TANZANIA

AN ASSESSMENT OF THE SOLID-WASTE-MANAGEMENT ECOSYSTEM

Research direction: Atin Biswas

Author: Siddharth Ghanshyam Singh

Research support: Ishani Sonak, Subhasish Parida and Richa Singh

Editor: Archana Shankar

Design and cover: Ajit Bajaj

Production: Rakesh Shrivastava and Gundhar Das

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41, Tughlakabad Institutional Area
New Delhi 110 062
Phones: 91-11-40616000
Fax: 91-11-29955879
E-mail: sales@cseinida.org
Website: www.cseindia.org

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1. NATIONAL-LEVEL SOLID-WASTE MANAGEMENT

About Tanzania

Tanzania, officially known as the United Republic of Tanzania, is a mid-sized East African country south of equator. It is bounded by Uganda, Lake Victoria and Kenya to the north; the Indian Ocean to the east; Mozambique, Lake Nyasa, Malawi and Zambia to the south and southwest; and Lake Tanganyika, Burundi and Rwanda to the west. It has an area of 945,087 square kilometres and population of about 58 million people.[1] It has a coastline of 800 km. Dodoma is the designated capital of Tanzania, but Dar es Salaam remains the seat of government administration as well as the largest city and port in the country (see *Map 1: United Republic of Tanzania)*. According to the 2012 population census, about 29.61 per cent of the population live in urban areas as against 70.39 per cent of the population that live in rural areas.

Tanzania is a democratic unitary republic, with both a national government and a devolved government of Zanzibar that has autonomy for non-Union matters. Since its independence in 1961, Tanzania has been continuously developing in terms of its economy and modern industry. The country's vision of its development goals as a middle-income country in 2025 are set out in the Tanzania Development Vision 2025. It aims for high-quality livelihoods; peace, stability, unity; good governance; a well-educated and learning society; and a competitive economy capable of sustainable growth and shared benefits. Due to its ever-increasing population and economic growth, the burden on natural resources is increasing too, bringing several environmental challenges. In particular, waste management is becoming a serious concern in Tanzania.

Institutional and administrative framework

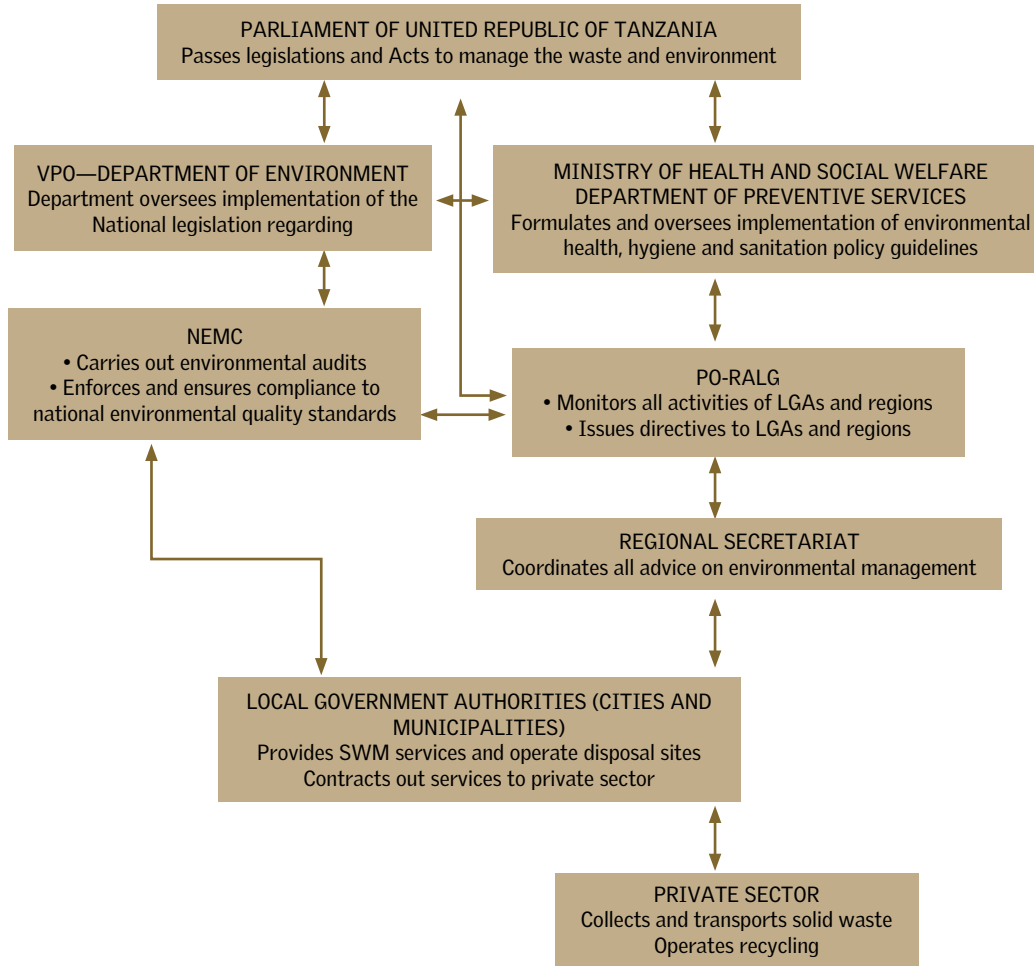
The Environmental Management Act, 2004 (Act no. 20 of 2004) (EMA) establishes the legal and institutional framework for sustainable management of environment, including waste management, in the country. It established the National Environmental Advisory Committee (NEAC) with the role of advising the minister responsible for protection and management of environment. It confers the role of enforcement to the National Environment Management

Map 1: United Republic of Tanzania

Source: Statoids.com

Council (NEMC). It directs establishment of Sector Environmental Sections, with the role of overseeing protection and management of environment in the relevant sectors. It also gives power to the regions to designate a Regional Environmental Management Expert (REME) charged with responsibility to advice and oversee implementation and enforcement of EMA. Further, it empowers the local government authorities (LGAs) (of cities, municipalities, districts and townships) to designate or appoint environmental management officers to oversee implementation of EMA at respective levels. In addition, the Act establishes Environmental Committees at the LGA level to advise and oversee implementation of EMA within their jurisdiction. The Act established the National Environmental Management Council as an institution responsible for enforcement of laws related to environmental management (see *Figure 1: System graph—Solid-waste management in Tanzania*)

Figure 1: System graph—Solid-waste management in Tanzania



The Environmental Management Act of 2004 (Section 114–138) assigns local government authorities with the responsibility of waste management, especially management and minimization of waste at source. Waste categories being referred to include solid waste, litter, liquid waste, gaseous waste and hazardous waste.

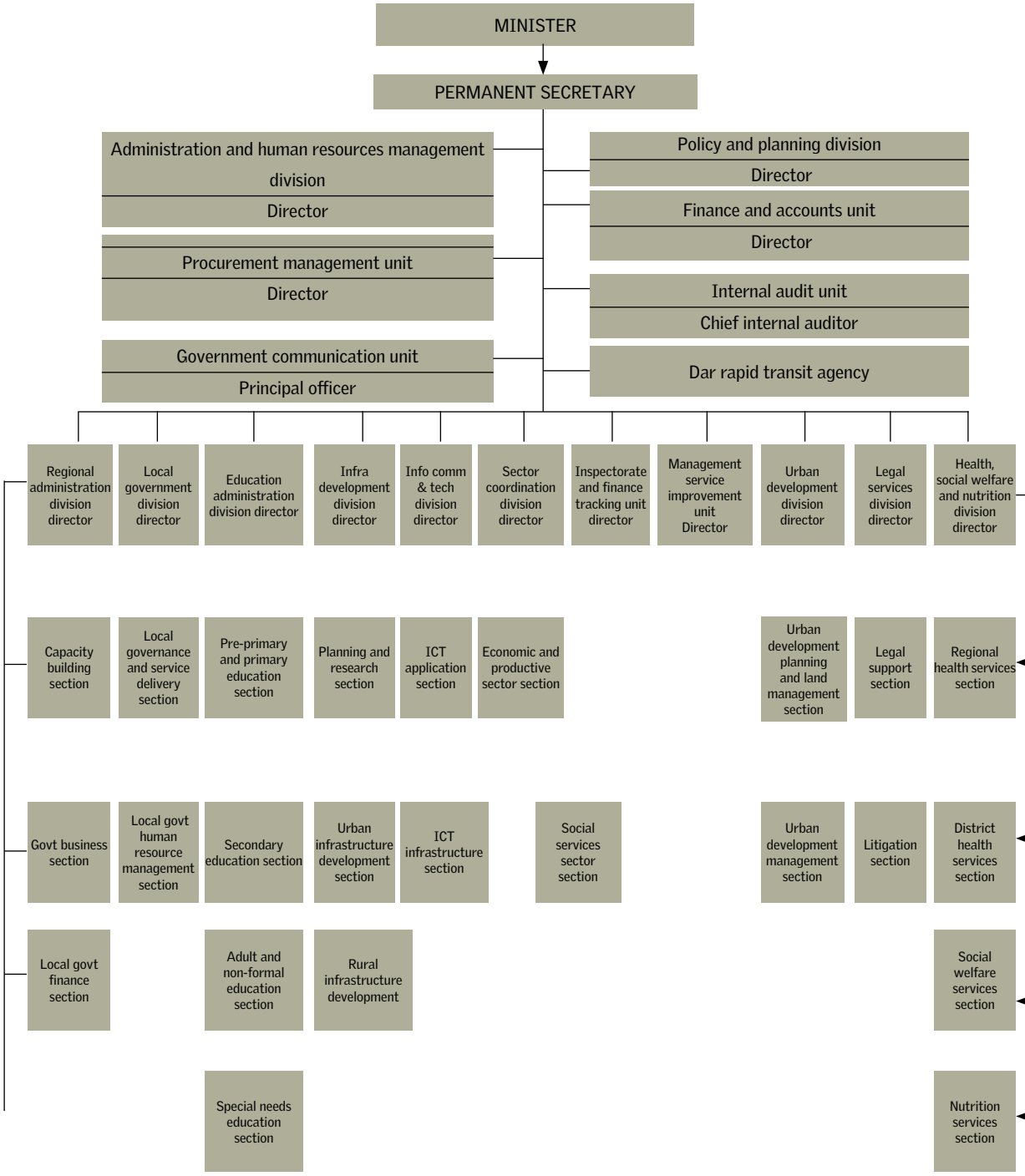
The Act sets basic standards for the collection of waste, including source separation and the use of appropriate waste containers (receptacles). Local government authorities are required to carry out regular studies into the management of wastes, including waste quantity and composition to guide the development of appropriate methods for sorting, storage and disposal. They are also responsible for managing waste collection in both urban and peri-urban areas and for establishing waste transfer and final disposal facilities. Local authorities must also oversee and ensure that industries appropriately manage all waste generated from their activities.

The Local Government Act no. 8 of 1982, Section 55 gives urban local government authorities (LGAs) responsibility to manage waste in their area of jurisdiction, including public latrines, septic tanks, dustbins and other waste receptacles, sewage and solid waste. Likewise, the Local Government Act No. 7 of 1982 gives district authorities the mandate to manage waste and conserve environment.

Both Tanzania and Zanzibar have local governments. Article 145 of the Constitution recognizes the local government and is supported by the Local Government (District Authorities) Act, 1982 and the Local Government (Urban Authorities) Act 1982. The Ministry for Regional Administration and Local Government (RALG) is responsible for local government in mainland Tanzania and has moved back and forth between the Prime Minister's and the President's Office since 1998, before being transferred to the President's office in 2015. Tanzania's regional administration and local government works in partnership with the Ministry of Health and Social Welfare to deliver public health services. Independently, the RALG manages district and regional health services, including the regional and district councils.

Since 2015, the President's Office—Regional Administration and Local Government (PO-RALG) has been headed by a Minister to whom the Permanent Secretary reports. Its various divisions focus on administration and human resources, government communication, procurement management, policy and planning, and finance and accounts, a unit headed by a chief accountant. Finally, the chief internal auditor is responsible for internal affairs. The government body is subdivided into more divisions and units, including a regional administration

Figure 2: President's Office—Regional Administration and Local Government (PO-RALG) organization structure



Source: https://www.tamisemi.go.tz/muundo-wa-wizara

and local government division (see *Figure 2: President's office—Regional administration and local government organization structure*). As a government body, the Ministry of Regional Administration and Local Government is publicly funded.

PO-RALG's projects heavily feature decentralization to improve the delivery of services; their efforts involve transferring responsibilities and resources from the central government to local authorities to strengthen local institutions. Additionally, they offer training resources for local officials and grassroots leaders.[2]

In the mainland, there are three types of local urban authorities—city council, municipal council and town councils. In rural areas there are two levels of authorities—the district councils along with township authorities, and the village council. In Zanzibar, urban authorities are either town councils or municipalities, while all rural authorities are district councils. In mainland Tanzania there are 25 regions, 40 urban councils and 132 rural district councils, while Zanzibar has five regions, four urban authorities and seven rural district councils[3] (see *Table 1: Distribution of councils and population in Tanzania)*

Local government authorities (LGAs) have the power to levy taxes, fees and charges; however the majority of local authority revenue comes in the form of sector-specific conditional transfers from national government. LGAs exist for the purpose of consolidating local services and empowering citizens to participate in social and economic development. Local authorities are mandated to: maintain law, order and good governance; promote the economic and social welfare of the people in their jurisdiction; and ensure effective and equitable delivery of quality services to the people.

The councils are categorized into city, municipal or town councils on the basis of the population, primarily the number of permanent residents (see *Table 2: Classification of council on the basis of population).*

Table 2: Classification of council on the basis of population

Type of council	Number of permanent residents
City	612,000
Municipal	80,000
Town	30,001

Source: CSE 2021, with inputs from officials

Table 1: Distribution of councils and population in Tanzania

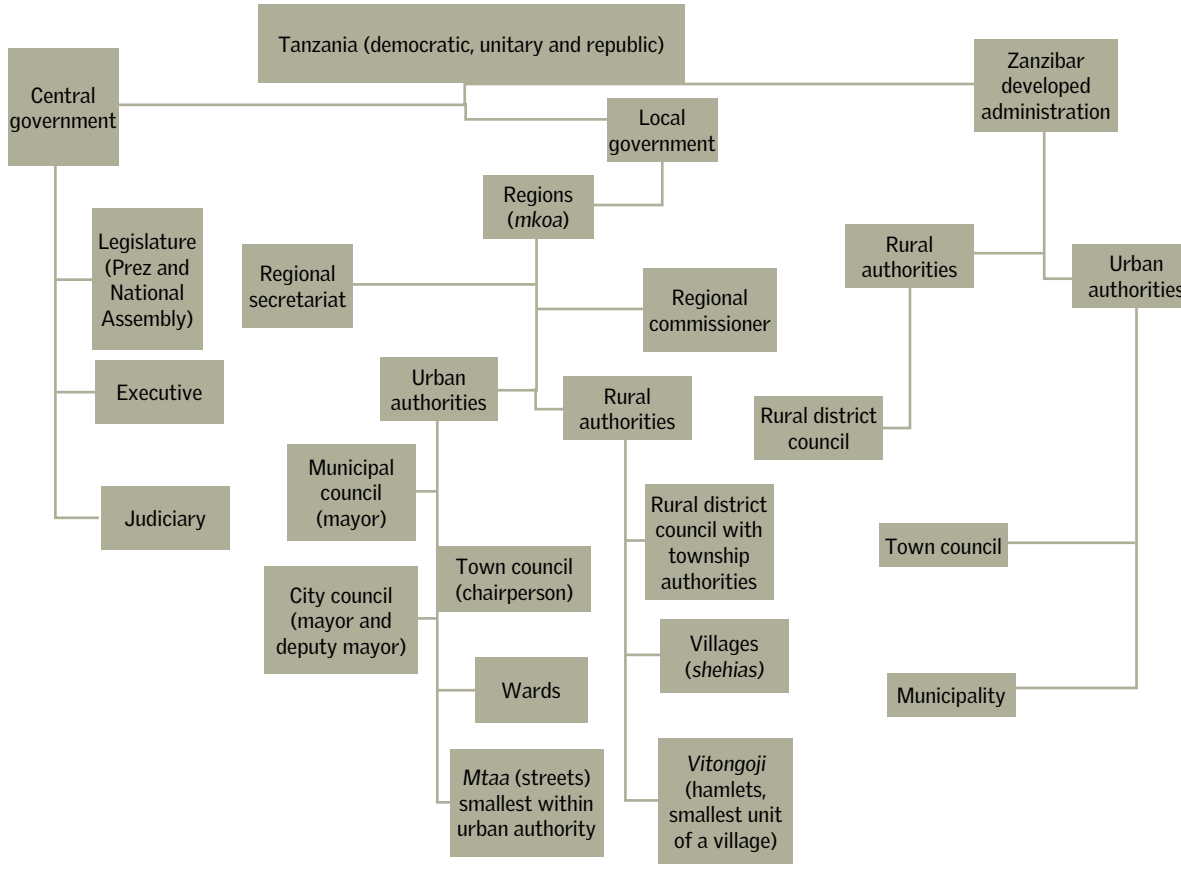
Region (*mkoa*)	Urban local government				Rural local government			Population (2012 census)	% Urban (2012)
	Districts	Urban councils	Wards	Mtaa	Rural councils	Shehias (villages)	Vitongoji (hamlets)		
Arusha	6	1	19	Data not available	6	104	Data not available	1,694,310	373
Dar es Salaam	3	5	90		0	0		4,364,541	100
Dodoma	7	1	37		6	152		2,083,588	16.2
Geita	5	1	35		5	63		1,739,530	19.3
Iringa	3	2	19		3	74		941,238	27.7
Kagera	7	1	14		7	167		2,458,023	10.6
Kigoma	5	2	28		6	83		2,127,930	19.2
Katavi	3	1	9		2	33		564,604	30.8
Kilimanjaro	6	1	21		6	132		1,640,087	25.4
Lindi	5	1	18		5	118		864,652	19.6
Manyara	5	1	8		5	114		1,425,131	15.9
Mara	6	1	13		6	141		1,743,830	19.6
Mbeya	8	2	37		8	181		2,707,410	33.8
Morogoro	6	1	19		6	135		2,218,492	30.2
Mtwara	5	2	27		5	122		1,270,854	22.7
Mwanza	7	2	21		5	133		2,772,509	38.9
Nijombe	4	2	21		4	75		702,097	23.8
Pwani	6	1	11		6	100		1,098,668	333
Rukwa	3	1	15		3	49		1,004,539	24.9
Ruvuma	5	1	21		5	119		1,376,891	25.7
Shinyanga	3	2	37		3	81		1,534,808	21.9
Simiyu	5	1	25		4	86		1,584,157	9.8
Singida	5	1	16		5	108		1,370,637	14.5
Songwe	5	1	16		5	108		998,862	na
Tabora	7	1	25		6	141		2,291,623	16.8
Tanga	8	3	44		9	171		2,045,205	22.2
Total mainland	**138**	**40**	**630**	**3,939**	**133**	**2,682**	**64,691**	**43,625,354**	**32.9**
Kaskazini Unguja	2		*	Data not available	-	*65	Data not available	187,455	8.7
Kusini Unguja	2	1	*		-	*61		115,588	6.9
Mijini Magharibi	2		*		-	*84		593,678	82.9
Kaskazini Pemba	2	3	*		-	*59		211,732	18.2
Kusini Pemba	2		*		-	*62		195,116	19.7
Total Zanzibar	**10**	**4**	**95**	**na**	**-**	**236**	**na**	**1,303,569**	**45.0**
Total Tanzania	**148**	**44**	**725**	**>3,939**	**133**	**2,918**	**>64,691**	**51,557,365**	**33.2**

*The number of shehiahs in Zanzibar includes urban wards

Source: http://www.clgf.org.uk/default/assets/File/Country_profiles/Tanzania.pdf

The urban councils are subdivided into wards and sub-wards. The smallest unit within an urban authority is called sub-ward or *mtaa* (singular) or *mitaa* (plural). There are currently 40 urban councils that are subdivided into 3,939 *mitaa*. The city and municipal councils are headed by a mayor and the town councils are headed by chairpersons. The basic functions of an urban authority is to formulate, coordinate and supervise the implementation of plans in their areas and monitor performance of the council in order to promote the economic and social welfare of the people and ensure effective and equitable delivery of services to all (see *Figure 3: Administrative framework of Tanzania)*

Figure 3: Administrative framework of Tanzania



Source: CSE, 2021

The rural areas of mainland Tanzania have two levels of government, an autonomous district council which is subdivided into village councils or township authorities (first level) and then into hamlets (*vitongoji).* Currently, the 133 rural district councils consist of 2,682 registered villages and 64,691 vitongoji (hamlets, the smallest unit of a village). District councils coordinate the activities of the township authorities and village councils, which are accountable to the district for day-to-day administration. Like the urban councils. The village and township councils also have responsibility for formulating plans for their areas, and in most cases for securing district approval.

Legislative and regulatory framework

Legislation

The Environmental Management Act, 2004 is divided into 20 parts. Each part deals with a broader subject and has certain sections to categorically talk about a particular area of concern. Part IX of the Act is dedicated to waste management, which includes solid waste, litter liquid waste, gaseous waste and hazardous waste. Sections 114–119 specifically deal with solid waste and are as follows:

Section 114: Duty of local government to manage and minimize solid waste
This section aims at minimizing solid waste in a certain jurisdiction area. Local government authorities are asked to prescribe to the residents to separate waste at source and collect it in standardized (in terms of type, size, shape and colour) containers. Local authorities are also asked to engage private sector and non-governmental organizations for achieving source separation and collection in standardized containers which the local authority has to oversee and ensure. An Environmental Impact Assessment (EIA) needs to be conducted for all new major activities leading to proper management of solid waste. The local government authorities also have to undertake studies to find the rate of local solid waste generation and the composition of the waste.

Section 115: Disposal of solid waste from markets, business areas and institutions
This section aims at solid waste management from markets, business areas and institutions such as schools, offices, hospitals, religious buildings etc. It mandates the local government authority to undertake periodic studies to determine the type of waste generated and appropriate methods for sorting, storage and disposal post its classification (prescribed by the minister) into organic waste, plastic waste, glass or metal etc.

Section 116: Storage of solid waste from industries
This section aims at solid waste management by the industries. They are suggested to provide adequate space and facilities for managing solid waste whilst also maintaining those spaces before they are collected for disposal by the local authorities.

Section 117: Solid waste collection in urban and rural areas
This section aims at optimizing collection time, equipment and routes for solid waste collection from urban and rural areas. The local government authority has to deal with the collection of various classification of waste as classified by the minister from the source of solid waste generation. It also has to find avenues of recovering the cost incurred in collection of solid waste on its own or through private or commercial sector.

Section 118: Waste transfer stations
The local government authorities have to designate transfer stations to serve as collection centres for cities, councils or towns that generate large quantities of solid waste. An area designated as a transfer station must be adequate in size, situated away from a residential area and fenced, and the solid waste should be removed regularly. An area can only be designated as transfer station if it has social, health and environmental impact assessment studies conducted.

Section 119: Final disposal of solid waste
This section lists the parameters that local government authorities need to consider before choosing the best method of solid waste disposal. Factors include climatic conditions, economic viability, community interests, environmental and social benefits, and availability of tipping sites.

Regulations

Environmental Impact Assessment and Audit Regulations, 2005 and 2018 Amendments
This regulation make it an offence to begin, finance, permit or licence any projects listed in the regulations without the developer submitting to the licensing or permitting authority an application for an EIA certificate in the format of a project brief.

The First Schedule in the projects category Type A for which it is mandatory to undertake Environmental Impact Assessment include construction of municipal solid waste landfill facility under the head of municipal solid waste.

Environmental Management (Solid Waste) Regulations, 2009
This regulation details the requirements and responsibilities for managing solid waste in Tanzania. It also highlights waste minimization and cleaner production principles alongside the duty to safeguard the public health and the environment from adverse effects of solid waste. The regulations also detail permitting requirements (Part III), notably that any person dealing with solid waste as collector, transporter, waste depositor or manager of a transfer station will apply to the Local government authority for a permit. The local authority will also issue licences to individuals or companies qualified to operate solid waste disposal sites, i.e. a permit is required to operate a local government authority waste disposal site. The regulations also mandates annual reporting by the local government authorities.

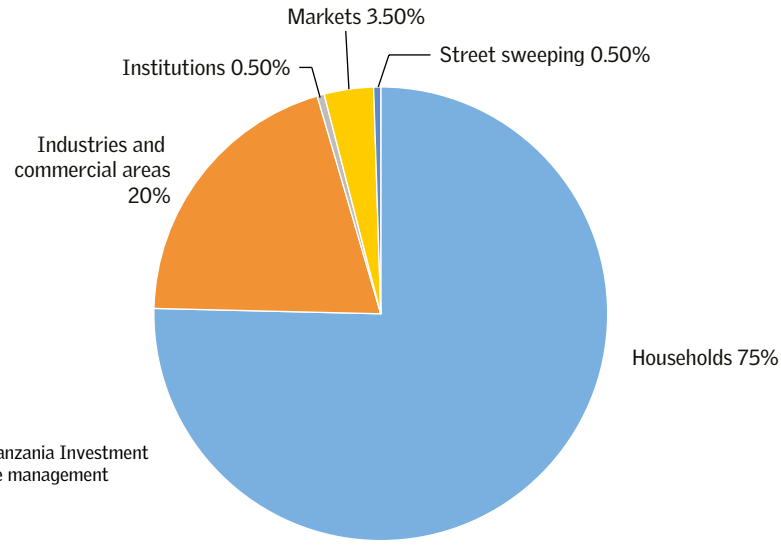
Current waste management in Tanzania

Prior to the early 1990s, waste management services were provided free of cost by the government, but with Tanzania becoming a capitalist economy in the early 1990s, solid waste management services were increasingly privatized and contracted to private sector companies and community organizations.[4]

Generation of solid waste

It is estimated that the amount of MSW generated in the country is about 12.1–17.4 million tonnes per year (0.66–0.95 kg per capita per day).[5] On average, each person produces 241–347 kg of waste annually. Major sources include households, industries and commercial areas, institutions, markets and street sweeping (see *Graph 1: Major sources of solid waste*). The national waste generation is growing at an estimated rate of about 5 per cent per year.

Graph 1: Major sources of solid waste

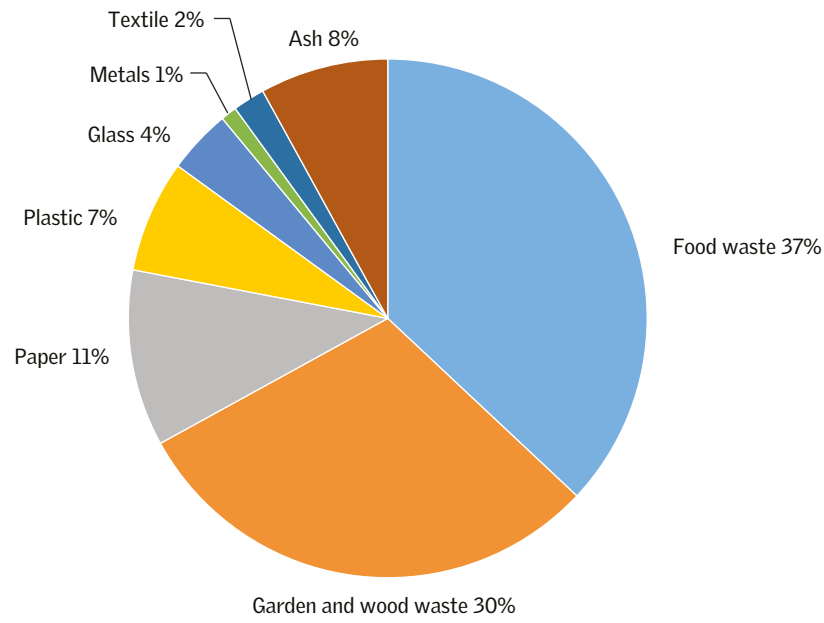


Source: VPO, Tanzania Investment Guide on Waste management

Composition of solid waste

The average composition of MSW includes garden and wood waste, food waste, papers, plastic, glass, metals, textiles and ash (see *Graph 2: Composition of solid waste*). Over 70 per cent of this—including garden and wood waste, food waste and ash— is biodegradable. In addition, other waste fractions that may be encountered include e-waste, used lead acid batteries and waste tyres.

Graph 2: Composition of solid waste



Source: VPO, Tanzania Investment Guide on Waste Management

Collection and transportation

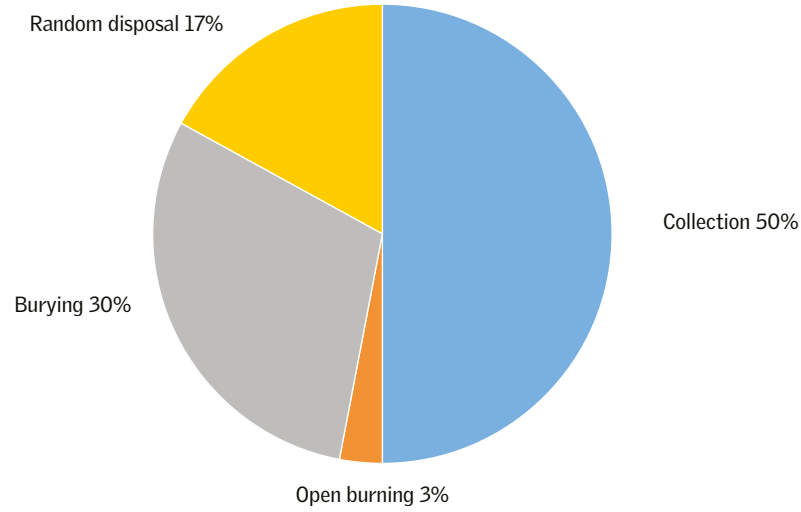
On average, close to 50 per cent of the waste is collected while the rest is disposed of by open burning, burying or haphazardly disposing of into the environment (see *Graph 3: collection and prevalent disposal methods for solid waste*). The majority of households use poor standard waste storage containers ranging from salvaged drums or tins, paper bags, plastic bags, jute bags or sacks.

The key actors for solid waste collection are:

- Local government authorities;
- Community-based organizations (CBOs); and
- Private companies

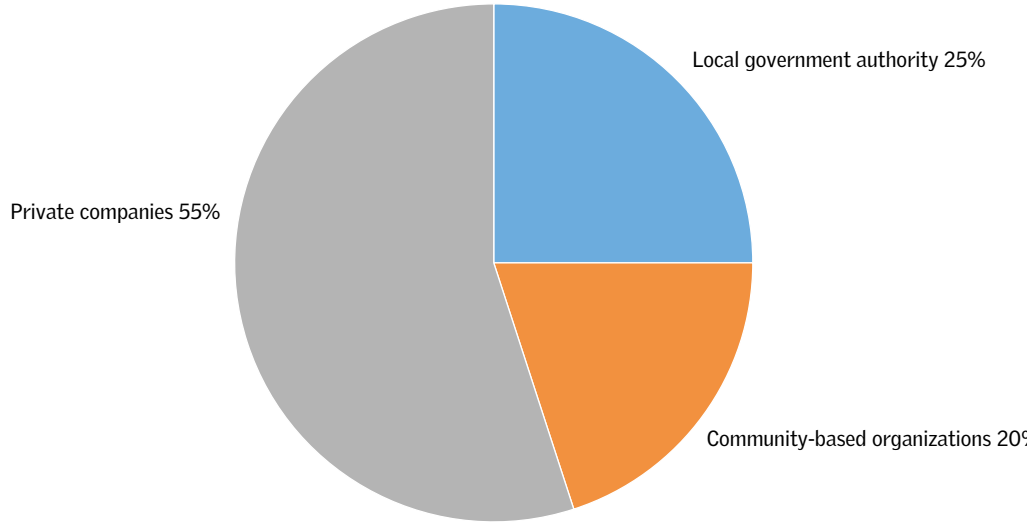
(see *Graph 4: Key actors in solid waste collection and their percentage distribution*).

Graph 3: Collection and prevalent disposal methods for solid waste



Source: VPO, Tanzania Investment Guide on Waste Management

Graph 4: Key actors in solid waste collection and their percentage distribution



Source: VPO, Tanzania Investment Guide on Waste Management

Trucks used for collection and transportation commonly include rear and side loaders, which are open- and closed-body types. Some urban authorities employ compactors, tractors, trailers and hand-driven pushcarts.

Common problems facing collection and transportation of MSW include high operational costs mainly due to poor choice of vehicles and distance from the collection point to disposal site. Other factors include inaccessibility to some localities, poor condition of waste collection vehicles, improper planning of collection routes and frequencies, limited supervision, poorly motivated workers, and low public awareness.

Recycling

Recycling of MSW, which is largely informal, is about 5–10 per cent of the total MSW generated and primarily involves plastics, paper, scrap metal, aluminium cans and glass. Very few households segregate waste at the household level. Most urban areas have minimal waste segregation at source within central business district areas, industries and institutions.

The main challenges are limited sorting of solid waste at source due to limited awareness and inadequate solid waste management facilities and poor quality of recovered materials due to contamination as a result of mixing waste streams.

Disposal

More than 90 per cent of MSW in Tanzania is believed to be disposed of in an unsatisfactory manner. Most of the MSW generated is disposed of in open and poorly operated dumpsites across the country, with the exception of a few municipalities—including Arusha, Tanga, Mwanza, Ilemela, Mbeya, Dodoma, Kigoma and Mtwara—that have improved landfills (with lining and leachate collection system) constructed by the Tanzania Strategic Cities Project (TSCP).

Urban areas in Tanzania are projected by 2030 to generate about 26 million tonnes of solid waste annually.[6] To accommodate this amount of waste, about 10.6×107 cubic metres (m^3) of landfill space is required; in terms of area approximately 200 hectares (about 494 acres) of land per year would be needed. This will necessitates diverting recyclable fractions of the solid waste to minimize the remaining amount requiring disposal and instituting sound disposal approach.

Data availability and transparency seem to be a challenge in Tanzania—limited to no data is available on the amount of solid waste generation in the major cities. The country has several towns and cities, of which four—Dar es Salaam, Mwanza, Arusha and Mbeya—are considered metropolitan cities.[7] Due to growth in urbanization, industrialization and population, the generation rate of solid waste in Tanzania cities and towns has also increased (see *Table 3: Waste generation in metropolitan cities of Tanzania*).

Table 3: Waste generation in metropolitan cities of Tanzania

City	Waste generation in tonnes per day (2012)
Dar es Salaam	4,252
Mwanza	338
Mbeya	400
Arusha	550

Source: Compiled from Solid Waste Management in Urban Centres of Tanzania, 2016

Dar es Salaam is considered the third-fastest growing city in Africa and tenth in the world, with a population density of 2,600 people per square kilometre.[8] It also generates the highest amount of solid waste compared to all the other metropolitan cities in Tanzania.

2. City-level solid-waste management

About Dar es Salaam

Dar es Salaam is Tanzania's most important city for both business and government. Downtown Dar es Salaam includes many small businesses, but 70 per cent of the city's population lives in informal settlements,[9] many of which are slums, most without running water or basic services.

The Dar es Salaam City Council (DCC) was established in 1996. As per the 2012 national census, DCC along with its three municipal councils—Ilala Municipal Council, Kinondoni Municipal Council and Temeke Municipal Council—and has a population of 4.36 million:[10] (see *Map 2: Map of Dar es Salaam City Council*). In 2016, two new municipal councils—Ubungo Municipal Council (bifurcated from Kinondoni Municipal Council) and Kigamboni Municipal Council (bifurcated from Temeke Municipal Council)—were added to the three existing municipal councils taking the overall count of municipal councils in DCC to five.

DCC is spread over an area of 1,393 square kilometres. The city encapsulates 102 wards which are further divided into 565 sub-wards (*mitaa*). DCC has a population growth rate of 5.6 per cent. The DCC and all the five constituent municipal councils constitute the Dar es Salaam region.

Waste management by-laws in DCC and its constituent municipal councils

On the basis of the Local Government (Urban Authorities) Act No. 8 of 1982, Tanzania, all the urban authorities in Tanzania are given the mandate to make their own by-laws to enable them execute their responsibility of waste management in their respective areas of administration. The Local Government (Urban Authorities) Act, delegates to the local authorities, including the Dar es Salam City Council and its five constituent municipalities—Kinondoni, Ilala, Kigamboni, Ubungo and Temeke—the power to make waste management by-laws within their respective areas of administrative control.

Map 2: Map of Dar es Salaam region

The Dar es Salaam City Council (Collection and Disposal of Refuse) By-Laws of 1994 were based on Section 56 of the Local Government (Urban Authorities Act) No. 8 of 1982 and were meant to be applicable and enforced (before 2016) in all three Dar es Salaam municipalities of Kinondoni, Ilala and Temeke. Upon the mandate of these by-laws the Dar es Salaam City Council is required to facilitate the collection and disposal of refuse from residential areas and business premises.

It also has to determine where the waste is to be deposited. The by-laws also forbid the deposition and throwing of all types waste and the accumulation of dust of any kind. If these by-laws are not abided by, it is taken as an offence and the offender is liable to being prosecuted. If found guilty, the offender is fined an amount not exceeding five thousand Tanzanian shillings (TSh) or is imprisoned for a term not exceeding six months. The by-laws were, however, repealed in early 2000 when the municipal council started to come up with their own by-laws.

The Kinondoni Municipal Commission (Collection and Disposal of refuse) by-laws of 2000 categorize waste into various groups—liquid or solid waste, domestic refuse or trade waste, and hazardous or bulk waste. Also, the by-laws give waste management responsibilities to entities other than the Kinondoni Municipal Commission, i.e. the Municipal Commission's registered agents or contractors. Non-compliance with these by-laws is taken as a criminal offense and the offender is liable to a fine of not more than TSh 50,000 or up to twelve months jail or both if found guilty.

The Temeke Municipal Commission By-laws on Solid Waste Management (Collection and Disposal of Refuse) By-laws, 2002 made under Sections 80 and 81 of the Local Government (Urban Authorities Act), 1982, categorize waste into three groups—bulk waste, bundle waste, and domestic refuse—defined as follows:

- Bulk waste, including large appliances, machines, furniture, and other solid waste (i.e. construction and demolition debris or dead animals with weights or volumes greater than those allowed for bundle waste or dustbins);
- Bundle waste, including tree parts, shrubs, bush trimmings, newspaper, magazines, cartons or solid waste securely tied as a package not exceeding one metre in length or one kilogram in weight;
- Domestic refuse, meaning normal household waste produced in any residential building used wholly as a private dwelling.

Operation-wise the Temeke Municipal Council provides solid waste management services through registered contractors and provides directives on management of the different kinds of refuse to all responsible entities. It also provides for the payment of waste collection fees by households or occupiers to the Authority or authorized agents and is responsible for disposal fees for persons and agents who transport wastes to dumping sites. Non-compliance with the requirements of the by-laws can make the offender liable to be fined not more than TSh 50,000 or be imprisoned for up to twelve months or both if found guilty.

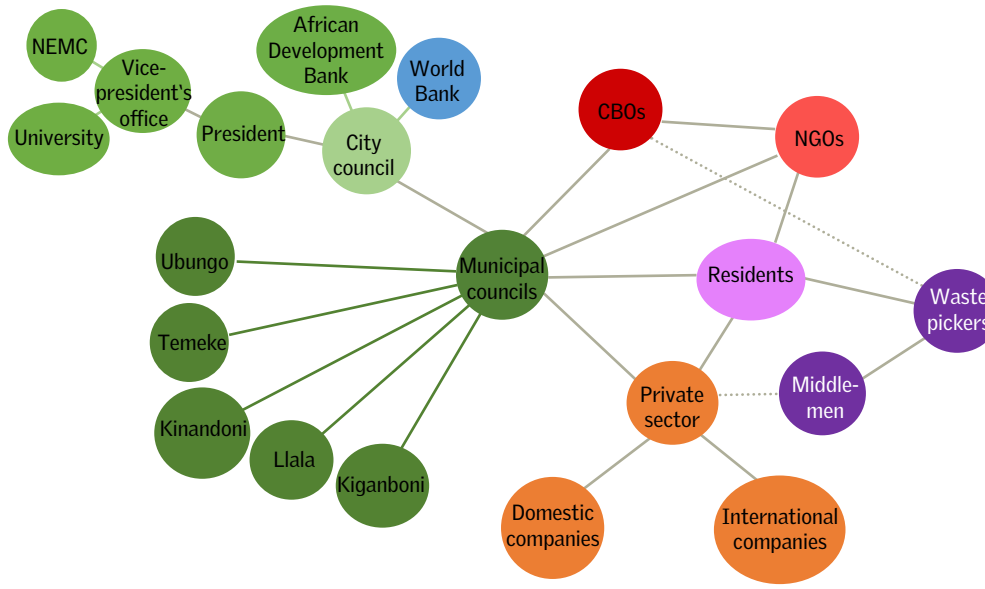
Ilala Municipal Council by-laws, made under Section 80 of the Local Government (Urban Authorities) Act, 1982, are similar to the by-laws of Kinondoni and Temeke municipalities and are used for solid waste collection and disposal in the Ilala Municipal Council.

Ubungo Municipal council has adopted the by-laws of Kinondoni Municipal Council and is working on its by-laws for management of solid waste which may be notified soon. The presence of by-laws with respect to waste management in Kigamboni Municipal Council could not be established, but it is believed that it would have adopted the by-laws of Temeke Municipal Council until it notifies its own set of by-laws for solid waste management.

Current waste management in Dar es Salaam

Dar es Salaam, the financial capital of Tanzania, is highly urbanized. While there are problems with respect to waste management, there are opportunities as well. A range of stakeholders, spanning from the President's office to the waste pickers in the city, are involved in the waste management domain of the city (see *Figure 4: Stakeholders involved the solid waste value chain in Dar es Salaam).*

Figure 4: Stakeholders involved the solid-waste value chain in Dar es Salaam



Source: Transforming solid waste management in Dar es Salaam, The Bartlett, University College of London (UCL) and Development Planning Unit (DPU), 2017.

Due to the high waste-generation rate that stems from rapid urbanization, accessibility and absence of language barriers in the city and since most of the solid waste studies for Tanzania are conducted in Dar es Salaam, significant data overlap was observed with regard to data for the country and the city.

Generation of solid waste

In 2012, Dar es Salaam generated 1.5 million metric tonnes of solid waste and the rate of generation of solid waste was found to be 0.97 kilograms per capita per day. This is considerably higher than the average per capita waste generation of a financial capital of a low-middle-income country. The reason for a high rate of solid-waste generation could not be established. The solid-waste generated by each of the municipal councils and their respective collection percentages before Ubungo Municipal Council and Kigamboni Municipal Council were established are discussed in the following (see *Table 4: Waste generation rates and collection percentages in DCC and constituent municipal councils, 2012)*

Table 4: Waste-generation rates and collection percentages in DCC and constituent municipal councils, 2012

Municipal or city council	Waste generated (TPD)	Population (Census 2012)	Rate of waste generation (kg/capita/day)	Average amount of waste collected (TPD)	Percentage collection
Ilala	1,088	1,220,611	0.89	600	55.14
Kinondoni	2,026	1,775,049	1.14	1030	50.83
Temeke	1,138	1,368,881	0.83	398	34.97
Dar es Salaam	4,252	4,364,541	0.97	2028	46.98

Source: Solid waste management city profile, Dar es Salaam, Tanzania, Climate and Clean Air Coalition (CCAC), 2015

Solid waste generated from both households and commercial activities are classified as municipal solid waste. Healthcare infectious waste and hazardous waste are managed as a separate stream of waste. As established, the amount of solid waste collected on a regular basis is less than half of what is generated.

Five years after the 2012 population census and after the establishment of the two additional municipal councils (Kigamboni and Ubungo), the overall waste generation of DCC went up by around 9 per cent (the rate of waste generation was assumed to be constant) primarily due to the increase in the population (see *Table 5: Waste-generation rates and collection percentages in DCC and constituent municipal councils, 2017*). Since population census in Tanzania was conducted in 2012, we estimated the population of each municipal council depending on the amount of solid waste generated and the rate at which solid waste was generated.

Table 5: Waste-generation rates and collection percentages in DCC and constituent municipal councils, 2017

Municipal or city council	Waste generated (TPD)	Estimated population (2017)	Rate of waste generation (kg/capita/day)	Average amount of waste collected (TPD)	Percentage collection
Ilala	1,088	1,222,472	0.89	600	55.14
Kinondoni	1,223	1,072,807	1.14	795	65.00
Ubungo	828	726,316	1.14	423	51.08
Temeke	1,300	1,566,265	0.83	585	45.00
Kigamboni	210	253,012	0.83	70	33.33
Dar es Salaam	4,649	4,840,872	0.96	2473	53.19

Source: National Waste management strategy, UNEP 2018

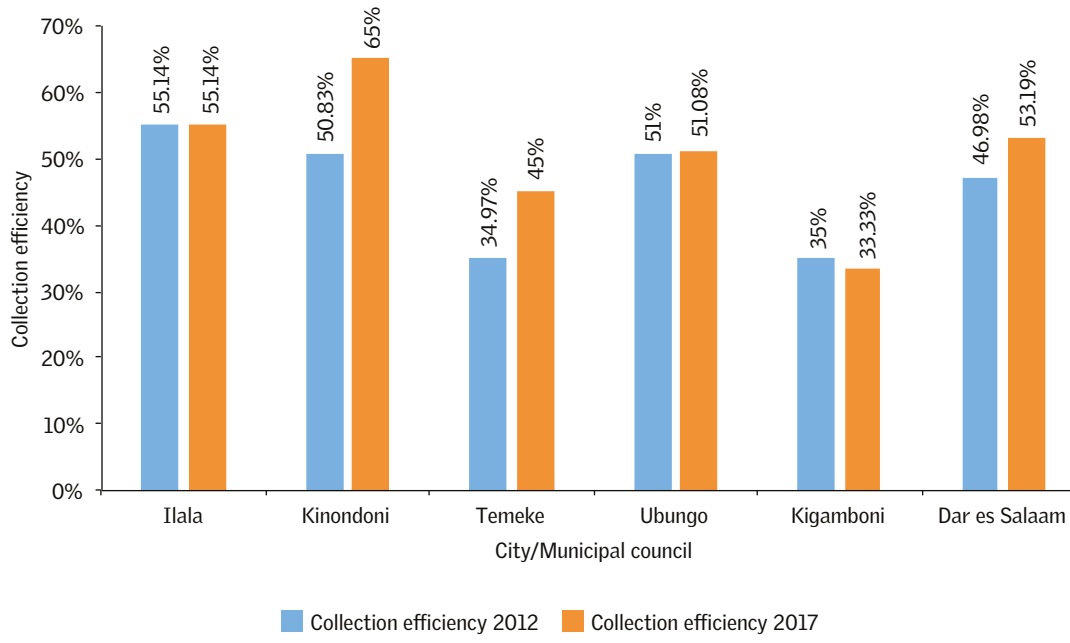
The rate of solid-waste generation of Ubungo and Kigamboni was considered to be the same as that of Kinondoni and Temeke respectively since they fell in those jurisdictions before they were established in 2016.

Collection of solid waste

It was observed that the efficiency of collection of solid waste increased by close to 15 per cent in the case of Kinondoni Municipal Council, while a decline of 1.5 per cent in the collection efficiency of Kigamboni Municipal Council was recorded. The efficiency of collection for the entire city increased by a little over 6 per cent in a period of five years (2012–17). Since Ubungo Municipal Council and Kigamboni Municipal Council were not established in 2012, for comparison we have considered their collection efficiency to be the same as that of the municipal council that they were born from and were previously part of (see *Graph 5: Changes in collection frequency of solid waste in Dar es Salaam [2012–17]*).

Collection of solid waste is one of the most basic facilities that the municipal councils struggle to provide. As per the legislation, municipalities contract the collection activities to CBOs (community-based organizations). In low-income areas, CBOs which perform the primary collection door-to-door by means of wheeled pushcarts, should deliver waste to specific official collection points. In this case the secondary collection (transportation to dumpsite) is performed by municipalities. However, on ground this practice is non-existent, which leads to irresponsible dumping in the vicinity. In middle-income areas, private contractors collect waste with their own trucks and deliver it to the dumpsite. In both the cases, source segregation doesn't take place, and there are only a few public collection bins in downtown areas.

Graph 5: Changes in collection frequency of solid waste in Dar es Salaam (2012–17)



Source: CSE, 2021

Sources and composition of solid waste

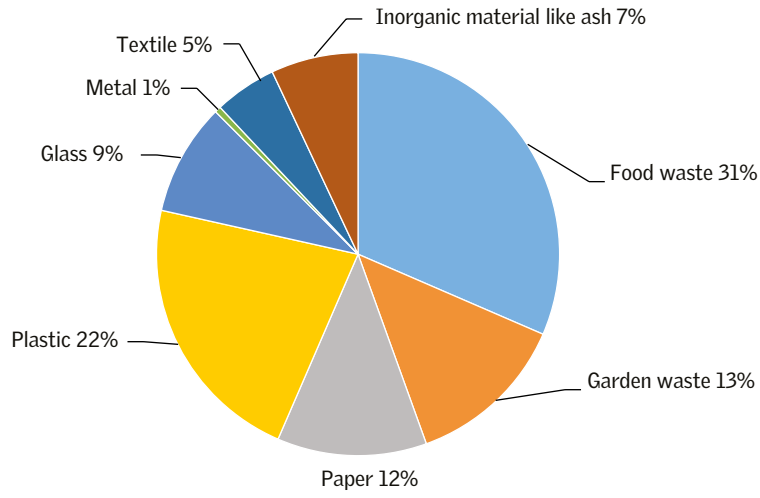
The sources of solid waste in Dar es Salaam are similar to the sources of solid waste discussed for Tanzania. There is hardly any difference between the two sets of data, suggesting that very few studies are conducted with regard to sources of solid waste in the country and existing studies are replicated at all levels of jurisdiction. The latest waste composition data for Dar es Salaam city was recorded in the National Bureau of Statistics in 2014 in the study conducted by UNEP[12] (see *Graph 6: Composition of solid waste in Dar es Salaam, 2014*).

The composition of solid waste varies with the livelihoods and affluence of residents. Since most of the population of DCC stays in low-income wards or in informal settlements in the jurisdiction of the city council, the percentage contributions of the various streams of waste vary greatly. Most of the waste generated, however, is organic in nature and in some wards can reach up to 75 per cent.[13]

Collection frequencies and disposal methods

Most household rely on community-based organizations (CBOs) for collection of their solid waste. Collection frequency varies between once and thrice a week and the residents are expected to pay refuse collection charges (RCC) to CBOs for the services provided.

Graph 6: Composition of solid waste in Dar es Salaam, 2014



Source: National Bureau of Statistics, 2015

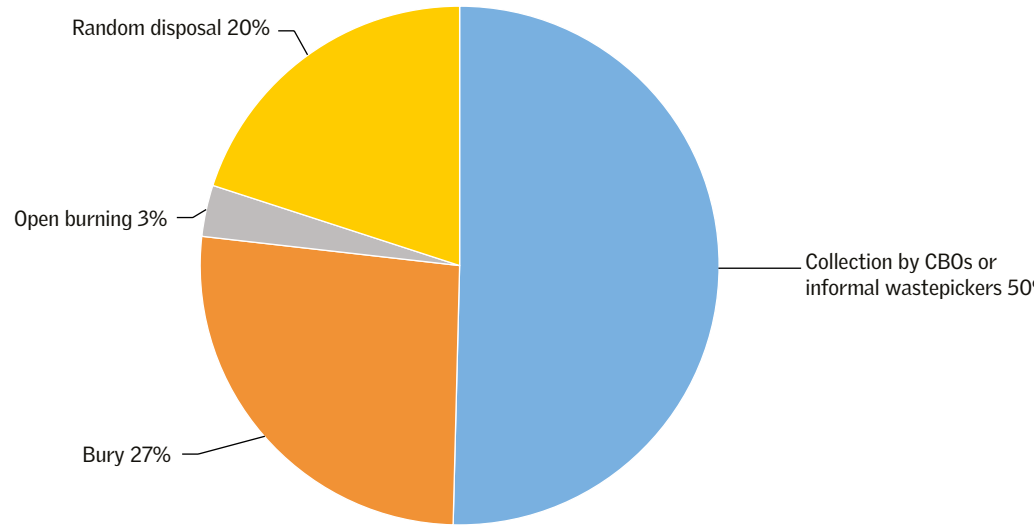
A small pool of close to 10 per cent households rely on informal workers to collect their waste at higher frequencies for a lower fee as compared to the CBOs. The organic fraction of the waste along with the low value dry waste (plastic, paper, etc.) collected from households by the waste pickers is discarded in drains or in other common areas after removing anything that is saleable and will fetch remuneration in the market.

Due to this prevalent practice only 40 per cent of the waste actually reaches the Pugu Kinyamwezi dumpsite, located 30 km from the city centre. All the disposal activities are carried out here.

Close to 60 per cent of the waste is either burned at the household level, dumped on the roadside or into drainage canals or sewers or is buried. Over 2,500 tonnes of solid waste is mismanaged in Dar es Salaam city every day (see *Graph 7: Collection and prevalent methods of disposal of solid waste in Dar es Salaam).*

Pugu Kinyamwezi dumpsite receives 2,000–2,500 tonnes per day of solid waste and its main operation is open dumping. Private companies had been contracted by the city council as well as respective municipalities to collect and transport waste to the dumpsite. The city dumpsite has two bulldozers, two excavators and one compactor (which is not working).[14]

Graph 7: Collection and prevalent methods of disposal of household solid waste in Dar es Salaam



Source: National Solid Waste Strategy, Tanzania, 2018

Incomplete collection of the waste is linked to rapid urbanization, high number of informal human settlements, poor education levels, low public awareness, poor law enforcement and insufficient financial support.

Financing

Waste services are financed through Refuse Collection Charges (RCC). RCCs were introduced in 1993 with the privatization of waste management (DCC by-laws). RCC was finally adopted in 2000–01 by the three municipalities, Ilala, Temke and Kinondoni. They are paid by the citizens on a monthly basis, ranging from a minimum to a maximum according to the average income of the areas, typically around TSh 1,150–2,300 per month, considered too low by private contractors, especially in low-income areas where only 30–50 per cent of citizens pay this monthly fee. For businesses, the fee is higher and negotiable according to size and location. The municipalities also use part of their general budget for secondary collection, i.e. transportation to Pugu Kinyamwezi from the garbage-vulnerable points in unplanned areas where CBOs operate in a limited way.

Centre for Science and Environment (CSE) has signed a memorandum of understanding (MoU) with a municipal council in the jurisdiction of Dar es Salaam City Council—Ubungo Municipal Council—to strengthen their solid waste management practices.

3. Municipal-level solid-waste management

About Ubungo Municipal Council (UMC)

Ubungo Municipal Council is one of the five municipal council that along with the Dar es Salaam City Council constitute the entire city of Dar es Salaam. It is bordered by Kibaha district in the west, Kinondoni Municipal Council to the northeast and Ilala Municipal Council to the south (see *Map 3: Map of Ubungo Municipal Council).*

The Ubungo Municipal Council has a total area of 260.4 square kilometres. According to the 2012 population census, its population is 845,368. It is divided into 14 wards, which are further divided into 91 sub-wards (*mitaa).* The council is estimated to have 257,837 households with an average of four person per household.

Waste management by-laws in UMC

UMC was formed in 2016, prior to which it was a part of the Kinondoni Municipal Council. It has adopted the Kinondoni Municipal Commission (Collection and Disposal of Refuse) By-laws of 2000 for management of solid waste generated in its jurisdiction.

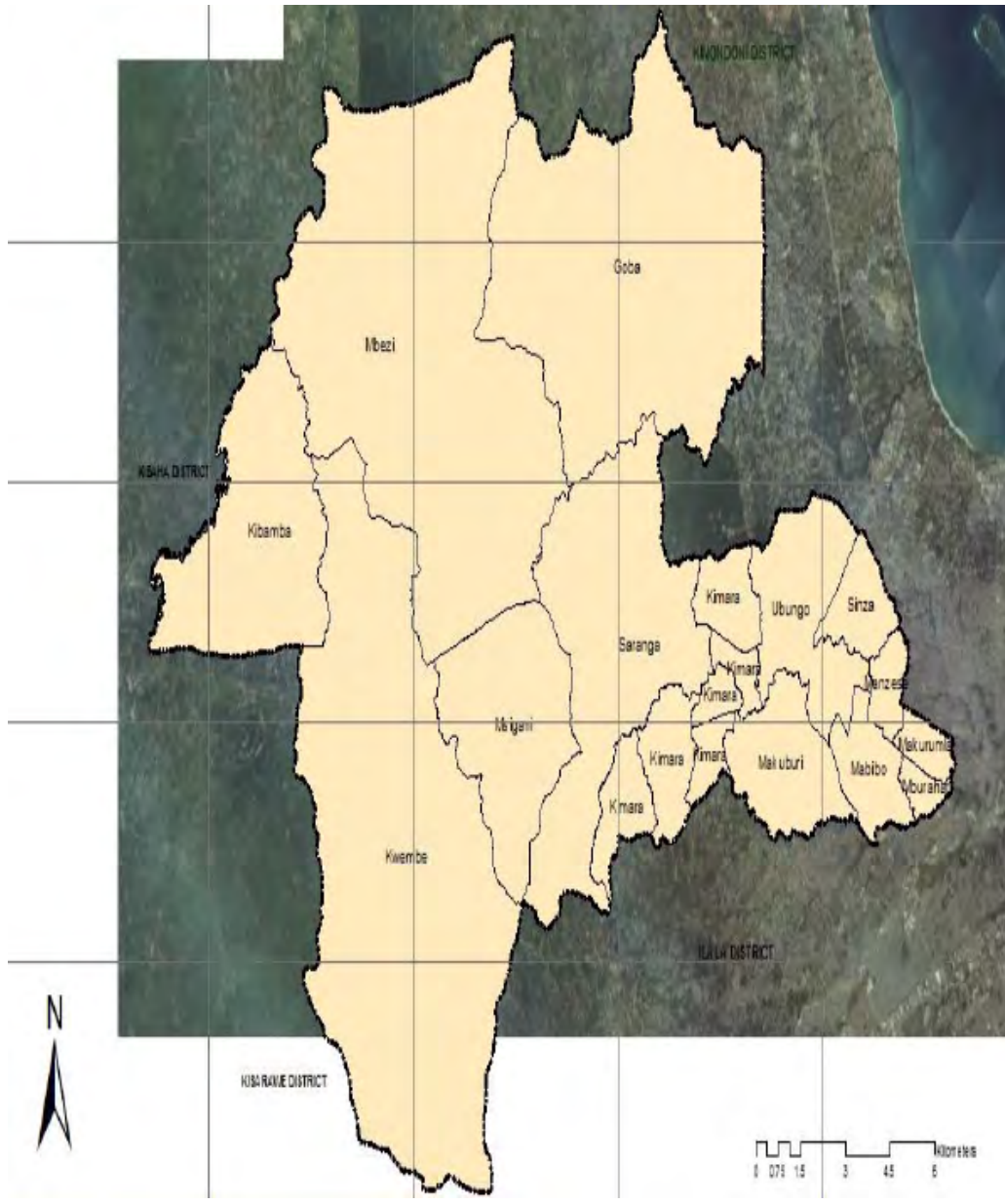
Although there are shortcomings and limitations of the existing by-laws that have been adopted, UMC has prepared a draft by law on solid waste management in 2020. The by-law is still to go through multiple levels of scrutiny and approvals before it can be gazetted.

Current waste management in UMC

Solid waste generation in UMC

UMC is divided into 14 wards that are subdivided into 91 sub-wards (see *Table 6: Wards and sub-wards in UMC)*

Map 3: Map of Ubungo Municipal Council



Source: Town planning GIS unit

The population of UMC for 2016 (at a growth rate of 5 per cent) was estimated on the basis of the 2012 census population (as UMC was established in 2016 and the solid-waste generation figures for UMC were also estimated around the same time).

Table 6: Wards and sub-wards in UMC

No.	Ward	No. of sub-wards	Estimated population (2016)	Average solid waste production (tonnes/day)	Per capita/day solid waste generated
1.	Makurumla	6	77,289	115	1.49
2.	Mburahati	3	41,630	72	1.73
3.	Sinza	5	49,466	106	2.15
4.	Manzese	10	86,019	133	1.55
5.	Mabibo	6	104,597	86	0.83
6.	Makuburi	5	70,038	43	0.62
7.	Ubungo	5	68,338	86	1.26
8.	Kimara	6	93,424	42	0.45
9.	Mbezi	8	89,565	20	0.22
10.	Msigani	5	67,235	13	0.20
11.	Kwembe	10	69,417	11	0.16
12.	Kibamba	5	35,240	16	0.47
13.	Goba	8	52,056	19	0.37
14.	Saranga	9	127,035	61	0.48
TOTAL		91	1,031,349	828	0.80

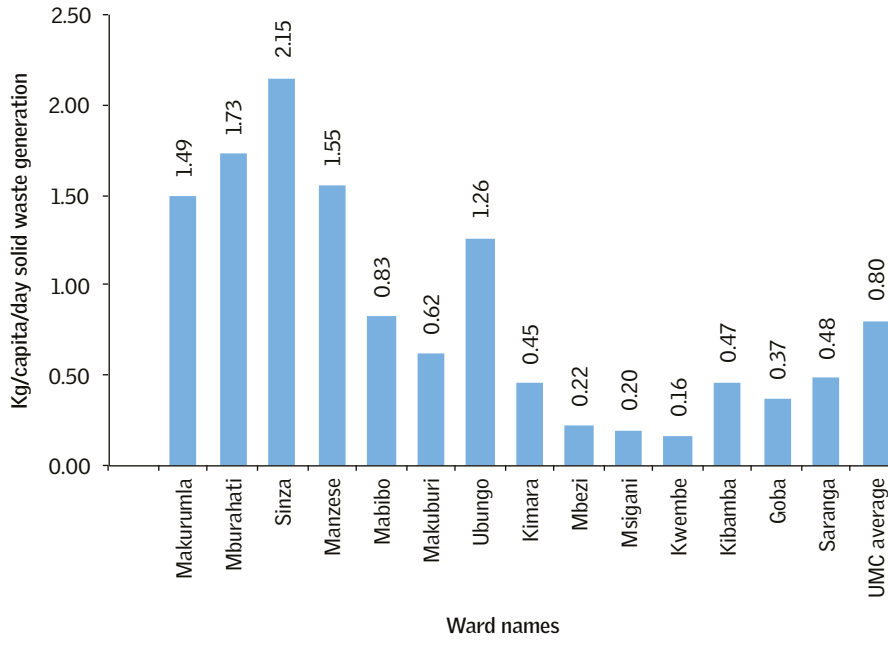
Source: CSE 2021, based on inputs from UMC officials

Among the UMC wards, Manzese ward generates the highest quantity of waste at 133 tonnes per day (TPD), while the lowest generation of waste is from Kwembe at 11 TPD. Saranga, with the highest population, generates 61 TPD and Kibamba with lowest population generates 16 TPD.

Sinza ward generates solid waste at the highest rate of 2.15 kg per capita per day and Kwembe ward generates solid waste at the lowest rate of 0.16 kg per capita per day. The average solid waste generation rate of UMC was 0.80 kg per capita per day.

Wards with higher populations are observed to generate lower amounts of solid waste and vice versa. A plausible explanation for this pattern would be the differences in income levels of populations in these wards. Wards generating higher per capita of solid waste are believed to be affluent communities with higher disposable incomes while the ones with a lower per capita waste generation would be low income groups residing in densely populated pockets, living in informal set-ups and urban slums. This explains that even within a ward, the amount and

Graph 8: Ward-wise rates of solid-waste generation in UMC



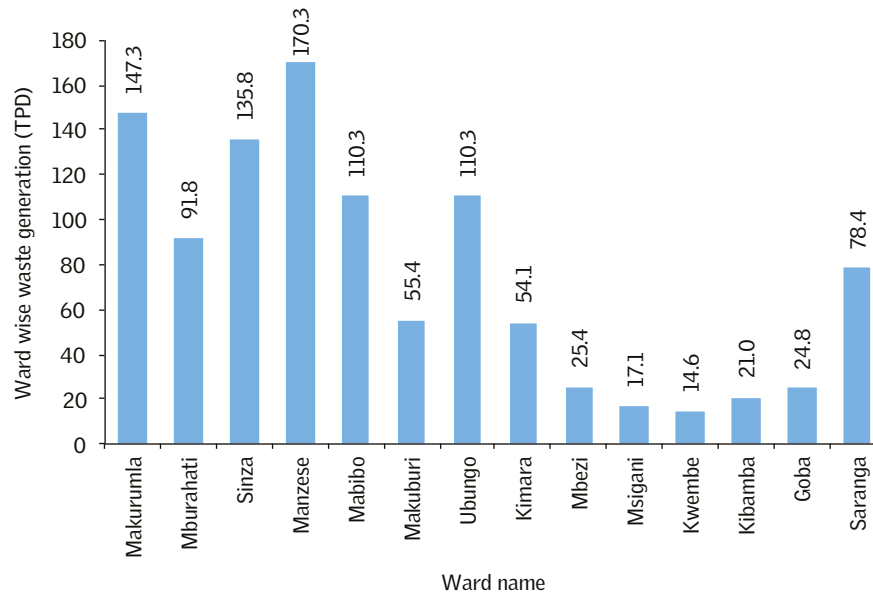
Source: CSE 2021

rate of solid-waste generation can vary depending on the wealth, affluence and lifestyle of the residing communities (see *Graph 8: Ward-wise rates of solid waste generation in UMC*).

Moreover, the wards that lie on the eastern side of the Ubungo Municipal Council (Ubungo, Manzese, Sinza, Mburahati and Makurumla) are the ones that are highly commercialized. A lot of business activities as well as hotels, lodging facilities and other commercial activities are commonly encountered thus contributing to a higher rate of solid-waste generation.

Since 2016, when UMC was formed, there has been no quantification of solid waste. No studies for composition of solid waste were done either. To strategize for a sound solid waste handling and management plan, we need to ascertain the amount of solid waste generated at regular intervals. The Solid Waste Regulations, 2009, Part IV, Section 21, Sub-section (1) states, 'Each local government authority shall in every year send to the council information and data on the rate, types, composition of solid waste generated, collection methods, treatment or disposal methods employed within its area of jurisdiction.'

Graph 9: Ward-wise estimated generation of solid waste in UMC, 2021



Source: CSE, 2021

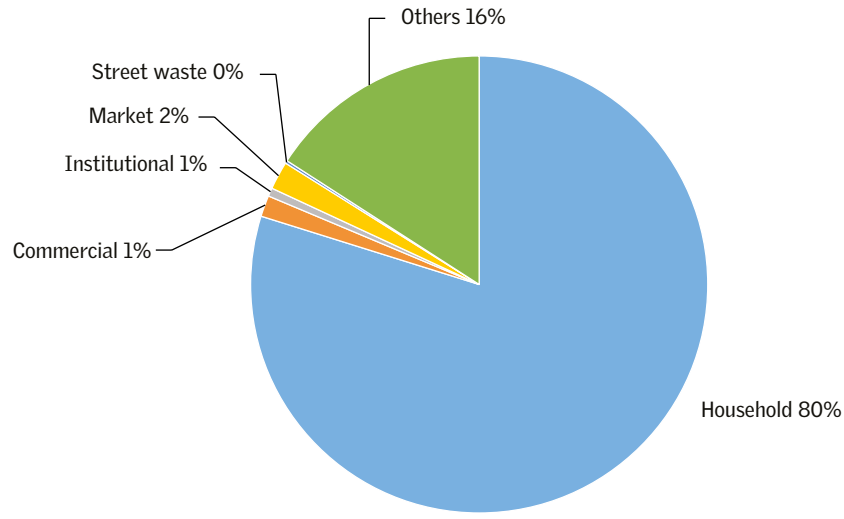
The rate of solid-waste generation in a region changes slowly and is a function of the affluence and lifestyle of the community. The quantum of waste generation, however changes largely as a result of increase in population. Assuming a population growth of 5 per cent, we estimate generation of solid waste in each ward in UMC. As per estimates by the Centre for Science and Environment, UMC will generate 1056.6 tonnes per day of solid waste in 2021 (see *Graph 9: Ward-wise estimated generation of solid waste in UMC 2021).*

The rate of generation of solid waste was kept constant in these estimations. As a result, total generation of solid waste increased, but the rate of waste generation across the wards did not change.

Sources of solid waste in UMC

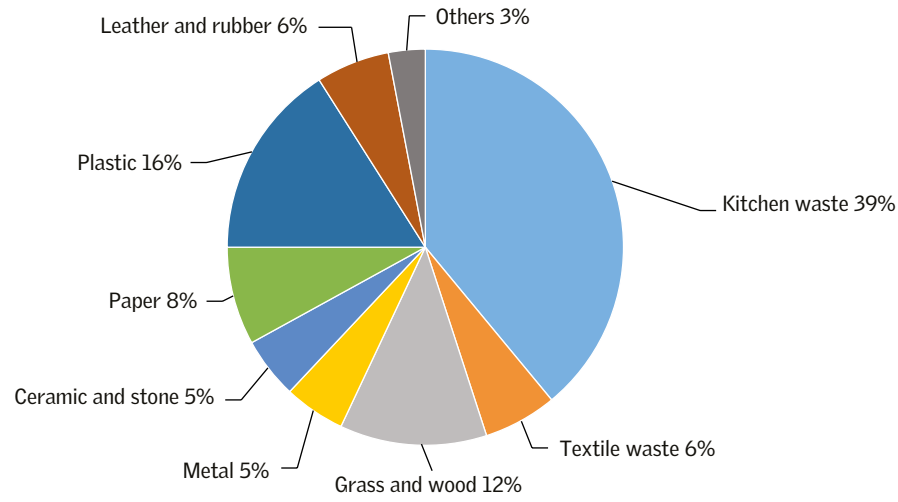
The major source of solid waste in UMC is households—approximately 80 per cent of the solid waste is generated in households (see *Graph 10: Sources of generation of solid waste in UMC*). The second largest source of solid waste is the informal sector, which primarily collects from household areas in both affluent and informal set-ups and disposes of non-valuable solid waste at non-designated spots.

Graph 10: Sources of generation of solid waste in UMC



Source: Environment and solid waste management department, Ubungo Municipal Council.

Graph 11: Solid-waste composition adopted by UMC



Source: Environmental Resources Consultants, ERC, 2004.

The low contribution of generation of solid waste from commercial, institutional and market areas is not clear from the above data. All these sectors combined produce roughly 5 per cent of the total solid waste generated in UMC.

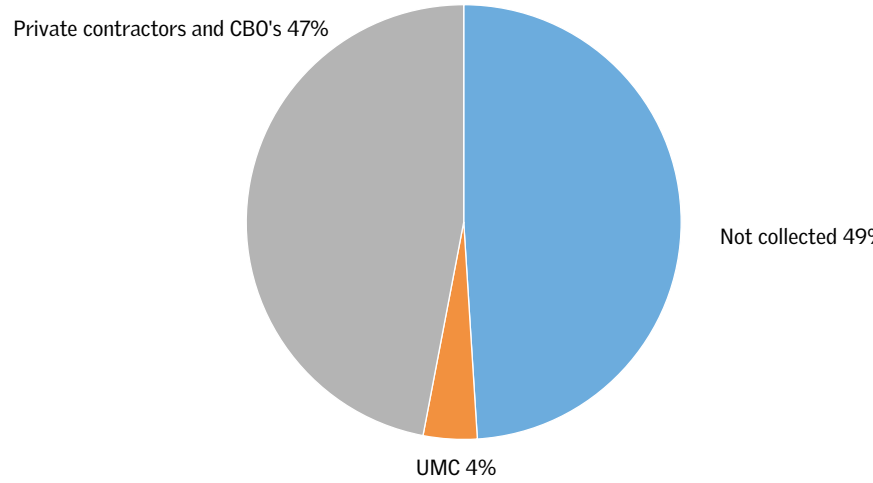
Composition of solid waste in UMC

Studies on composition of solid waste have not been conducted in UMC. Two studies—of the Japan International Cooperation Agency (JICA 1997) and the Environmental Resources Consultants (ERC 2004)—to establish the composition of solid waste were undertaken for Dar es Salaam city. UMC adopted this 2004 waste composition without actually conducting a study (see *Graph 11: Solid-waste composition adopted by UMC*). It is worth noting that UMC was non-existent (as a municipal council) when these waste composition studies were conducted. This makes strategizing, developing and implementing a solid waste management plan a challenge across the municipal council.

Collection of solid waste

Four stakeholders—UMC, private contractors, CBOs and the informal sector—are involved in the collection of solid waste in UMC. In spite of this, almost half of the waste generated in the council is never collected. UMC contributes to 4 per cent of the solid waste collection with the limited vehicles they own and operate. A little less than half of all the solid waste collected is carried out by private contractors and community-based organizations (CBOs) who have registered themselves with the municipal council (see *Graph 12: Key actors in collection of solid waste and their percentage contribution in UMC*).

Graph 12: Key actors in collection of solid waste and their percentage contribution in UMC



Source: CSE 2021, with inputs from UMC officials.

- **Ubungo Municipal Council**

The municipal council only collects solid waste from market places and some commercial establishments and government institutions with the help of four trucks, which are used intermittently as they are prone to break down due to the low maintenance. Apart from the solid waste collection from these generators, a major responsibility of the municipal council is to supervise the collection handed over to the private contractors and CBOs.

- **Private contractors**

Private contractors are professional waste-collection and -disposal services, who have registered themselves with the municipal council as per the Environmental Management (Solid Waste) Regulations, 2009. They provide services to commercial establishments, institutions and high-income residential areas. They have a fleet of their own, proof of which has to be submitted to the council at the time of application. The collection frequency and charges are decided mutually by the contractors and the client in case of commercial establishments, while in the case of residential areas, the private contractor and the community leaders come to an agreement mutually suitable to both the parties. Collection of RCC happens once a month. All the waste is transported to Pugu Kinyamwezi dumpsite for disposal. The private contractors also pay a fee for disposal of the transported solid waste at the dumpsite, depending on the quantum (tonnage) of waste dumped. The private contractors pay TSh 2000 for every tonne of household waste that they dump. The record of the waste brought in by a particular private contractor is done by a DCC officer (in shifts) who is present at the dumpsite 24 hours a day, seven days a week. Private contractors can choose to pay on a daily or monthly basis.

- **Community-based organizations**

Community-based organizations (CBOs) are local groups generally comprising a few supervisors and waste-collection staff. They are used interchangeably with private contractors in UMC.

The primary source of revenue for the CBOs is refuse-collection charges (RCC) from the households, done by the *mtaa* executive officer on a monthly basis and passed down to the CBO leaders. Payment rates are however low (30–50 per cent) in both affluent and poor or unauthorized areas. The secondary source of income is the resaleable plastic waste obtained on separating the solid waste. The frequency of collection of solid waste offered by CBOs is generally once to thrice a week.

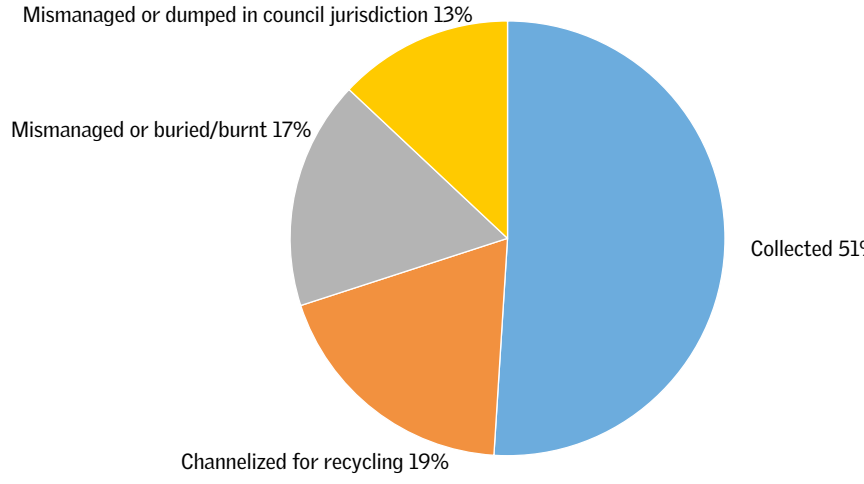
CBOs usually use equipment such as hired pushcarts which makes access in the narrow lanes of the *mtaa* easier, thus ensuring collection. They dispose of the waste in several ways: some CBOs collect waste from households and dispose it of at the Pugu dumpsite with their own fleet; they may have a tie-up with a private contractor; or they may drop off the collected waste at a vulnerable garbage spot (referred to as on-site disposal by UMC) from where it may or may not get collected by the municipal council vehicle. CBOs and private contractors face rising competition from the informal sector.

- **Informal sector**

An estimated 10 per cent of the residents prefer to hand over their waste to the informal sector rather than to CBOs because they offer their services both cheaper and at a higher frequency than CBOs. Most of the informal sector may or may not have pushcarts to carry waste around and usually collect fees on demand for the service. The informal waste collectors rely heavily on irresponsible on-site dumping of solid waste once the resalable items have been obtained from the solid waste—hence the waste collected by the informal sector results in new and emerging garbage dumping spots in the municipal council jurisdiction. The informal sector is not authorized by the municipal council. A handful of households prefer not to pay for the solid waste collection services, and resort to burning waste or burying it in their backyards.

The percentage of waste managed or mismanaged in UMC cannot be ascertained as even after reaching the Pugu Kinyamwezi dumpsite, the waste is not really managed—it is simply dumped. Hence, we can only place it in the basket of collected solid waste (see *Graph 13: Collection, recycling and mismanagement of solid waste*).

Graph 13: Collection, recycling and mismanagement of solid waste



Source: Ubungo Municipal Profile, 2016

Disposal and channelling for recycling at Pugu Kinyamwezi

Almost 90 per cent of the waste collected by the municipal councils, private contractors, CBOs and informal workers reaches the Pugu Kinyamwezi dumpsite. Spread over 60 hectares (148.26 acres) of land, the dumpsite became operational in 2007. Waste is simply disposed of here under uncontrolled conditions. Over 250 trucks enter the dumpsite to dispose of their waste, which is weighed and mapped to the operational private contractor along with the vehicle registration details. The cost for household waste is TSh 2,000 per tonne and for special waste (sludge, liquid waste, waste from factories or commercial establishment, i.e. waste other than household waste) is TSh 8,000–10,000 per tonne. All the income generated from this goes to the Dar es Salaam City Council (DCC) through a DCC officer.

At the dumpsite, primarily owned by the Dar es Salaam City Council, multiple forces are at play, including:

Association of waste-pickers and middlemen:
Since the establishment of the dumpsite everybody has been able enter the dumpsite, but after a series of incidents, waste-pickers and middlemen created an association in 2015. This association is recognized by the dumpsite management and has a chairman and a secretary who work voluntarily. The primary responsibilities of the association are to resolve any disputes between the waste-pickers and approve any new person for work at the dumpsite. It is also responsible for registration of all members (waste-pickers and middlemen), issuing paid uniforms to registered members—which distinguishes waste-pickers and middlemen on the basis of the commodity they deal with—and negotiation of prices with various middlemen to ensure that commodity prices are not disrupted. The association is also in charge of keeping a record of all the people who come to the dumpsite to sell food and water.

Waste-pickers:
When Pugu became operational in 2007, waste-pickers comprised mostly male youth who lived in neighbouring areas and organized themselves to pick up waste and send it for recycling. Initially the waste-pickers would directly sell to the local factories, but the factories accepted only large amounts of waste so the waste-pickers had to gather all their waste and sell collectively to these factories. Some waste-pickers subsequently became middlemen and collected small quantities of specific waste streams from the waste-pickers until it became large quantities that could be sold to the local factories. This helped all the waste-pickers working at the dumpsite as they started to receive a higher value for the recyclables they collected. Plastics are perceived to be the best commodity for trading as the rates are lucrative.

Middlemen:
Middlemen specialize in specific streams of recyclable waste, metals and plastics being the most profitable. Plastic dealers may deal in more specific streams, depending on the resin used in the plastic. Quantities of collection and the prices of commodities fluctuate since they are a function of seasonal variation and demand and supply. Many middlemen store specific streams of waste, selling them when the supply is low and demand high, fetching a higher value.

Middlemen have two options with respect to selling their recyclables: directly selling to local factories in Dar es Salaam city or selling to other middlemen. Directly selling to local factories turns out to be expensive as the cost of transportation and labour has to be borne by the middlemen. Additionally, due to the price fluctuations and absence of contractual agreement it is a risky proposition. This mode of operation works for middlemen who have huge quantities (that can be transported in a single trip), good relations with the waste-pickers (low labour cost), private contractors (negotiable transportation costs) and local factories (assurance of commodity sale at a good price).

Financial arrangements:
UMC receives a primary budget allocation under the head of solid waste management from the PO-RALG. As per secondary data collected from UMC officials, UMC environment and solid-waste department budget for 2020–21 is TSh 1,542,565,841.92 (over TSh 1,542 million). This is utilized by the council for expenses of day-to-day activities such as vehicle servicing, fuel, labour and driver charges, paying contractors responsible for street sweeping and cleaning and administrative expenses (not including salaries).

As refuse collection charges, *mtaa* executive officers collected and disbursed a total of TSh 2,552,694,558.96 (over TSh 2552 million) to private contractors and CBOs registered and operational in the municipal council.

Analysis of the situation with regard to management of solid waste in Ubungo Municipal Council, Dar es Salaam City Council and Tanzania shows that the basic mechanism of solid waste management at the country, city and municipality levels is extremely weak. There is a massive gap between existing policy and its adherence by the local administration. The country, city and municipality levels challenges need to be strategically converted into opportunities with engagement and involvement of all the stakeholders.

4. The way forward

Challenges

Institutional and administrative challenges

The budget allocated for solid-waste management by the Central government to the municipal councils is inadequate due to the sector being low on government priority. The legislations and regulations are fairly well drafted, but with almost no adherence. In the public domain, there are hardly any records of Environmental Impact Assessment (EIA) projects approved by the National Environmental Management Council (NEMC) before a project was commissioned, indicating lack of transparency. Unplanned development of urban areas and poor development of infrastructure such as roads contribute to inaccessibility and hence unserviceability and unsatisfactory waste management practices. Weak enforcement capability of all the authorities—from the Central government to the local administration—is a prime area of concern.

The Tanzanian institutional arrangement for waste management involves multiple stakeholders, including the Central government (President's office), city council and the municipal council along with CBOs, private contractors and the informal sector. Waste management has been entrusted to grassroots institutions such as municipal councils, who have further handed it over to private contractors and CBOs. There is no coordination between the various stakeholders, which makes flow of information and funds all the more difficult.

Legislative challenges

There is a clear and tangible disconnect between the Environmental Management Act (EMA), the 2004 legislations, the Environmental (Solid Waste Management), Regulations, 2009 and the by-laws adopted by the municipal councils. While both the legislation and the regulation emphasize on the importance of source separation, they fail to mention the number and streams in which separation of solid waste has to be done before being handed over to the waste collector. Further, the by-laws notified and gazetted by the municipal council do not mention the need for residents to separate their solid waste at source. Further, it is vital to note that Tanzania does not have guidelines issued by the authorities to deal with solid waste management.

Annual reports, which are supposed to move from private contractors to the municipal or city council and finally to the National Environmental Management Council (NEMC), are rarely prepared and submitted, leading to lack of data and transparency.

Data insufficiency

There is limited and outdated data available with respect to management of solid waste. Most of the studies have been done in Dar es Salaam city and the results have been replicated for the entire country. Municipal councils like Ubungo rely on data as old as a decade and a half to estimate their waste composition. Ironically, Ubungo Municipal Council did not exist then.

Basic data such as the amount of solid waste generated in the country has been prescribed as a range. In councils where figures are available, the methodology for estimation of solid waste generated is not clear. The waste that does not reach the dumpsite for disposal is simply not accounted for in the solid waste generation.

The authenticity and credibility of data shared by the various government institutions is diluted due to lack of mechanisms for collecting, collating, analysing and interpreting the data.

Operational challenges

Operational challenges are many, with a few prime issues. The core challenge is the unwillingness of citizens to separate solid waste at source and the inability of the authorities to enforce it, mostly due to the poor awareness of citizens and inadequate capacity building of the officials. Another challenge is the low frequency of waste collection which stem partly from residents refraining from paying refuse collection charges and resorting to irresponsible dumping to save costs and partly due to inaccessibility of some areas which makes waste collection practically impossible.

Unsustainable waste management practices are being followed, due to location and distance of the dumpsite from the city centre. Despite the legislations categorically mentioning about setting up transfer stations by authorities (which again has been left up to the private contractors to register with LGA and operate), there are no transfer stations across the country. Secondary collection points also seem to be missing from the overall picture, increasing costs for private contractors and making operations economically impractical.

Non-abundance of decentralized facility for treating organic waste using local

solutions needs to be fast-tracked and supported with funds by the Central government and the local government authorities (LGAs). Replicable pilot projects operational in certain parts of the country are not duplicated due to non-availability of funds. Dry waste which is resaleable (mostly plastic and metal) is only collected by the informal sector (across the administrative hierarchy) with little support from the authorities.

There is a lack of public awareness with respect to sanitation and appropriate storage of waste. Littering and grey spots are common in informal settlements and peri-urban areas as they do not fall under the jurisdiction of city or municipal councils.

Recommendations

Institutional and administrative

One of the primary challenges is waste management being low on priority. This can be tackled by encouraging funding from national and international development agencies in the solid waste management sector of the region. It would, however, be more effective if financial support were result-based. This would keep the authorities and other stakeholders motivated to generate authentic data and develop data-backed strategies for implementation.

Capacity building exercises with the use of Information, Education, Communication (IEC) tools need to be undertaken across the country. The themes for every IEC campaign should be categorically target specific issues as for instance, general awareness, source segregation, importance of home composting etc.

Legislative and regulatory

The legislative framework of Tanzania can be improved by adopting an integrated approach to handle the mismanagement of solid waste. CSE proposed an 'Integrated waste management policy and legislation for African countries' in 2017. It could be adopted with relevant changes by the Central government of countries across Africa. It addresses every stream of waste and also suggests method for collection and disposal of each stream.

The concept of extended producer responsibility (EPR) and extended consumer responsibility (ECR) should be introduced in the country. This will align with the Polluter Pays Principle that the Central government along with National Environmental Management Council (NEMC) has been trying to promote through its legislations.

The NEMC should make it mandatory for every municipal council and city council to include a section on waste minimization and source segregation. The number of streams in which source segregation has to be carried out and the method of disposal of each stream would be categorically mentioned in the by-laws.

Data sufficiency for waste inventorization and composition studies

Encouraging local government authorities (LGAs) to undertake intermittent waste composition studies along with solid waste inventorization as stated in the Environmental Management Act (EMA), 2004 will help local authorities to have data relevant to their jurisdiction. This can help them to develop strategies to tackle the peculiar problems they face.

LGAs may pass on these data sets to city councils who may in turn collate and share the data with the Central government. This will help the country build its inventory and have waste composition data that has been collected close to the source of waste generation and is hence reliable.

Operational

The operational challenges of solid waste management can be overcome by following the steps for waste-management strategy (see *Figure 5: Steps for waste-management strategy*)

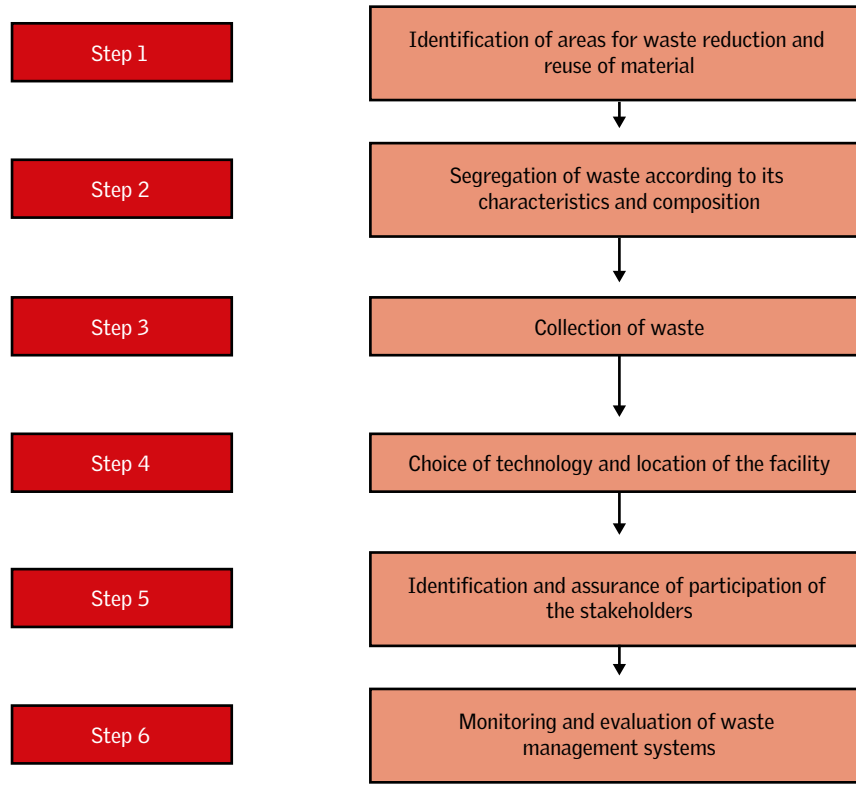
Step 1: Waste minimization

As mentioned in the EMA, 2004, minimization is an important aspect. Reduction of waste can be achieved by avoiding packaged goods and material. Smaller pouches are more affordable in low-income countries but they create a nuisance because they are difficulty to collect and are non-recyclable. Producers who put potentially polluting packaged product on the market should be made responsible for its collection through a reverse logistic mechanism.

Step 2: Source separation of solid waste

Residents should be encouraged to separate their solid waste at source. This will specifically help in better management of waste by conducting waste composition and characterization studies. Encouraging residents to segregate waste can go a long way in developing a sound waste management mechanism. This can give greater mileage if the source separation is incentivized by the authorities.

Figure 5: Steps for waste-management strategy



Source: CSE, 2017, Integrated waste management policy and legislation for African countries

Step 3: Efficient collection of waste

The established correct procedure of waste collection is as follows:

- Segregated waste is stored in colour-coded bins at the source of origin. One bin and two bags is the ideal option for storing segregated wet, dry and sanitary waste separately;
- Type of collection—door-to-door or community bins;
- Frequency of collection to be established by responsible stakeholders (see *Table 7: Suggested frequency of waste collection by type*);
- Informal system of collection should be integrated with the formal system;
- There must be a buyback system through retailers or dealers; and
- Adequate infrastructure for strengthening collection (tricycle, pushcarts, handcarts, tipper etc.) must be provided.

Table 7: Suggested frequency of waste collection by type

Source of waste	Type of waste			
	Biodegradable waste	Recyclable waste along with domestic hazardous waste	Sanitary/ biomedical waste	Other waste (e-waste and construction and demolition waste)
Household (organized)	Daily	Twice a week	Once a week	On demand
Household (unauthorized)	Daily	Twice a week	Once a week	On demand
Office with canteen or cafeteria	Daily	Once a week	Once a week	On demand
Hotel and lodging	Twice a day	Alternate days	Once a week	On demand
Restaurant	Twice a day	Alternate days	NA	On demand
Airport/railway station	Twice a day	Daily	Once a week	On demand
Hospital (<250 beds)	Daily	Daily	Daily	On demand
Hospital (>250 beds)	Twice a day	Daily	Twice a day	On demand
Market areas	Twice a day	Daily	N.A	Daily

Source: CSE 2021

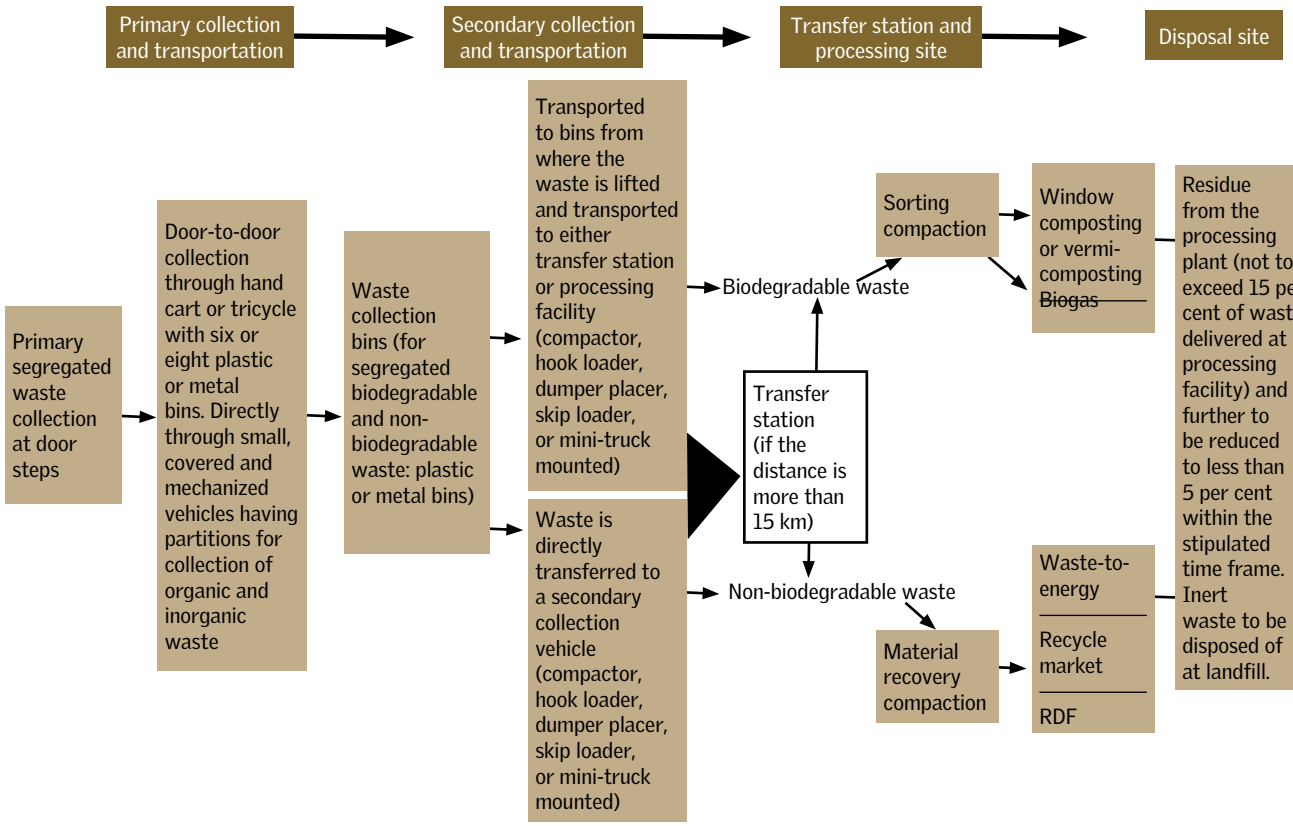
Segregated wet waste needs to be collected every day from households. Once the system is set, with requisite infrastructure and manpower in place, dry waste can be collected twice or once a week while domestic hazardous waste can be collected once a week. The mechanism can be adopted for institutions as well. In case of hotels, restaurants, airports, hospitals and other commercial areas, wet waste can be collected twice a day and dry waste once every alternate day.

Contracting of private vendors and community based organizations (CBOs) to collect only a specific type of waste will be a good strategy to adopt. Residents pay for their wet waste collection, sanitary waste and domestic hazardous waste (to separate vendors), while they get paid for dry waste collected. If a household is managing their organic/wet waste on their own through home composting, they become liable for an incentive by the local government.

Step 4: Choice of technology—Decentralization of processing facilities

Decentralized management of solid waste happens to be the first step to managing our solid waste responsibly. The management of biodegradable waste is challenging due to its perishable nature, its limited storage period, and its harmful impact when leeching out of landfills. However, it is also an area where significant improvements are possible by adoption of decentralized technologies such as composting and biomethanization. Using decentralized local technologies will help in reducing transportation cost of organic fraction of solid waste. Nearly 80 per cent of the waste is received from household of which over 50 per cent is

Figure 6: Flowchart for household waste collection, transportation and disposal



Note:
- Compactor with compartments is an appropriate vehicle for collecting biodegradable and recycling component of solid waste
- Skip loader or hook loader are preferred for collecting construction and demolition waste
- Waste may be transferred to transfer station if the processing site is located more than 15km away from the city.

Source: Expert committee for revision of MSWM Manual 2013–15

organic in nature—decentralization will help reduce cost of transport for private contractors hence improving the economic feasibility of their operations (see *Figure 6: Flowchart for household waste collection, transportation and disposal*).

Local technologies that can be operated at household level to promote home composting should also be propagated. Incentivizing home composting may go a long way in having positive and lasting impact on communities.

Material recovery facilities (MRFs) can be proposed for channelling and storing dry fraction of waste in wards where the per capita waste generation is high. The MRFs can be used as an intermittent storage points where the waste can sub-segregated by involving informal waste pickers which can then be directly sold to recycling factories in the country.

The non-recyclable fraction should be channelled to cement companies to be used as an alternate fuel. Only rejects from the systems, which are not fit to be received by any of these decentralized facilities should be channelled to scientific landfills.

Step 5: Identification and assurance of stakeholder participation
No waste management policy, programme and legislation can be successful without the participation of the stakeholders. It is, therefore, necessary to identify the stakeholders, understand their challenges and address them.

Step 6: Monitoring and evaluation
Waste management cannot be effective without a proper monitoring system in place. Monitoring protocols can be intensive as well as extensive in nature. Extensive monitoring can be carried out at the local level by the authorities during routine inspections. It must be designed in a way that allows the authorities to create fair statistics answering the following questions:

- How much waste is generated at each level?
- How much waste is segregated and collected?
- How much waste is converted into value added products (recycled)?
- How much waste is sent for dumping and landfilling?
- What are the problem areas?

The National Environmental Management Council (NEMC) must be engaged on a random basis in cooperation with the local authorities to device an intensive survey to identify the knowledge and infrastructure gaps and awareness levels. This evaluation will help develop future strategies and targets in order to fill the existing gaps in the system.

The NEMC can adopt the following outline in order to evaluate the present status of waste management and make future targets:

- Segregation at household, commercial places and source of generation.
- Collection systems
- Collection centre (register)
- Processing (recycling or composting)
- Waste dealer (register)
- Health survey of both the formal and informal sector (as part of an intensive survey)

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Tanzania, home to some of the fastest-growing urban centres in East Africa, produces 12–17 million tonnes of solid waste every year. Only 50 per cent of this is collected and sent to dumpsites. The focus on waste processing is low, while disposal of waste is common.

The problems with regard to waste management are similar at the national, city and town council levels. This report analyses of the challenges that Tanzania faces, and the opportunities it has, to come up with strong waste management enforcement and legislative changes that are vital to improving the sanitation and health of the country.

Centre for Science and Environment
41, Tughlakabad Institutional Area, New Delhi 110 062
Phones: 91-11-40616000 Fax: 91-11-29955879
Website: www.cseindia.org