

# INTERNATIONAL WASTE ACTORS' PEER-TO-PEER WASTE TECHNOLOGY EXCHANGE

Report from a workshop in Kisumu April 25<sup>th</sup> — 26<sup>th</sup> 2019



## Recycling Networks & Waste Governance

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More information about the research projects can be found at the websites:

<https://gri.gu.se/english/research/managing-big-cities--recycling-networks>

<http://pswm.uvic.ca>

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# Foreword

Millions of informal waste pickers collect household waste daily in cities around the globe to earn a living. In doing so they make a significant contribution to reducing the carbon footprint of cities, recovering re-sources, improving environmental conditions and health particularly in low-income residential areas, creating jobs and income among the poor. Strengthening of such initiatives, networks and practices promotes grassroots resilience, contributes to reduce both the adverse impacts of cities on climate and environmental change (UN sustainable development target 11.6) as well as urban poverty (UN sustainable development goal 8).

“Recycling Networks” is a research project that aims at examining the challenges that innovative grassroots initiatives and networks encounter in generating livelihoods to improve household waste collection and recycling in informal settlements of global South cities. The research on “Mapping Waste Governance” seeks to map successful waste management initiatives, arrangements and policies in some cities in the global South and global North.

Researchers in the two projects collaborate in offering a critical inter- and transdisciplinary perspective on waste governance, organizing resilience against climate and environmental change involving cooperatives, associations, community-based organizations, public-private partnerships, networks and organizations working with waste related issues.

This report summarises the most important lessons learned from an international waste actors peer-to-peer workshop in Kisumu, Kenya, 2018. The workshop was initiated by the waste actors and materialised by the help from Stena Recycling International AB for which we are most thankful.

## A waste actor peer-to-peer workshop

Waste actors' Peer-to-Peer waste technology transfer was started by waste actors themselves following an **International Recycling Network and Waste Governance Workshop** activity, held in Kisumu-Kenya, 23<sup>rd</sup>-28<sup>th</sup> April 2018, as a result of two collaborative research projects; 1. **Recycling Networks**, which examines challenges that innovative grassroots initiatives and networks encounter in generating livelihoods to improve household waste collection and recycling in informal settlements of global South cities, and 2. **Mapping Waste Governance**, that maps successful waste management initiatives, arrangements and policies in some cities in the global South and global North. Participants included; researchers; (from Kenya, Tanzania, Sweden, Argentina, Brazil, Canada and Nicaragua), representatives waste actors' networks/organizations; (from Argentina, Brazil, Canada, Chile, Kenya, Nicaragua and Tanzania), and practitioners as well as officials from the city of Kisumu led by the City manager and Environmental Officers at both the City of Kisumu and County.



International Recycling Network and Waste Governance Workshop, Kisumu 23<sup>th</sup>-28<sup>th</sup> April 2018.

### The waste management situation in Kisumu-Kenya and opportunities for improvements

Apart from the workshop activities highlighting innovative practices from various cities represented in the workshop, there were field visits to the Kisumu dump site, Kibuye market (largest open-air market in East Africa), some waste recycling activities e.g. waste paper bulking facilities, as well as visits to informal settlements. While waste actors from other countries were able to identify and see some of the challenges and innovative practices in Kisumu, they saw gaps and opportunities in the city's waste management system. They engaged their waste counterparts from Kisumu for possibilities to learn from each other's experiences for effective waste management and improvement of their livelihood. To the researchers, this was unique in these collaborative research projects. It demonstrated peer-to-peer learning by the waste actors themselves, south-to-south ideas/technology transfer across continents with the knowledge of "high-tech" experiences from the north

thanks to research team, and opportunity for researchers to contribute to waste actors mutual learning by sharing, developing, and adapting ideas and technologies designed by waste pickers in other parts of the world to the Kenyan context.



Kiwan Members receiving registration certificate from City Manager on 24<sup>th</sup> of April 2018.

A Peer-to-Peer workshop also presents a scenario where leading and established waste actors work with academic researchers to promote knowledge co-creation among waste actors. Exequiel Estay (Chile), Hector Marcelo Loto (Argentina) and Cleiton Ribeiro (Brazil), led discussions with the waste actors from Kisumu city on waste management technology transfer. These were based on observations and understanding of the challenges of solid waste management of Kisumu city that included low collection of waste especially from residential areas (only 25% of waste generated is collected for disposal to the dump site) by waste actors due to narrow zig-zag paths hindering waste evacuation, difficulty in the management of organic waste (organic waste constitute 65% of the total waste generated, yet has no clear safe means for management and disposal) compared to plastics and metallic waste components which are more valuable and easily recycled for other purposes, and difficulties in handling bulky materials like waste paper and plastic materials that therefore results into high cost for transport.

The specific equipment earmarked for improvement through the Peer-to-Peer Technology exchange were:

1. Hand cart to facilitate waste evacuation from the residential areas.
2. Portable bio-digester for management of organic waste by producing biogas for cooking purposes and bio-fertilizer for use in the farms for increased crop production.
3. Mechanical manual paper press to reduce the volume of bulky materials mainly paper and plastics to reduce transport cost for waste pickers who cannot afford automatic paper press.



Researchers and Waste Actors from various countries in a panel

### Approach to technology transfer

After the international workshop 2018, the waste actors continued their discussions on how to actualize the technology transfers from their countries for use by the Kenyan colleagues. They communicated through emails, social media (e.g. WhatsApp), and even used Skype, to make sure that the principles and materials necessary for design and construction of the facilities were as accurate as possible. The research project facilitated and provided space for such interactions and learning by the waste actors, and also by identifying what would enhance such learning and sharing of technology transfer processes. There was need to have continued interactions by the waste actors through social media, additional resources to acquire materials to make/fabricate prototypes in Kisumu and peer-to-peer demonstration workshop in Kisumu to test the new equipments. It created a platform to develop and scale up grassroots innovations typically popular in informal set ups, (e.g. waste picking and recycling) that lack formal approaches to address their needs.

**Stena Recycling International AB**, a Swedish recycling company specialized in recycling/refining industrial waste and to produce new raw material for use for other uses, provided financial means to this south-south technology transfer. The SEK 10,000 they provided was used to purchase materials for fabrication of hand cart, paper press and the portable bio-digester. The materials were identified by the waste actors from Kisumu with guidance of the waste actors from Chile, Brazil and Argentina. They were purchased from the local hardware shops in Kisumu by the waste actors themselves. The design drawings were developed and given to local artisans for fabrication. Fabrication involved cutting of components, welding of metallic materials, grinding, threading and joining of pipes/fittings and assembling of the various components. All these were done locally and it showed that, with enhanced skills and appropriate tools, the waste actors can design, fabricate their own tools and equipment adapted to the local conditions.

With the expectation of the city of Kisumu decentralizing and privatizing waste management to recovery centres with recycling facilities including those for managing organic waste, e.g. bio-digesters, waste actors can position themselves to manage at least one of the centres. Kisumu waste actors' Network Sacco (Kiwan) is engaging the

city authority on issues of waste management of the city and preparing for this task. This is a new way of waste management in the region and would require learning, sharing of experiences and adapting ideas, practices and technologies from other regions.

The working relationship and network of waste actors already created by this recycling project can be strengthened and expanded for peer-to-peer learning and technology transfer. It will also enhance interaction within and across the continents. This is important as solid waste management is a cross cutting issue with impacts on 12 out of 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development, including: ecology, economy, and society, and in particular covers living conditions, sanitation, public health, marine and terrestrial ecosystems, access to decent jobs, as well as the sustainable use of natural resources. It also offers a comparative platform for cities and regions to draw out experiences, lessons and knowledge of good practice that can influence changes promoting sustainable solid waste management.

# I. Instructions for fabrication and setting up a biodigester (small scale biogas production unit)

The instructions on material and fabrication were forwarded to waste actors in Kisumu from Brazil through emails and discussed through WhatsApp and Skype. They included;

1. Type of feedstock: organic waste + cattle/horse/goat manure
2. Biodigester container: Considering a 200l container, that will be needed around 75 kg of organic material, half (37.5 kg) animal manure. This must be mixed with water until it gets to a soup-like consistence
3. The container cannot allow the entry of air or light. It will be needed an outlet on a distance of one palm (10 cm) of the bottom. In this outlet a a register will be installed and connected to a pipe, all very carefully sealed. We are going to transfer the feedstock to the biodigester by this pipe.

## Step by step fabrication:



Container pierced at the bottom to fix a tap to exit bio-fertilizer



Used to seal all entries and exits of pipes and connections (Adhesive sealant)



Fix a tap to exit bio-fertilizer



Container must be pierced in the bottom, on a height that allows to fix a tap and a small pipe connected, allowing the biofertilizer to flow (always very carefully sealed).

## Biofertilizer exit (outlet pipe)



Portable Bio-digester



Container must be pierced in the bottom, on a height that allows to fix a tap and a small pipe connected, allowing the biofertilizer to flow (always very carefully sealed). Feeding pipes (inlet pipes) assembly: Feed hopper. In order to feed the biodigester, some kind of funnel must be connected to the feeding (inlet) pipe.

## Final assembly of the bio-digester fabricated by KIWAN

Waster actors guided on the fabrication of a bio digester at Kibuye market Demonstration site in March 2019



Fabrication of prototype taking place in Kisumu



Researchers: Adalberto from Brazil and Michael from Kenya deliberating on development of portable Bio-digester



Different technologies being tried; 1. Market waste, 2. Human waste and 3. Institutional/ domestic waste resources.

**NB: The technologies being tested in the site include both vertical drum design and horizontal design.**



Connecting the gas to a burner for burning to generate heat for other uses.



Kiwan Chairman: Mr. Harrison Otieno demonstrating biogas production by biodigester at Kisumu Agricultural Show in 2019.



Attempts to package the gas using a shorter pipe. Packing is still opportunity for research.

## II. Fabrication of a hand cart



Marcelo Loto from Argentina with an artisan during assembly of a hand cart. The components were designed and made in Argentina and brought to Kenya.



Cleiton from Brazil holding the hand cart from Argentina to be tested in Kisumu



Testing of the hand carts by the local waste actors. One designed, fabricated, transported and assembled in Kenya, and the other designed, fabricated and assembled in Kenya with instructions from waste actors in Argentina. The two were compared. One transported from Argentina was lighter and could maneuver well within the informal settlement. The one fuller developed in Kenya was heavy and strong, required more energy to push.



Member of Kiwan and director of Kamongo paper recycling Dorcas Okode and Kibuye Waste Mgmt CBO members test waste carts designed by Cooperative *Reciclando Suenos* at Kibuye market during the exhibition



Waste collection using new hand carts in Obunga on 26th April 2019. This marked actual testing of hand carts by one of the waste actors in Obunga informal settlement, while collecting waste from the households.



Display and comparison of different technologies of hand carts used for waste collections by the waste actors. Marcelo from Argentina and Exequiel from Chile present.

# III. DEVELOPMENT OF A LOW-COST MANUAL PAPER PRESS

With the instructions from waste pickers from Argentina, the materials for the press were acquired, fabricated and assembled locally. The press can be used for both paper and plastic materials.



Paper press during fabrication at a workshop in Kisumu.



The paper press being installed for testing at Mama Dorcas premise, where waste paper is bulked.

## Connecting waste actors across the continents and importance of peer to peer technology transfer

The peer-to-peer technology transfer workshop managed to connect Kisumu Waste actors' Network (Kiwan) from Kenya, Coop Les Valoristes waste pickers' organization in Canada, Binners Project of Waste pickers in Canada, Reciclando Sueños Cooperative and the LabIEC in Argentina, National Brazilian Waste pickers' Movement, and Redlacre (Latin America Waste Pickers). The workshop and planning processes demonstrated how the networks can share ideas within and across continents, and learn from each other. It also provides a platform for sharing and testing academic research findings, making academic research work more focused in addressing critical societal challenges. Other information shared were how the networks are organized and management in different regions, their relationship with the local authorities, their contribution to global environmental issues, material resources recycling, inclusive circular economy from below and the livelihood of waste pickers, and appropriateness of waste management technologies in different regions in the world.

Peer-to-Peer therefore promotes international collaborations with benefits cutting across different aspects; organizational and coordination with the various stakeholders; among them local government officials, facilities and technologies to increase efficiency in waste management. In this case of Kisumu, it is technology transfer for low-cost and low-tech grassroots sustainable solutions by the waste actors themselves. They designed, developed and produced 1. a light push cart adapted to waste collection in informal settlements, easy to manoeuvre, and cheap to produce, strong, and capable to take heavy loads; 2. a mechanical/manual press for convenience material handling, and to reduce cost of transportation of bulky waste materials (paper and plastics); and 3. a small-scale biogas production unit to be used for sustainable management of organic waste materials resulting into biogas for clean energy provision and biofertilizer for farm use.

It also shows the ease with which waste actors can learn from each other and adopt practices from different regions. Waste actors use different technologies and facilities for same purposes. The effectiveness of the technologies and facilities in waste management vary with the designs, ease of fabrication, use, maintenance and repair by the waste actors themselves. Given their low-income levels and need to reduce cost of operations, these variations make peer to peer interactions relevant and worth promoting.

Consolidating resources and sharing of facilities (e.g. space for daily operations, equipment, workshop repair tools, etc) is important given their income levels and the high cost of these facilities. This will increase their effectiveness in waste management and also raise their income levels. In future, it can also enable them manage a large recycling facility with different sections of waste stream for the city, as their counterparts are doing in other countries, e.g. Sao Paulo, Brazil. Simple skills of metal and wood work, welding, wiring etc can be learnt through peer to peer processes.

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