URBAN GOVERNANCE RESEARCH LAB

Solid Waste Management Brief

Good Practice Case Studies

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1. Introduction

African cities are going through major social and economic transformations and rapidly urbanizing. As the urban populations are growing, so is their solid waste generation. With limited financial, human, and infrastructural solid waste management (SWM) resources, most cities experience many SWM challenges. Nearly half of the waste generated in Africa remains uncollected and is illegally dumped on sidewalks, open spaces, storm drains, rivers, and uncontrolled dumpsites. Uncontrolled waste disposal results in numerous socioeconomic and environmental problems such as water, land, and air pollution which threaten human and animal health and life. Uncollected waste is often burned and produces toxic gases that pollute the air, cause fires, and contribute to climate change. Indiscriminate dumping of waste results in ecological risks such as flooding and landslides and outbreaks of diseases such as cholera, malaria, typhoid, dengue fever, and Zika. Moreover, poorly managed dumpsites can harbour dangerous animals and rodents which pose a danger to nearby communities. It is therefore imperative for cities to have functional and sustainable SWM systems.

2. Challenges of SWM in African Cities

SWM in Africa is hampered by several factors. Most African countries/cities suffer from poor public resources management compounded by weak institutional and legislative frameworks. While there are many environmental and waste management policies and laws, implementation and enforcement are slow as they are affected by weak governance institutions, resulting in uncontrolled waste dumping. SWM challenges are also worsened by the fact that the continent experiences illegal dumping of hazardous waste and end-of-life products from developed countries as African governments fail to domesticate international waste agreements. African cities also experience poor SWM financing because the waste sector in Africa is seen as a high-risk investment. As a result, SWM infrastructure remains poorly developed. Most African cities also lack SWM expertise - there is a poor understanding of project costing and cost recovery among personnel running public institutions in charge of waste logistics and management.

3. Benefits of SWM

Proper solid waste management has numerous environmental, economic, and public health benefits:

a. Environmental benefits

- Reduces pollution of air, water, and soil, preserves ecosystems, and promotes biodiversity.
- Promotes waste recycling, reusing, and composting, which minimize greenhouse gas emissions that cause climate change.
- Reduces environmental disasters such as flooding, landslides, and fires.

b. Economic benefits

- Promotes the circular economy, creates jobs, and generates income in waste collection, recycling, processing, and sale of recyclable materials.
- Promotes resource conservation - recycling recovers valuable resources from metal, paper, and plastic waste.
- Can convert non-recyclable waste into electricity which reduces the reliance on dirty fuels.

c. Public health and safety

- Prevents the spread of diseases and the contamination of water sources.
- Promotes proper disposal of hazardous waste to ensure that harmful substances do not pose health risks to communities.
- Reduces the breeding of rodents, insects, and stray animals which can affect communities.
- Keeps communities clean and aesthetically pleasing - clean neighbourhoods and public spaces improve the overall quality of life for residents and visitors.

4. Components of a Sustainable SWM System

Despite the many challenges, it is crucial to highlight that the social, economic, and environmental costs of inaction outweigh the cost of managing waste, hence the need for cities to develop effective and sustainable SWM solutions. An effective and sustainable SWM system aims to ensure timely collection and appropriate disposal of all waste in engineered landfills. It should reduce waste generation and divert waste away from dumpsites by promoting waste reuse, recycling, and recovery. It should prioritize initiatives like composting, bioenergy recovery, biorefinery of organic waste; reuse and recycling of paper, plastic, metal, and glass waste as well as refurbishing/repair/reuse and recycling the electronic waste which also creates employment, income, livelihood, and business opportunities for many and at the same time-saving society and the environment from the dangers/hazards/risks of poor SWM. A successful sustainable SWM system should include carefully constructed public-private-people partnerships in which partners are adequately incentivized for their continued participation. Strong legislative and institutional frameworks to implement policies and enforcement of waste and environmental laws and a robust monitoring and evaluation system are also preconditions for a sustainable SWM system.

5. Good Practices for Solid Waste Management: Guidelines for Decision-makers

- To design successful sustainable and effective SWM models, cities should consider some key standards. Sustainable and effective SWM models should emphasize the need to develop a waste hierarchy, proper planning, and waste characterization, covering all aspects of SWM from waste reduction to disposal. Cities should know the importance of partnerships with other stakeholders in SWM, recognizing the role of informal waste pickers, job creation, and converting waste into livelihoods and cash. The following guidelines are recommended by the United States Environmental Protection Agency (USEP) and the United Nations Environmental Programme (UNEP).

- Design a solid waste management hierarchy that creates a general ranking system for the different solid waste management strategies, starting with the most to the least environmentally preferable, prioritizing waste reduction, reusing, and recycling.

- Waste characterization: Waste composition differs from one city to another, so it is important to characterize and categorize all locally generated waste. Information about waste sources, quantities, and composition can provide the foundation for all stages of a successful SWM strategy. Waste characterization is important because of the following reasons:
    - It allows decision-makers to develop relevant outreach campaigns and policies that promote waste prevention and minimization.
    - It informs how waste can be categorized, separated/sorted, collected, transported, stored, treated, and disposed of.
    - Helps in deciding on appropriate technologies that can enhance SWM.

- Organic waste management: Organic waste constitutes most of the solid waste stream in many low-income countries and should be accorded more attention. The best options for managing such waste include waste reduction at source, separation, diversion, quick collection/transportation, composting, or decomposition to produce high-quality organic fertilizer, and/or biogas.

- Inorganic waste management: A robust recycling plan is crucial to managing inorganic solid waste. Recommended methods include collecting and separating distinct types of inorganic and recyclable waste such as paper, plastics, metals, tyres, and electronic waste. These can be reused or recycled to produce raw materials for new products. Recycling inorganic waste preserves landfill space, recovers resources, generates revenue, and creates employment.

- Dumpsite management: Open dumpsites are associated with huge public health and environmental risks. There is therefore a need for cities to transition from open to controlled dumpsites and sanitary landfills which minimize the risk of fires, leaching and water contamination, bad odours, diseases, and slope failure. Dumpsite fencing is also strongly recommended.

- Identifying potential partners and establishing relationships with interested stakeholders and affected parties. This ensures that the project/program gains support from different stakeholders. Such support may come in the form of SWM policies, informed decisions, programs, service issues, and funding. Collaborating with stakeholders ensures transparency, participation, and inclusiveness of interested parties. Examples of collaborations include public-private partnerships (PPP) and public-private-community partnerships. Stakeholders or potential partners in SWM may include municipalities, national and sub-national governments, communities/residents/civil society, the private sector, NGOs, funding institutions, and academic institutions among others.

- Planning systems: Planning and evaluation are critical steps for cities to design an effective SWM system. Key planning guidelines include identifying, inventorying, and assessing resources; goal and objective setting; defining and evaluating SWM options, securing funding and developing an M&E system.

- Harnessing the socio-economic benefits of waste: This can be done by considering SWM options that promote turning waste into resources/cash/livelihoods, and job creation by promoting the collection, transportation, composting, reusing, separation, storage, recycling, reselling, treatment, and disposal of waste. Informal waste pickers can play a key role in some of these activities.

6. Good Practices for Solid Waste Management: Selected case studies

This document summarizes five good practices case studies implemented in four global South cities which other cities can learn from as they design their own SWM strategies. These are Addis Ababa (Ethiopia), Nairobi (Kenya), Dhaka (Bangladesh), and Belo Horizonte (Brazil). These case studies are considered effective and sustainable because of the following reasons:

- they are innovative, not complicated, and low-cost (except for the Reppie incinerator), and thus affordable for cities facing financial constraints.

- they use an integrated approach to SWM which emphasizes waste reduction at source (awareness), sorting, transportation, reuse, recycling, and recovery.

- they aim to create value out of waste by creating entrepreneurial, livelihood, and employment opportunities for the poor.

- they are formed out of public-private-people partnerships, which also recognize the role of micro-players (informal waste pickers) and communities in SWM.

a. **Reppie waste-to-energy plant** | Addis Ababa, Ethiopia

Inaugurated in 2018, the Reppie plant is Africa's first waste-to-energy facility built after 116 waste pickers died in a landslide at the Koshe dumpsite. Addis Ababa City Administration undertook to rehabilitate the dumpsite and build an environmentally friendly plant that also generates electricity from waste. It received financial and technical assistance from the Ethiopian national government, UN-Habitat, the government of Japan, and private companies from Singapore, China, and Denmark. Koshe is an open dumpsite where residents can dump waste for free. Once delivered, waste is sorted and separated according to type. The plant is divided into a composting plant (for organic waste) and an incinerator (for burnable waste). Organic waste is decomposed using the Japanese 'Fukuoka method' which speeds up decomposition and reduces the generation of greenhouse gases like methane which contributes to global warming. It is converted into high-quality bio-fertilisers and sold to farmers. Burnable inorganic waste is burnt in the plant's combustion chamber to boil water to produce steam which is used to power a turbine generator to produce electricity. The plant covers over 350,000 tonnes of waste into 50MW/year and supplies 30% of Addis Ababa's household electricity. Informal waste pickers also earn income from picking waste for reuse, recycling, and selling it to industries. SWM activities at the Reppie plant reduced odour, pollution, erosion, flooding, and disease outbreaks in nearby neighbourhoods. It created jobs for plant workers and improved livelihoods for informal waste pickers. The model received attention from Kenya and the Nairobi County is set to construct a similar plant with funding from the African Development Bank. However, the Reppie plant faces challenges related to inadequate financing, low-quality waste, and lack of skilled personnel, which reduce its capacity to fully function.

b. **TakaTaka Solutions** | Nairobi, Kenya

TakaTaka Solutions is a vertically integrated waste management social enterprise based in Nairobi, Kenya. It works through a value-chain model in which it is actively involved in solid waste collection, sorting, recycling, composting, and disposal. It offers affordable SWM services to over 21,500 households and more than 40 corporates where it collects over 60 tonnes of waste daily. TakaTaka is creating jobs for many people who work in waste collecting, sorting, recycling, composting, and disposal activities. By 2023, the project had created up to 2,400 jobs, up from just 200 in 2020. Waste is collected and transported using dump trucks and delivered to the entity's different plants. There, it is sorted into over 40

different fractions with the help of conveyor belts and other machinery. To speed up sorting, TakaTaka provides their clients with bin liners of distinct colours to separate waste at the source i.e., during the household disposal stage. Organic waste [69%] is taken to the composting plant and composted into high-quality organic fertilizer which is sold at a profit to farmers. Plastic waste [26%] is recycled into new raw materials and sold to manufacturers. TakaTaka also partners with external recycling partners for other recyclables like paper, cardboard, glass, and many other materials. TakaTaka Solutions recycles 95% of all collected waste and disposes only 5% used in landfills. This reduces disposal costs and enables the firm to offer affordable green SWM solutions for as low as US$1/household/month. About 80% of its clients are low-income households. However, despite its success story, the project is affected by some challenges. These include a lack of cooperation from clients (households and corporates) in separating waste at source and high rental costs since TakaTaka Solutions does not own the land.

c. Mukuru Integrated Waste Recycling Centre | Nairobi, Kenya

Mukuru Recycling Centre is a community-based 'waste for livelihoods' initiative based at Dandora dumpsite in Nairobi. It was founded by St. John's Catholic Church in Korogocho which later partnered with UN-Habitat, Nairobi City Council, and Kenya Association of Manufacturers which provide financial and technical support. The primary aim of the project was to rehabilitate waste pickers who stayed at the dumpsite back into the community and transform their waste picking into a sustainable livelihood by reducing exploitation by waste dealers working in the area. SWM activities are organized into four distinct groups/categories. Group 1 collects recyclable waste from the dumpsite, sorts and cleans it, and sells it directly to industries bypassing intermediaries. Group 2 offers waste collection services as a business and is paid to collect wastepaper from commercial businesses in the CBD and sells it directly to recycling industries for a profit. Group 3 works on organic waste delivered at the dump site. They use it to make bio-fertilizer and stock feed for pigs for sale to farmers and for their own domestic use at their homes. The group also works with plastic waste which they collect and take to a recycling plant where they sort according to colour, shred into pellets, and sell to industries. Group 4 makes briquettes using low-quality waste papers, sawdust, and/or coffee husks for sale. Besides rehabilitating homeless waste pickers back into communities, and creating jobs and livelihoods, the Mukuru project has also reduced crime, flash floods, and disease outbreaks in surrounding neighbourhoods.

d. Waste Concern Waste Project | Dhaka, Bangladesh

Waste Concern started with a 'cash for trash' SWM model aimed at converting waste into resources in Dhaka. It aims to improve urban environmental sanitation through an SWM model that emphasizes waste reduction, reuse, recycling, and recovery (4Rs). The model works through a network of community-based composting plants used to convert household organic waste into bio-fertilizers and create jobs in the process. Community members are employed to collect and deliver organic waste to community composting plants daily. At the plants, organic is composted and converted into bio-fertilizer which is sold to farmers. The money earned is given back to help the communities. After a successful pilot project, the model attracted some funding partners resulting in the signing of public-private-community partnership agreements between the communities, municipality, Bangladesh Ministry of Environment, and United Nations Development Programme (UNPD). Through funding from these partners, the model was replicated in five other communities across the city before attracting other municipalities. To date, the model has been replicated in over 20 other cities in Bangladesh. Robust awareness campaigns led to significant waste disposal behavioural change, and an increase in door-to-door collection, marketing, and sale of compost and organic fertilizer which also increased earnings for community members.

e. Belo Horizonte Recycling Model | Belo Horizonte, Brazil

The city of Belo Horizonte has an integrated SWM system that promotes the separation of waste at the source to minimize the harmful waste-related environmental impacts and maximize socioeconomic benefits obtained from waste. The integrated SWM system is based on recycling, social inclusion (integrating informal workers into the formal SWM), job creation, and income generation. SWM in the city includes recycling construction waste and composting organics. The municipality collects domestic non-organic recyclable solid waste (plastic, paper, metals) through three main channels:

i. Drop-off system: There are over 150 delivery sites across the city where waste is deposited.
ii. The curbside collection system: Municipality trucks collect non-organic recyclable waste to delivery sites; and
iii. The door-to-door collection from non-residential facilities by waste cooperatives.

All collected waste is taken to warehouses run by informal waste pickers' cooperatives where it is sorted, shredded, packaged, stored, and sold to industries. The money is shared among cooperative members. In managing construction waste, informal collectors collect

debris from households for a fee (paid by households) using horse-drawn carts and deposit it at any of the 29 municipal receiving depots. The waste is used to make bricks for sale and some at municipal sanitary landfills. Organic waste including food, vegetables, and tree/plant material is sent to a composting facility and processed into compost manure which is sold to farmers.

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