovations of bio-digesters in Latin America. BioLAC network training.* Caitlyn Peake. Greenempowerment- Nicaragua.



Photographer, Marvin Soto, journalist, ACEPESA, EfW Workshop, San José 2010. © ACEPESA all rights reserved

Ms. Caitlyn Peake, representative of Greenempowerment, Nicaragua, presented the following topic, "General Overview of the Technological Experiences and Management Models for the Management of Bio-digesters in Latin America."

Greenempowerment - is an NGO that works in rural communities and with other NGOs in developing countries to implement renewable energy and water systems to alleviate poverty and improve the environment. Green Empowerment works in countries like: Mexico, Guatemala, Nicaragua, Costa Rica, Ecuador, Peru, the Philippines, and in the border between Burma/Thailand and Malaysia

When speaking of energy it was indicated that energy could be Renewable, from Water and Watershed. These energy sources were: solar energy, micro-central energy, wind turbine energy and energy from bio-digesters

Various devices are used to extract energy from the above-mentioned sources, some of them are: Ariete Pump, Solar Pump, Gravity Systems and Biosand Filters.

These forms of energy can be found in forest reserves and regeneration basins.

Biodigestor Models

During the presentation different types of Biodigestors were presented and that are presently being used in many countries. The Biodigestor models are: Fixed Dome Model (China and Nepal), Modified Fixed Dome Model (India), Aluminum Floating Dome Model, Per lot "Plug Flow" model (Sri Lanka) and Tubular Model: Taiwan and recently Latin America

Currently in Latin America, bio-digesters with different types of materials are used, some of which are: polyethylene, polypropylene and Gememranas (PVC). Some countries that use bio-digesters are:

- 1. Mexico: International Renewable Resources Institute (IRRI)
- 2. Nicaragua: ATDER-BL and Asofenix
- 3. Central America: in Sustainable Harvests
- 4. Costa Rica: EARTH University
- 6. Colombia: Bioverde, CIPAV and Aprote
- 7. Ecuador: CARE
- 8. Bolivia: Tecnología en Des
- 9. Peru: Soluciones Prácticas ITDG
- 10. Bolivia: GTZ
- 11. Argentina: Fundación Proteger.
- Project: "Bio-digesters innovation in Latin America "Besides the countries and the different types of materials and models used for bio-digesters, the conference made reference to a project that Green Empowerment has in Nicaragua called "Bio-digesters Innovations in Latin America". This project aims to increase the amount of successful and innovative bio-digesters projects in Latin America through the improvement of the quality of the methodologies and materials used. They are looking to get a summary of experiences with bio-digesters to share innovations with during the workshop and exchange experiences of bio-digesters in Latin America. These experiences will be presented at the launch of the BioLAC network. Also the project aims to install bio digesters in five countries and do an assessment that will be shared in the workshop and the BioLAC networks international meeting, and also provide a space for the lessons learned during the process.

* Meetings

1. The Experience Exchange workshop on Bio-digesters in Latina America: took place in May 2009, at the CEDECAP in Peru. There we 33 representatives from NGOs, universities, small businesses, bio-digester producers and users from 10 countries. The presenters shared their experiences with different sizes, materials and models of management.

2. The Bio-digesters Network meeting for Latina America and the Caribbean and the Biodigesters workshop: Clean Technology for Climate Change Mitigation: It was held in Costa Rica at the EARTH University in May 2010. Sixty representatives of various NGOs, universities, financial institutions, government agencies and enterprises in the agricultural sector and urban cleanliness and sanitation sector officials were present.

Biodigestor Network for Latin America and the Caribbean- de America Latina y el Caribe – RedBioLAC

The RedBioLac network was created with a baseline. In it there are sites for discussions on materials, biodigesters with latrines, instruments for measuring gas, etc.

The RedBioLac Strategic Plan: The RedBioLAC network vision is to be the reference organization for research, development, deployment and diffusion of bio-digesters to stimulate adequate management of natural resources and promote socio-economic well-being of Latin America and the Caribbean. The RedBioLAC network aims to be a network that brings together institutions related to applied research and the dissemination of the anaerobic to stimulate holistic treatment biodigestor research and the management of organic waste, such as strategies to improve the well-being of the population of Latin America and the Caribbean.

Objectives:

- 1. Exchange information and experiences among the participating institutions in the BioLAC network. Identify and overcome technical, environmental, social and economical barriers.
- 2. Propose projects as mechanisms to facilitate the adoption of bio-digesters technology.
- 3. Build partnerships to facilitate the adoption of the bio-digesters technology
- 4. Systematic research and dissemination between partners (health, finance, politics, education, industry and Commerce)
- 5. Promote the incorporation of other organizations, institutions and research centers in the field of applications.

Responsibilities:

The RedBioLAC is responsible for the incumbent technical expertise in the design and manufactures a range of designs of bio-digesters for rural application in Latin America. As well as forming a consortium with NGOs, research centers, universities and cooperation agencies it is also responsible with regard to experience and practice with different dissemination methodologies of bio-digesters and models of management, including the sale of prefabricated digesters, materials, facilities in agricultural promoters and the formation of cooperatives for the sale of life "kits". It must also have knowledge of markets and national policies that encourage or prevent the dissemination of technology. And finally its network competence has a proven track record in coordination among members including two international events organization (Costa Rica and Peru), development of joint proposals; the establishment of a virtual forum and financial management of sub-donations made to five countries.

Board of Directors:

The RedBioLAC network Board of Directors is formed by: Jaime Martí of the GTZ-CIMNE, Alex Eaton of the International Institute for renewable resources, Rafael Escobar from Soluciones Practicas - ITDC, Raúl Botero from the EARTH University and Anna Garwood from Green Empowerment.

Lessons Learned:

Family Selection: the lessons that were from the activities were the following:

- 1. There was a certain difficulty in collecting firewood and other forms of cooking. (Deforestation problem areas). There should be a number of animals concentrated close to the house.
- 2. The family enthusiasm to participate is very important for both men and women in charge of the tasks of maintenance, labor, load and use of biogas,
- 3. The family is the owner of the plot or has housing stability in order to maintain the bio-digester.

<u>Family Selection # 2</u>: the lesson learned in selecting the family was that it is important to properly select the site to build the bio-digester. It is preferable to do so on the mainland, with appropriate solar direction, close to where the cooking is done and near where the largest animal concentration is located. The area should be where there is no risk of flooding. The water should be preferably chlorine free and the crops should be close by to use the Biol.

<u>Type of Technology</u>: The preferred type of technology is Taiwan (tubular model) for the following reasons: easier to install, has lower up-front investment costs, easy transport of material for installation in isolated communities, the technical benefits are a horizontal flow: it is favorable to nature by producing renewable energy and the installation is partially free of risk of short circuits. You can also use insulation when the weather is very cold, also in this model it is easier to detect when there is a gas leak and there are no risks should there be an earthquake.

<u>*Technology (Materials)*</u>: The use of polyethylene is cheap and regularly used but it presents certain problems since it has a low resistance to the sun rays, it does not allow welding, pasting or patching and it is a fragile material. This means a lower user life and the return on investment is affected.

<u>Technology (Materials</u>): The Geo-membrane and the polypropylene have certain advantages that make it better to use it but at the same time make it more expensive than polyethylene. The advantages that these materials present are: they have a greater robustness and lower fragility which means a longer user life. It is easier to install and move and it is possible to centralize certain phases of the production which result in improving quality control and facilitating of installation operations. Also, if the materials are partially damaged they can be easily repaired.

<u>Technology (Component Design)</u>: In order for the bio-digester to operate correctly, it must meet certain design guidelines: it needs to have cement entering it to help with the mixing, a filter to prevent the entry of solids, an exit for the sediment sludge, bags in a trapezoidal form, roofs in the the form of semicircles because the temperature increases more than in a triangular form and filters for the hydrogen sulfide.

<u>Management Model (Sustainability)</u>: For this type of project to be sustainable there should be a transfer of knowledge, there should be a strengthening of local capacities, a complete induction to learn how to use and to

develop the products from the bio-digester, promote cooperatives that can sell the biodol, teach farmers the use in the crops since they are already organic and which in turn raises the price in the market, establish a price for the users to pay and opens the possibilities of micro-credit.

<u>Applied Research</u>: Research was conducted to find out what materials would impact less among plastics and which in turn could be recyclable, also the combining of bio-digesters materials to save plastic and facilitate maintenance, to extend the coverage of bacteria, also the form (trapezoidal) that the ditches should have results in an increase in the benefits of the effluent output.

***** Steps to follow for the Red BioLAC

The next steps to be taken to improve the network are: create a virtual library with articles, links to institutions and an open forum for discussions. Databases must be updated, inter country programmes developed and extend regional funding. A struggle for multinational research has been given and IRRI is expected to participate at the Encuentro 2011 meeting in Mexico.

5.8 Total Conversion of Waste without Collateral Impact to the Environment. An integral Sustainable Development and Social Development for Municipal Waste Management. Biodigestor. *Anne Usher. FUVAAL- Argentina.*

The eighth presentation was given by Ms. Anne Usher, Director, Project Management for FUUVAL, in Argentina. The topic of her presentation was, "The ECOVIDA Business Model: Economic, Social and Environmental opportunities available in the EfW Programmes in Argentina", this presentation was done via Skype.

ECOVIDA, Inc is the non-governmental organization in charge of the project. It is a non-profit organization that was started with the integration of three entities. Each one is detailed below:

- 1. FUVAAL-COOVIVI that is a regional incubator for solutions to create jobs and reduce the shortage of housing.
- 2. RECI-K It is a Mexican company whose patented the Kinkreto process that consists of the transforming of non-organic wastes that normally would not have a sales value into usable construction inputs or materials.

The results are illustrated in the following data:

- ✤ 540 Tons/d company RECI/K achieves the production of:
- ✤ 1569,60m3 per month of recyclables with a direct sales value
- ✤ 7855,20m3 per month of recyclables with value-added for reprocessing
- ✤ 31413,69m3 per month of lightweight aggregate

- ✤ 486m3 monthly of water extracted from the waste for recycling in the process.
- 3. ProterraBio is an international company with a focus on bio-conversion and bio-refining of organic waste; at the same time it provides the technology for the production of energy from renewable sources and bio-fertilizers among others.

ProterraBio with 1000 tons/d produces:

- ♦ Methane gas with pipeline quality 2.752 MM BTU for electricity generation.
- ✤ 22,038 gals/d of liquid natural gas.
- ◆ 265,12 tons/d. Compressed CO2 with edible industry quality
- ✤ 316 tons/d of high performance organic agri- products, (bio-fertilizers, bio-nutrients).

The reason for its creation is due to the following mission: Combine their state of the art eco-technological for the conversion of waste in a series of plants so the total consumption of waste is without collateral damage to the environment and management, support these eco-technologies with technical research and continual improvements through their incorporation once proven. Contribute to the mitigation of environmental pollution problems, desertification and climate change. Build a platform of social benefits and economic development for the most vulnerable sectors of the community by the return of the net profit.

There are already some countries where there are examples of the project for example in Mexico REC-K SA Enterprise and Norway, Germany, USA, Denmark ProterraBio W2E Inc Company.

The social, economical and technological opportunities resulting from this development must be highlighted, as well as job creation and sustainability, resulting in the creation of successive trends of future social benefits and economic development.

Within ECOVIDA companies have available the following sources of employment:

✤ PROTERRA BIO

The following jobs are available: 45 direct positions, 150 direct positions in the Small business unit Organic Crop Cultivation, 10 direct positions in the ECOCENTRO and 200 direct positions in maintenance, packing, distribution, transport and sales.

✤ <u>RECI-K</u>

Available work positions: 65 direct jobs per shift, 120 indirect partner SMEs and 150 indirect additional sales, transport and distribution.

ECOVIDA, has as environmental commitment policy which proposes zero collateral damage, this commitment can be achieved with the proposals set out below:

- 1. Desertification: With the extraction and processing of the waste humidity, which allows for water recycling process and the purification of sanitary water. Also the bio-fertilizer improves 5 times the mass of root crops, reducing water consumption.
- 2. Greenhouses gases: These are closed and odorless processes without collateral damage to the environment; all pollutants are converted into useful and marketable items
- 3. Research and Development: The project has the ability to incorporate improvements resulting from constant research between ECOVIDA and several academic institutions in Norway specializing in bio-technology.

This process used by ECOVIDA eliminates the need for waste incineration, tree cutting and stubble burning.

At the same time non-organic waste such as PVC, polypropylene, plastics treated with chlorinated piro-retardants are used in the Kinkreto process and are sealed to prevent their continuous degradation that can last up to 100 years in a sanitary landfill.

Bio-refining and bio-conversion process accelerates the degradation of dioxins, the PCDDS and the PCDF and other pollutants in closed environments; they recombine the elements into useful and non-hazardous products.

The main way to which humans are exposed to dioxins and furans is through the ingestion of contaminated food, especially meat and dairy products. The presence of these dioxins and furans in these foods is due to livestock consumption of contaminated vegetable follage.

ECOVIDA applies an innovative business model with a focus on society, a model that shares the profits from the operation with the communities. ECOVIDA can replicate the model, scaling it, and adapt it to the needs of each community.

As a vote of confidence, the project shows a base of ethics with social, economic, environmental and management criteria that is very up-to-date, transparent, responsible and collaborative.

In the project in Argentina several provisions were done with the municipalities, so that at the moment of their operation it will be done in the best possible manner. For example, receiving waste without charging or disrupting existing arrangements for collection; and operating the plant for 30 year life cycles with improvements.



Photo ECOCENTRO ,taken presentation ".*Total Conversion of Waste without Colateral Damage to the Environment, Integrated Sustainable and Social Developement from the Municipal Waste Management Biodigestor.*", Anne Usher. FUVAAL- Argentina., *San José Costa Rica, 2010 EfW Workshop*, © Anne Usher. FUVAAL- Argentina all rights reserved

As well as its own investment in a Small-Medium Enterprise (SME) for the prefabrication of low-cost housing panels using the constructive system called KINKRETO and another for the crops under plastic as a sample

Furthermore, ECOVIDA undertakes with funding for seed investment, advice and support to SME's and social factories and cooperatives in activities related to the plant, such as:

✤ The lightened aggregate: direct sale of aggregate, forms and concrete panels

Plastics: ground for industrial raw materials, molding of palettes, basketry, pots for of crops and the, plates industry etc.

Tires: ground as industrial raw materials, coverings of floors, waterproofing etc.

• Fabrics, rags, and industrial cleaning supplies.

 Bio-fertilizers: organic cultivation from the bio-nutrients: such as fresh water fish producers, chickens, swine, etc.

5.9 Experiences in the Production of Biogas from Waste in Brazil and Haiti. Sylvia Raulo – Valmir Fachini – NCA/Viva Río, Brazil.



Photographer, Marvin Soto, journalist, ACEPESA, EfW Workshop, San José 2010, © ACEPESA all rights reserved.

Mr. Valmar Fachini, who represents NNCA / Viva Río de Janeiro, Brazil, presented the following topic " Experiences in biogas production from waste in Brazil ", EfW Workshop.

* Background:

- 1. In 1979 in the city of Brazil, a digester was built following the model used in China. The EMRATER (a Brazilian company, that no longer exists, gave technical assistance and rural extension) published a manual which is currently used in most of the Brazilian States. Programmes that are functioning in Brazil currently are under the responsibility of EMBRAPA.
- 2. In 1982 the State Foundation of Environmental Engineering (FEEMA) installed in the Favela da Rocinha a digester that operates with human stool and also uses kitchen waste.
- 3. By 1991, the non-governmental organizations (NGO) German Hamburg Umweltinstitut in conjunction with the municipality of Silva Jardim developed a project for the cleaning of sewage and nutrients recycling in Ciudad Nueva.
- 4. In 1993 the NGO, Environment Institute was founded and settled in Petropolis, Rio de Janeiro for the management and development of new projects. In addition the digesters with a fixed dome were adopted in cities of China and Brazil and institutes from both countries agreed to exchange information for the improvement of the Biosystems.

Household Biodigestor: construction and uses

Photo domestic biodigestors in production in Brasil , taken presentation " *Experiences in Biogas Production from Waste in Brazil and Haiti*". ", Sylvia Raulo – Valmir Fachini – NCA/Viva Río, Brazil., *San José Costa Rica, 2010 EfW Workshop*, © Sylvia Raulo – Valmir Fachini – NCA/Viva Río, Brazil all rights reserved





Photo people building a biodigester in Brasil, taken presentation "*Experiences in Biogas Production from Waste in Brazil and Haiti*". ", Sylvia Raulo – Valmir Fachini – NCA/Viva Río, Brasil, *San José Costa Rica, 2010 EfW Workshop*.". © Sylvia Raulo – Valmir Fachini – NCA/Viva Río, Brazil all rights reserved.

✤ Uses for Biogas

Biogas can be used in many ways. One is the direct combustion in conventional kitchens (houses and restaurants), in land fires, fireplaces, heaters, dryers and lighting fires. It can also be used in power generation, energy saving materials and water heaters.

Photo example of the use of biogas in conventional kitchens in Brasil, taken presentation "*Experiences in Biogas Production from Waste in Brazil and Haiti*". ", Sylvia Raulo – Valmir Fachini – NCA/Viva Río, Brasil., *San José Costa Rica, 2010 EfW Workshop.*. © Sylvia Raulo – Valmir Fachini – NCA/Viva Río, Brazil all rights reserved.



Solution Programme Development with VivaRio/NCA in Haiti

- 1. 2008: the OIA contacted VivaRio and preceded to a visit Brazil installations.
- **2. 2009**: development of a community biodigestor for one thousand people in Calle JJDesallines 67, Kay Nou.
- **3. 2010:** implemented a Digester attached to school bathrooms and destroyed by the earthquake of January 12. In addition group study was formed.



Photo biodigestors with protable bathrooms without need of discharge in Brasil, taken presentation" *Experiences in Biogas Production from Waste in Brazil and Haiti*". ", Sylvia Raulo – Valmir Fachini – NCA/Viva Río, Brasil, *San José Costa Rica, 2010 EfW Workshop*..© Sylvia Raulo – Valmir Fachini – NCA/Viva Río, Brazil all rights reserved

* Bio-fertilizer Production

- 1. According to EMBRAPA, Sete Lagoas replaces 3, 6 kg of NT, 4.9 kg P2O5 and 1.4 kg k with an equivalent amount of Bio-fertilizer components produced in bio-digesters. The use of bio-fertilizers is important because of the large savings that it produces in the agricultural sector.
- 2. Areas of impact: The use of Bio-fertilizers has a direct impact on the agriculture, sanitation, environment and energy sectors.

* Bio-digesters

Used by Viva Rio/NCA in Haiti to solve immediate sanitation problems after the earthquake in 2010 as illustrated in the following picture.



Photo of biomas being taken advantage for portabil bathrooms after the earthquake in Haiti, taken presentation, "*Experiences in Biogas Production from Waste in Brazil and Haiti*", ", Sylvia Raulo – Valmir Fachini – NCA/Viva Río, Brasil., San José Costa Rica, 2010 EfW Workshop....© Sylvia Raulo – Valmir Fachini – NCA/Viva Río, Brazil all rights reserved

This community biodigestor was built in Brazil by the ONG, Viva Rio.



Photo of community biodigestor in Alto Caxixe in Brasil,taken presentation," *Experiences in Biogas Production from Waste in Brazil and Haiti*". ", Sylvia Raulo – Valmir Fachini – NCA/Viva Río, Brasil., San José Costa Rica, 2010 EfW Workshop, .© Sylvia Raulo – Valmir Fachini – NCA/Viva Río, Brazil all rights reserved

5.10 Regional Programme for Energy Efficiency in Central America. Support for EfW Activities in Latin America. Biodigestor. Sergio Musmanni Sobrado- GTZ Central American Energy Program.

Mr. Sergio Musmanni, GTZ Energy Program for Central America, presented, "GTZ Costa Rica: Support for EfW activities in Latin America".



Photographer, Marvin Soto, journalist, ACEPESA, EfW Workshop, San José 2010. © ACEPESA all rights reserved

Experience in processes and systems developed under the Competitively and Environment Programme (CYMA) are a value added for present and future programmes because of their public-private coordination, also with the creation of a network of contacts and a range of initiatives.

In what refers to "The waste in municipalities and industry for selected regions of Costa Rica Integral management has improved", the CYMA program suggests the following objectives:

- 1. Establish an inter-agency platform for the advancement of the topic and improve governance.
- 2. Develop a series of instruments and tools that range from regulatory framework to action plans.
- 3. Link solid waste with climate change.
- 4. Includes monitoring and assessment of impacts.

In order to better manage solid waste the CYMA developed a Solid Waste Plan and a handbook for municipal solid waste management plans to be implemented.



Publication Illustration # 1: Documents for consultation for better solid waste management, elaborated by CYMA, taken presentation ". Regional Energy Efficiency and Renewable Energy Program for Central America, Support for EfW Activities in Latin America. Biodigestor ",. Sergio Musmanni Sobrado- GTZ Energy Program Central America, San José Costa Rica, 2010, EfW Workshop, © Sergio Musmanni Sobrado- GTZ Energy Program Central America all rights reserved

In order to elaborate a report on the national management of residues a Materials Flow (MFA) initiative was adopted, including 18 materials.

The materials included are of interest because of their potential energy production such as: industrial sludge and industrial biodegradable organic waste: examples of these are the banana, coffee, and palm oil industry.



Publication illustration # 2: National Report on Materials Management in Costa Rica 2006, taken presentation "Regional Energy Efficiency and Renewable Energy Program for Central America, Support for EfW Activities in Latin America. Biodigestorr ",. Sergio Musmanni Sobrado- GTZ Energy Program Central America, San José Costa Rica, 2010, EfW Workshop, , Sergio Musmanni Sobrado- GTZ Energy Program Central America all rights reserved

Latin America has the initiative to unite efforts and synergies between the public and the private sector, which in turn have the potential to be replicated in other sectors of the economy at the regional and/or international level. For CYMA the exploitation of natural resources in a sustainable way imposes a rhythm and adjusts the rate of consumption according to the capacity of the system.

The sources is based on photosynthesis and therefore solar radiation



Illustration # 12: Photosintesis process, taken presentation, "Regional Energy Efficiency and Renewable Energy Program for Central America, Support for EfW Activities in Latin America. Biodigestor", Sergio Musmanni Sobrado- GTZ Energy Program Central America, San José Costa Rica, 2010, EfW Workshop, © Sergio Musmanni Sobrado- GTZ Energy Program Central America all rights reserved

There are several programmes in Central America and Panama that with the collaboration of Germany of GTZ are working on projects for renewable energy and energy efficiency. Participating programmes are:



Renewable energies and energy efficiencies.

Illustration # 13: Renewable energy and Energy eficiency, taken presentation, "Regional Energy Efficiency and Renewable Energy Program for Central America, Support for EfW Activities in Latin America. Biodigestor", Sergio Musmanni Sobrado- GTZ Energy Program Central America, San José Costa Rica, 2010, EfW Workshop, © Sergio Musmanni Sobrado- GTZ Energy Program Central America all rights reserved

The regional programme has intended to improve the implementation of strategies for the deployment of renewable energy and energy efficiency measures, increasing investments in ER and EE projects in the countries of Central America.

The programme identifies relevant stakeholders for the development and implementation in the public and private sector; and strives to achieve an impact in the period of execution until December 2013.

To meet the programme goal, three priority lines of action are intended and described below:

- Give advice to national Governments in ER and EE issues to improve the regulatory framework and the general framework for investments.
- Support measures to train relevant institutions in the region in the field of EE and RE to strengthen the capacities of developing and implementing projects.
- In addition the GTZ has a national programme installed in Chile, called non conventional renewable energy project in Chile (CNE/GTZ), which works in the identification and classification of different types of biomass available to be used for the generation of biogas and the variety of available biomass from various sources.

In Chile there is the Peralillo bio-digester, which has a slurry digester capacity of 37 000 m3 and receives 120,000 swine waste divided into 4 units. These are conducted via underground to the digester, where the anaerobic process that allows for the transformation of organic matter into methane gas begins. The bio-digester generates about 15,000 m3 of biogas per day with 65% of methane.

In regards to a futuristic vision, the GTZ projects in Latin America have a great potential for the exploitation of renewable resources including processes such as waste to energy, EfW or WTE, that require systemic care including the regional "know-how" and "know why" for proper knowledge management (KM), and as a region a search for possible synergies and dedication of time to the topics defined as priority for countries and to support the regional initiatives.

6. CONCLUSIONS AND DISCUSSION: CHALLENGES, PRINCIPAL ACTORS, POTENTIAL PILOT PROJECTS.

The participants concluded that the workshop served to know what is being done in different countries of Latin America and the Caribbean in regard to the issue of Energy from Waste (EfW) generation. Some concerns shared were with respect to the continuity or project sustainability once the international economic support ends and how it is necessary to take this into account from the very beginning so that the results include economically sustainable activities.

Practically all the countries represented were interested in being focal point and eventually anchor institutions. However, many questions were asked which were impossible to answer at that time, for example if there was a timeline for the proposed pilot project, what implications are involved in being a member anchor institution or in being a member of GENUS, whether there is funding available for projects, among others.

It was agreed that each country woud do some research and propose members for the establishment of GENUS.

Mexico (Alexander Eaton) proposed that the RedBioLAC be a technical arm of GENUS in the area of biodigesters. There were members and interested institutions, but more information is needed on the part of UN-Habitat. The results expected for the workshop and included in the first presentation prepared by UN-Habitat conclude as follows:

1. In regard to the introduction of GENUS, its objectives and goals were fulfilled. It can be agreed upon that the participants found the workshop to be very useful. Some representatives of the RedBioLac (Mexico, Ecuador Nicaragua) had the opinion that this network could be a technical arm of GENUS to take advantage of resources and efforts already made by them.

2. The presentation of different projects and initiatives developed in the countries represented enabled the development of common ideas regarding available technologies, necessary elements for the economic and political sustainability of projects in the topic waste to energy generation.

3. The participants expressed an interest in the possibility of developing pilot projects or the inclusion of this topic within some projects already being developed but lacked information about the technical and economic implications that this could represent for organizations that participate.

4. In reference to the establishing of national focal points for GENUS in the region of Latin America and the Caribbean, some participants showed an interest, for example: Alexander Eaton- Mexico, Anna Zuchetti - Peru, Diana Dominguez - Ecuador, Maritza Marín - ACEPESA Costa Rica and some others with different levels of participation. The big question that prevented formalizing an agreement on what could be the structure of the GENUS was a lack of technical and organizational information as well as leadership on the part of UN-Habitat. The absence of an active participation from someone from UN-Habitat that could clarify doubts, questions and observations as well as more information regarding the guidelines, responsibilities and rights of the members of GENUS was reflected during the workshop. The same way that the preparation for this workshop was developed: the organization of travel without return travel expenses covered and without paying the corresponding DSA, had consequences on the commitment they could give to GENUS participants during the activity.

Never the less there was interest demostrated on the part of all participants and there was an agreement of the majority to ask UN-Habitat to supply more information on these questions that were brought up and that will enable the establishment and sustainability of GENUS in our region with a regional anchoring institution and national focal points as well as committed members.



ANNEXES



43

Annex 1. AIDE-MEMOIRE





WORKSHOP AIDE-MEMOIRE

Promoting Energy Access for the urban poor in Africa

Generating Energy from Waste

Organized by

The Global Energy Network for Urban Settlements [GENUS]

27th-29th OCTOBER 2010

1.0 Introduction

Current patterns of energy production, distribution and utilization are unsustainable, and there are wide disparities in the level of energy consumption within and between developed and developing countries. One third (2 billion people) of the global population has no access to basic energy services. Most of them (1.6 billion people) live in developing countries, mainly in South Asia and in Sub-Saharan Africa. They depend on inefficient biomass fuels, such as wood, animal and crop waste for cooking and heating, which have detrimental effects on air quality and health. About three-quarters of the world's commercial energy is consumed in urban areas, and many of the people in direst need of access to modern energy systems are located in rapidly growing informal urban settlements (slums) throughout the developing world. Despite such numbers, the energy needs of poor urban households, and particularly of women, in developing countries have not been properly addressed, as development efforts have focused intensely on the rural poor.

Access to affordable, modern energy services is a pre-requisite for sustainable development and poverty alleviation and, more specifically, for achieving each of the Millennium Development Goals (MDGs). Lack of access to reliable, safe and mostly environmentally-friendly energy is a strong constraint on human development.

To encourage and support the design and implementation of energy-access programmes and projects for the urban poor worldwide, UN-HABITAT established the Global Energy Network for the Urban Settlements (GENUS). This is a dynamic new partnership and collaboration with multiple institutions and stakeholders, including the public and private sectors, governmental and non-governmental organizations, grass-roots groups, national and international development agencies, working in the urban energy sector. GENUS aims to provide world-wide exchange and dissemination of best practices and technologies, awareness creation, capacity-building, advocacy, tools development and knowledge management.

GENUS is a global programme structured geographically to operate in Asia, Latin America and Africa. It addresses three key themes of access to energy for the urban poor worldwide, namely Improved urban mobility for the poor; (ii) Slum electrification; and (iii) Energy from waste.

2.0 Generating Energy from Wast

Energy from Waste [EfW] is a process of applying a variety of technologies that convert different types of waste into useful energy. EfW schemes not only aim at producing various forms of energy such as electricity and heat, but also elimination of waste that could otherwise have negative effects on public health and the general quality of the environment

According to Hickman¹ there is a substantial body of research into technologies to recover energy from Municipal Solid Waste (MSW). As a consequence, there is a significant amount of knowledge concerning the physical, chemical and biological processes that might be used to extract energy from waste. However, full scale use of these technologies is impeded by their high capital and operating costs compared to land-filling the waste.

Under these conditions treatment of municipal solid waste is often considered to be an expensive and financially unviable. However, the context for EfW technology application has changed rapidly over the past several years as a result of regulatory actions particularly in Europe, the global increase in oil prices, and heightened awareness of the need to reduce Green-House Gas [GHG] emissions from fossil fuels.

The consequence of these factors is that alternative sources of energy that were previously not cost-competitive with oil are now becoming financially attractive propositions. Currently, there is a high level of research and development into EfW technologies, and full scale commercialization of these technologies is likely to become widespread.

¹ Doug Hickman [undated]Guidance Document on State-of the Art Energy from Waste Technologies UN Habitat, Nicaragua

There is however a need to begin disseminating existing knowledge on EfW approaches to various stakeholders in municipalities such as city managers and policy makers, potential investors and users.

3.0 The EfW Workshop:

The workshop will have a technical and programmatic content. The technical aspects of the workshop will focus on technological options, their economic, policy and social dimensions. The programmatic aspects of the workshop will aim at developing a network of practitioners, policy makers and interest groups that can help promote, expand and disseminate best practices in creating energy from waste treatment processes.

In particular, the workshop will focus on reviewing:

- An overview of the political, environmental and commercial interests involved in influencing waste management policies and approaches in typical municipalities of developing countries
- □ Elaboration of the issues around materials recovery [recycling] versus energy recovery and the contexts under which one is preferred over the other?
- □ Typical EfW technologies, context of their use, successes and limitations.
- □ Practical examples of successful EfW plants and factors that contribute to success or failure of EfW
- □ Economic and financial viability of various technologies
- □ Policy and regulatory issues in up scaling of EfW
- □ Social and environmental goals of EfW programme

The workshop will bring together key agencies, institutions and stakeholders involved in urban energy issues in Latin America. It will provide an in action-oriented forum for the exchange and integration of various best practices, lessons learnt and perspectives represented by the experts, into the development of a programme of action for improving energy access for the urban poor using solid waste.

The workshop will form the basis of the launch of the GENUS network and programme of work on energy from solid waste. This workshop follows similar regional workshops held in May 2009 in Asia, and October 2009 respectively, focusing on access to transport for the urban poor and slum electrification. These series of workshops will culminate in an inter-regional meeting to mark the formal launch of GENUS as global platform on access to energy for the urban poor in the latter part of 2010.

4.0 Outcomes

- Developing an understanding of key issues, technological, economic and regulatory challenges and opportunities for generating energy from solid waste and making it accessible to people living in poor and informal settlements.
- □ Mapping of key stakeholders in Latin America to be enjoined in the emerging GENUS partnerships and networks.
- □ Broad agreement on the structure of the GENUS network in Latin America.
- □ Identification of potential anchor institution for GENUS activities in Latin America.
- Broad agreement on a comprehensive operating plan and objectives of the GENUS in Latin America

5.0 Venue

To be advised.

6.0 How to register

Contact the Workshop Secretariat for additional information on genus@unhabitat.org Registration is free.

Annex 2. Agenda

UN HABITAT FOR A BETTER URBAN FUTURE

Monday, 25th October 2010

9.30-10.00	Registration and coffee		
Opening Session			
10.00-10.45	Welcome Statement [10.00]		
	– Maritza Marin, ACEPESA		
	Opening Remarks [10.15]		
	- Christian Schlosser, Chief (Ag.), Urban Transport Section, UN-HABITAT		
	Nairobi (via Skype call)		
	The Global Energy Network on Urban Settlements. Workshop objectives and		
	expected outputs [10.30]		
	– Marianela Mora, Facil		
Session 1: Over	rview on approaches, challenges and opportunities of generating Energy		
from Waste in	Latin America		
10.45-11.30	Biomass: potential as renewable source		
	- Luis Diego Jimenez Gongora, Consultant, UN-HABITAT		
11.30-11.50	Questions/Plenary discussion on overview presentation		
11.50-12.10	Coffee/Tea Break		
Session 1: Over	rview on approaches, challenges and opportunities of generating Energy		
from Waste in	Latin America		
12.10-12.30	Scaling Household Bio-digester Programs in Latin America. Policy issues and Lessons Learned		
	- Alexander Eaton, President, REDBioLAC, Mexico		
12.30-12.45	12.45 Questions/Plenary discussion on key policy issues in EfW in Latin America		
12.45-13.45	Lunch		
Session 3: Case Studies on Waste Conversion from Municipalities in Latin America			
13.45-14.10	Conversion of Abattoir Waste into Energy: A Case Study from Ecuador		
	- Diana Dominguez, CARE Ecuador		

14.10-14.30	An Approach for Energy Production out of household waste in Bolivia. Expe-		
riences from Swisscontact			
	- Matthias Nabholz, Project Manager Swisscontact, Bolivia/Luzi Hugentobler,		
Regional Manager for Central America, Swisscontact, Costa Rica			
14.30-14.40	Questions		
14.40-15.00	Coffee/Tea Break		
Session 4: Exp	eriences from EfW projects/case studies		
15.00-15.20	Case Study on Energy Recovery from a land-fill in San Jose, Costa Rica		
	– Jose Pablo Cob, National Electricity Company, Costa Rica		
15.20-15.40	Management of waste through use of Bio-digesters. A project by the National		
	University and Bun-ca, Costa Rica		
	- Ronny Cascante, Bun-ca, Costa Rica/Wilfrido Paniagua, ITCR, Costa Rica		
15.40-16.10	SNV – Experiences on Biogas Production and Renewable Energy in Central		
	America		
	- Bella Sosa, Advisor SNV (Netherlands Development Organization), Hondu-		
	ras		
16.10-16.40	Plenary Discussions		
16.40-17.00	Resume and Closure of Day 1		
	- Marianela Mora, Facilitator		

Tuesday, 26th October 2010

9.30-9.40	Opening of the Day		
	- Ileana Ramirez Quiros, UN-HABITAT Programme Manager Costa Rica		
	(t.b.c.)		
Session 5: Reg	ional Perspectives on Generating Energy from Waste		
9.40-10.10	Innovations in Biogas Digesters in Latin America: The Formation of the		
RedBioLAC			
- Caitlyn Peake, Greenempowerment, Nicaragua			
10.10-10.40 The ECOVIDA Business Model: Economic, Social and Environmen			
	portunities available from EfW Programmes in México and Latin America		
	- Anne Usher, vice president ECOVIDA, president FUVAAL, Panamá		
(via Skype call)			
10.40-11.10 Experiences in Biogas Production from Waste in Brazil			
- Valmir Fachini, NCA/Viva Rio, Brazil			
11.10-11.30	Tea/Coffee break		
11.30-12.00 Energy use of waste by means of co-processing in Costa Rica			
- Wilkie Mora, Holcim, Costa Rica			
12.00-12.30	Plenary Discussions		
12.30-13.30 Lunch			
Session 6: Bilateral and Multilateral Co-operation for Promoting EfW programme			
13.30-14.00	GTZ Costa Rica: Support to EfW activities in Latin America		
	– Dr. Sergio Musmanni, Coordinator, GTZ Energy Programmes, Central		
America			

14.00-14.20	Plenary Discussion		
14.20-14.40	Tea/Coffee		
Session 7: Focus on GENUS and the Way Forward			
14.40-15.40	Overview on GENUS: Objectives, structure and operations and GENUS		
	steering structure for Latin America		
	- Marianela Mora, Facilitator		
15.40-16.20	Plenary Discussion: Recommendations and Way Forward, Resume of the		
	meeting		
	– Marianela Mora, Facilitator		
16.10-16.25	16.10-16.25 Closing remarks		
	- Ileana Ramirez Quiros, UN-HABITAT Programme Manager Costa Rica		
	(t.b.c.)		

Annex 3.	Participant's	List
----------	---------------	------

No.	Name	Organization	E-mail
1	Anne Usher (via Skype)	FUUVAL - Argentina	ausher@fuvaal.org
2	Alexander Eaton	Instituto de Recursos Renovables (IRRI)- Mexico	alex@irrimexico.org
3	Anna Ortiz	ACEPESA- Costa Rica	ortianna@gmail.com
4	Anna Zucchetti	Grupo GEA- Peru	azucchetti@grupogea.org.pe
5	Bella Sosa	SNV- Honduras	bsosaoal@snvworld.ogr
6	Caitlyn Peake	Green Empower- ment-Nicaragua	Caitlyn@greenempowerment.org
7	Diana Dominguez	CARE- Ecuador	Dianadominguez1@gmail.com
8	Sergio Musmanni	GTZ- Costa Rica	Sergio.musmanni@gtz.de
9	Eveline Volkart	Swisscontact	Eveline.volkart@swisscontact.bo
10	Floria Roa	ITCR- Costa Rica	froa@itcr.ac.cr
11	Ronald Arias	ACEPESA- Costa Rica	rarias@acepesa.org
12	Jaime Muñoz	ASOFENIX- Nica- ragua	asociacionfenix@yahoo.es
13	Luis Diego Jimenez	INBIO- Costa Rica	ljimenez@inbio.ac.cr
14	Luzi Hugentobler	Swisscontact- Costa Rica	swisscontact@amnet.co.cr.cr
15	Matthias Nabholz	Swisscontact- Bolivia	Matthias.nablholz@swisscontact.bo
16	Ronny Cascante	BUN-CA- Costa Rica	rcascante@bun-ca.org
17	Silvia Raulo	NCA- Haiti	ncahaiti@nca.no
18	Valmir Fachini	Viva Rio- Brazil	fachini@vivario-org.br
19	Maritza Marin	ACEPESA- Costa Rica	mmarin@acepesa.org
20	Marianela Mora	ACEPESA- Costa Rica	marimpnela@gmail.com
21	Wilkie Mora	Geocycle-Holcim- Costa Rica	Wilkie.mora@geocycle.com