

Using organic waste streams for up-scaling composting and biogas production in Nairobi; opportunities and challenges¹

Recycling organic waste: a solution to decrease Nairobi's waste problem

Waste management is a persistent problem in Nairobi, due to the growing population and insufficient waste collection services. Organic waste forms the largest portion of waste streams in Nairobi, finding its way into the Dandora and other dumpsites.

Dumping organic waste results in the degradation of essential natural resources (such as rivers) through the disposal of raw untreated sewage, the emission of greenhouse gases, and water and soil pollution. Dumping also negatively impacts the health of local residents and waste pickers, and can cause soil degradation. Soil degradation is caused for instance when the waste dumped is contaminated by heavy metals and metalloids that can adversely affect plant growth, soil organisms and water quality; and thus urban food production.

Waste recovery is a private economic activity, carried out by private entrepreneurs in the so-called waste supply chain. But because it decreases both the burden of responsibility on the city authorities, and the amount of waste requiring disposal, it also has a relationship to good solid waste management.

Some of the registered CBOs and NGOs collectors, who form a part of the total Nairobi waste management system, have primary or secondary activities in waste recovery. The formerly active Kayole Environmental Management Association used to collect biodegradables and compost them, but because of the requirements regarding licensed operations and transport they have not been able to operate optimally. At the moment, several private entrepreneurs, CBOs and NGOs, are active in Nairobi. Examples of these organizations are:

1. ECOH holdings Ltd.;
2. City Park Market Environmental Group;
3. Kayole Environmental Management Association;
4. City Garbage Recyclers;
5. New Nairobi Dam Community Group;
6. KIRDI (Kenya Industrial Research and Development Institute);
7. GTZ-PSDA;
8. Keekonyoike Slaughter House (Biogas production);
9. Kuku Women Group.

In spite of the large percent of organic waste in the Nairobi waste stream, estimated at about 60% by volume, most reported waste recovery and valorisation involves recyclables, which go to the recycling supply chain. Strengthening the recovery and valorisation activities for organic waste has a much higher potential for reduction of waste dumped at the Dandora dumpsite. This organic waste represents a missed opportunity for win-win co-operation between private supply chain actors and the City Council of Nairobi, which has the main waste management responsibility.

Non-domestic organic waste streams in Nairobi

Looking at *non-domestic* waste streams, large volumes of waste are produced in Nairobi, which can be segregated and recovered relatively easily. Work done in 2009, surveying markets and other non-domestic generators, provides a picture of what is

¹ The information from this brief stems from the Nairobi City Waste project, which was funded by the Ministry of Economic Affairs, Agriculture and Innovation of the Netherlands (BO-10-011-104) in 2009-2010.

happening with this waste. Below you will find information on the five largest non-domestic generators of organic waste:

- **Markets:** an analysis of four markets showed that the markets generate on average at least 19 tonnes per day in total, comprising of about 95% organic waste (raw fruits and vegetables, meat etc.), with the remaining 5% being packaging materials. Market waste, though largely uncontaminated, is not scavenged but sometimes collected for either pig feed or for composting. Markets currently dispose most of their wastes into the Dandora dumpsite, with little to no reuse, recycling or recovery taking place at source or at the collection & transportation levels of their waste management chain.
- **Slaughterhouses:** in total 28.8 tonnes of organic waste per day is generated at two slaughterhouses that were investigated. About 30-40% of it is currently going into disposal sites that are licensed by NEMA for this type of waste. Some of the waste ends up in composting and biogas units. The rest is sold to produce bone meal etc.
- **Hotels:** in total 11 tonnes of organic waste per day is generated at 11 hotels studied. Segregation at source, though not a common practice, is taking place within some hotels. When segregated, it ends up as animal feed or in some occasions in composting and biogas units. The rest is dumped at dumpsites.
- **Sanitation facilities:** in total, 7.5 tonnes of organic waste is generated per day at four sanitation facilities (Ecosan toilets) studied. The waste from all 50 Ecosan toilets is to end up in biodigesters, but due to space problems only waste from 2 of the 50 toilets currently ends up in a biodigester. Most of the waste is collected and goes into the main sewer line.
- **Education centres.** In total 4.2 tonnes of organic waste is generated per day at three education centres studied (which accounts for 40% of all waste generated). The key waste fraction was paper, at 50% by volume of the total waste composition. Education centres dispose their wastes into Dandora dumpsite, with little to no reuse, recycling or recovery taking place.



Waste Dump (Photo: ECM Centre)

Opportunities in valorising organic market waste streams in Nairobi

Even though organic waste from markets, slaughterhouses and hotels is sometimes already used for composting, biogas production or livestock feed, a high share of the organic waste, amounting to huge quantities, is currently disposed of to dumpsites. Especially organic waste streams *from markets* are good sources for the production of compost, biogas and bioenergy, as:

1. Markets generate large quantities of organic waste. The four markets we investigated (Wakulima Market, Gikomba Market, City Park Market and City Market), in total generate on average at least 19 tonnes of organic waste per day. Yearly, these four markets generate 6935 tonnes of organic waste;
2. 95% of market waste by volume and weight is organic², which makes segregation at source and recovery relatively easy.

Nairobi markets can therefore provide large volumes of good quality, largely uncontaminated organic waste, to be converted into compost or biogas.



Composting site in Nairobi (Photo ECM Centre)

Some examples of composting or biogas generation using waste from markets and institutions have been found. Nevertheless, these activities are still relatively small-scale and have difficulties to expand, as there are quite some constraints in sourcing organic waste from markets. These constraints also pose difficulties in starting up new, economically sustainable, composting or biogas activities. Below you will find the challenges to be addressed to upscale the reuse of market waste for the production of biogas and compost and for livestock feed.

Challenges in using Nairobi market waste for compost and biogas production

As has been indicated, the availability and quality of organic waste at Nairobi markets does not pose a problem for a company wanting to source such waste for compost production or biogas generation. *Gaining access to market waste* is the key challenge in starting or expanding company activities in this field of work. Difficulties in accessing organic waste from markets are currently mainly due to:

1. A comprehensive regulatory system, including economic instruments, for segregation of waste at source for recycling purposes, is lacking in Nairobi resulting in valuable organic waste being transported to the dumpsites. Specifically, the ownership of waste is not clear in the law, and it is not clear what the rights of commercial or market generators are to do something with it, including selling it. There are conflicting rules of access and ownership.
2. Disposal is un-priced. The economic signal from the solid waste system that stimulates valorisation of all wastes is the price of disposal. Disposal at Dandora is still so cheap as not to function as a price at all. This means that recovery of organic wastes (and recyclables) will be limited to “cherry-picking” the most valuable materials. And these are in many cases already claimed. Until disposal is priced, and there is a clear legal enforcement of authorised dumping, additional

² Based on observations as well as data from the City Council of Nairobi.



- recovery activities represent a high risk of dispossessing existing entrepreneurs, who already recover materials; and of introducing less efficient valorisation via composting or biogas;
3. Institutions, and thus also markets, are mandated to ensure that the disposal of their waste is undertaken by a licensed contractor which transports the waste to approved designated waste disposal facilities in Nairobi³. The use of market waste for other activities – even where it actually occurs – thus has a rather uncertain legal status and is vulnerable to various bureaucratic sanctions;
 4. The Solid Waste Management By-Laws (2007) do provide for small-scale resource recovery activities to be undertaken by organized groups at designated sites before the disposal of wastes. Designated sites are not defined by the law, and groups (including companies) that would want to recover large volumes are restricted. At the City Park Hawkers Market for example, some composting activities are undertaken by a small women’s group. They would like to up-scale their activities, but the law limits that;
 5. Enterprises wishing to source organic waste for composting or biogas generation activities have no access to dumpsites for waste recovery; according to the Solid Waste Management By-Laws, “no person shall sort over or disturb anything deposited at a place provided or approved by the council for the deposit of waste or in containers for waste provided by the council or other persons unless he is a person entitled to the custody of the container or is authorized to do so by such a person, or is a person having the function of emptying the container”.
 6. If organic waste could be diverted for composting or biogas generation, obtaining a license to transport waste from markets and to operate a waste processing plant/site is expensive for small or newly starting enterprises;
 7. Kenya does not apply fertiliser standards to compost. Neither the waste sector nor the agriculture sector has production or application standards for compost. There is no grading or pricing system. While this does not impede small-scale transactions, it provides a barrier to large-scale investment and compost production.

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³ The Dandora Dumpsite, approved incineration sites, and approved farms for the disposal of manure