Start Your Waste Collection Service

A TECHNICAL STEP-BY-STEP GUIDE OF HOW TO START A COMMUNITY-BASED WASTE COLLECTION SERVICE

Start Your Waste Collection Service

Technical Handouts

INTERNATIONAL LABOUR OFFICE
Start Your Waste Collection Service

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This Training Material is part of a training package that was produced for the Sustainable Lusaka Programme by a task force of the International Labour Organization, consisting of:

Andreas Klemmer and Lucia Mandengenda for ILO/SIYB-Harare
Chilufya and Evans Lwanga for ILO/SIYB Master Trainers
Wilma van Esch and Tomas Stenstrom for ILO/ASIST
Saskia Bakker and Alodia Ishengoma for the ILO Area Office in Dar-es-Salaam
Arjen During for the ILO Area Office in Lusaka, and
Kees van der Ree for ILO/SEED, Geneva

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The Ministry of Local Government and Housing, Department for Physical Planning and Housing
P.O. Box 32379, Lusaka, Zambia
Fax: +260-1-253697
Or
International Labour Organisation
Area Office, Lusaka
P.O. Box 32181
Tel: +260-1-228071/2 or Fax +260-1-223277/84
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1. SOLID WASTE MANAGEMENT

1.1 What is Waste?

Everyone produces waste. Some people produce more waste than others, but everyone produces some waste as leftover food, dirty water or garbage, just to mention a few. So, what is it that we call waste?

One of the answers is that waste is simply something unwanted, something left-over which has lost its value for the initial user. It is something you do not want any more and want to throw away.

For example, you eat rice and beans, when you feel full the remaining rice and beans become unwanted. You are not hungry anymore, so they loose their value for you. You throw the remaining rice and beans away and they have now become waste. You buy a tin of milk, you use the milk for tea and you throw the tin away. Or, you buy a pair of shoes wrapped in a paper or contained in a box. You take out the shoes for use and you have no further use for the paper or box. So, you want to get rid of them, because they have no value to you anymore. They have become waste. You can give many more examples from your own experience of things that you do not need anymore and have become waste.

1.2 What to Do with Waste?

So, what do you do with this waste? You will have to get rid of it by throwing it away, burying it or burning it. You don’t want to keep it because you have no further use for it. However, the disposal of this waste might be a problem for you. Why? Because you do not want these things to be laying in the yard, smelling, rotting and maybe endangering yourself or your family.

Remember: The waste thrown away by you might still of value to someone else. Someone else might pick it up and use it.

For example, the tin thrown away by you might be picked up immediately by a boy named Kabwe who sells it to people who make local kerosene lamps from tins. Also, the paper or box you threw away can be picked up by Kabwe. Are the tin and paper or box still waste in this case? The answer is No. This “waste” is valuable for Kabwe and is not waste to him. Kabwe can use the box and paper at home to keep things in. He can also sell both the box and the paper to small industries in Lusaka that make new things out of wastepaper.
In the same way, when you buy a bottle of Mazoe\(^1\) made of plastic or a bottle of black current juice made of glass, you drink the Mazoe or juice and throw the bottle away. A girl named Moza comes along and picks the bottles up. She takes them to her mother who cleans them and uses them at home to store local beer, kerosene oil or cooking oil in them. Moza can also sell the bottles to Kabwe or to someone else, who in turn sells it to people who use the bottles as honey containers or local beer containers. Kabwe can also sell the bottles to plastic and glass industries that can use them to make other, new things from these used bottles. The process of turning waste into new useful things is called **recycling**. Recycling will be discussed in more detail in later sessions in this manual.

### 1.3 Solid Waste Management

Waste is usually found in solid or liquid form. **Solid waste** is any waste that is hard or **solid** and not water-like or **liquid**, for example; broken glass, used plastic bags, left over food and food remains, torn cloth, yard sweepings, etc. are all called solid waste. **Liquid waste** is any waste which is in a watery form, or which can flow. For example; dirty water used for washing clothes or dishes, or for flushing the toilet; milk that has gone bad; used engine oil, etc. are all liquid waste You can give more examples of solid and liquid waste from your own experience.

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\(^1\) Mazoe is a concentrated orange drink that is mixed with water before drinking it.
The main subject in this training manual is how to deal with solid waste in a proper way. We call this solid waste management.

An increasing number of people, including yourself, realise that solid waste can be a big problem that needs to be handled with care. Now, how do you deal with waste in your own situation? Do you throw it away in an acceptable way? Or, do you just throw it wherever you like? If the answer to the first question is yes, than you are practising some sort of solid waste management.

1.3.1 Good and Bad Practices in Solid Waste Management

**Good Practice in Solid Waste Management** is the collection and proper disposal of solid waste in a systematic manner, regularly and in time. Proper disposal includes: recycling, composting, treatment, and regulated dumping. All of these will be dealt with in this manual. They require separate attention to be fully covered and understood.

1.3.2 Solid Waste Mismanagement

On the other hand, Mismanagement of Solid Waste is the case when waste is not disposed off in a proper way, not collected regularly, or not collected at all. In this case the waste can cause risks to people’s health and the environment you live in. Uncontrolled burning of waste, burying of waste, and uncollected piles of garbage are all examples of waste mismanagement. It is a risk to do these things and this is why:
• Uncontrolled burning of waste pollutes the air you breathe. It may produce poisonous gases that might cause diseases like cancer. Also, certain kinds of waste like spraying cans can explode when you burn them.

• Uncontrolled burying of waste can pollute the ground water and in turn the water you drink. This also may produce poisonous gases that might cause diseases like cancer, or produce gases which might burst into flames.

• Uncollected piles of garbage attract animals and insects that can be harmful and can spread diseases. Sharps or sharp objects like needles, broken glass and razor blades and other dangerous (hazardous) waste might be present in waste piles and harm children, scavengers and the animals we keep at home like dogs and cats. Piles of waste look ugly, smell badly and make people living nearby feel uncomfortable.

So, good practice in solid waste management is very important, to avoid these risks to our health and the environment we live in.

1.3.3 How to Deal With Solid Waste?

There are three global options for dealing with waste.

1. The first option is to collect the waste and transport it to a legal and well-protected dumpsite, where it can be disposed off. In this case waste remains as waste.

2. The second option is to re-use waste, or recycle it. This includes composting of any waste that can rot. In this option waste becomes something useful again, as was already explained earlier in this session.

3. The third option is the treatment of waste. This includes controlled burning and controlled burying of waste. In this case waste can become a source of useful energy for example in the form of heat or gas for cooking.

You may want to ask yourself the question: Which option fits to our own situation?

Above we have seen the three global options for good practice in solid waste management. Now we will look at realistic options under the given circumstances. What is desired in Community Based Solid Waste Management is summarised in the chart depicting a well-developed solid waste management system below.
1.3.4 Solid Waste Management in Lusaka - Zambia

In developing countries, including Zambia, the problem of Solid Waste Management is becoming more and more complicated and requires long-term and sustainable programmes for its solution. Considering African cities, including Lusaka, experience tells that less than 20% of urban solid waste is collected and disposed of properly. We can say that solid waste management is not satisfactory in developing countries. As part of the solution, some cities and towns have privatised solid waste management services, and/or involved the communities in the management of solid waste by introducing Community Based Solid Waste Management.

Box 2 below deals with some of the experiences with community based solid waste management in the city of Dar es Salam. It explains what their situation is and how they are dealing with solid waste. Maybe you can learn from their experiences.
Dar es Salaam city is one of the examples where community based solid waste management is being practised. Let’s take a closer look at what they are doing.

The city authorities have been unable to provide adequate services of waste collection and disposal and therefore decided to privatise these services in late 1998. Solid Waste Management (SWM) in Dar es Salaam is now undertaken jointly by the City Authorities under 3 municipalities and licensed private contractors.

How is this done?
- The Dar es Salaam City Authorities allocate areas to be served for solid waste collection, to Community Based Organisations (CBOs) and private companies. These groups are known as contractors in solid waste management.
- Many of these private companies own vehicles that transfer waste directly from households to the legal dumping place.

Community based organisations operate in a situation similar to yours, in the lower income areas of Dar es Salaam. Let’s look at how these CBOs operate in Dar es Salaam:
- The CBO collects waste from house to house on fixed days using hand carts. Many women do the waste collection and also push waste carts.
- The collected waste is moved to a collection point or transfer station. A collection point is a place agreed upon by residents and CBO to temporarily store waste. A transfer station is a built up structure in the form of block containers for storing waste longer than at collection points. See the picture of a transfer station in figure 1.
- The CBO hires a vehicle to transfer waste from the collection point or transfer station to the legal dumping site.
- Alternatively the CBO contacts the Dar es Salaam city authorities to help them with transport to transfer waste to the legal dumping site. In this case the CBO meet fuel expenses and some token money for the vehicle crew.
- The CBO collects the Refuse Collection Charges or fee for collecting the waste, from each household by physically going from house to house. Sometimes they have to involve a local leader to ensure that people will pay.
- Some CBOs and companies sweep main roads that pass through their area of operation and get paid by the Dar es Salaam city commission. This adds to their income and complements the solid waste collection fees.
- Some CBOs and private companies have started sorting some waste such as cans, plastic, paper and glass for recycling and sell these items to middlemen (people who buy and sell to industries) or directly to the recycling industries.

Zambia is among the most urbanised countries in Sub-Saharan Africa. This means that a large number of the Zambian people live in cities or towns, which we call urban areas. 42% of the Zambians live in these urban areas. Lusaka, the capital and largest city of the country, had a population growth rate of 6.2% per year in 1990, compared to the country’s population growth rate of 3.4% in the same year (1990 census). The city has extended its boundaries from 93 sq. km. in 1970 to 360 sq. km. at present.

The waste problem is also growing as:
- more people means more waste production,
increase in industrial activities and advancement in technology, means more waste is produced, and a larger part of this waste is hazardous. Indeed solid waste in Lusaka, particularly in unplanned settlements, has reached an alarming level. Heaps of garbage are seen in many places inside and around these settlements. Besides the growing size of the city of Lusaka and its population, and advancement in technology, other reasons for insufficient solid waste management include:

- Lack of resources: funds, equipment, tools, and skilled manpower.
- Lack of political will: solid waste management is not a priority.
- Lack of public awareness, people do not understand the dangers of solid waste mismanagement.

The reality in most settlements of Lusaka

Waste collection in Lusaka is restricted to a few selected areas, such as government offices, embassies and the town centre. Indeed, only about 15% of the total estimated residential waste is effectively collected by both the Lusaka City Council (LCC) and private collectors. Lusaka City Council alone collects about 12%. Many high density unplanned settlements are difficult to access and almost never have see any waste collection. As a result the waste is piling up around the settlement and often also at certain places within the settlement. In Box 2 some ideas of what can be done are given using the example of Dar es Salaam.

1.4 Conclusion

From your own experience of living in a peri-urban settlement you know that waste disposal is a problem and that there is no proper solid waste management system in these areas. This session has given a first introduction of the concept of solid waste management and has introduced you to some of the terminology used. Further an example was given from Dar es Salaam. Hopefully the session has given you some ideas for discussions on how to solve the
solid waste management problems in your compound.

1.5 Group Work

1. Is waste a problem for the people in pictures 1 to 7 below?
2. Is waste a problem for you?

3. What is to be done in your community if waste is a problem for you?
2. LAWS, REGULATIONS AND POLICIES GOVERNING SOLID WASTE MANAGEMENT

We are now aware that waste is something with no value to us. We would like to throw it away as soon as possible. Experience has shown that people dump waste near their neighbour’s houses or in their back or front yard. They also throw it on the roads, footpaths, in drains, in rivers and streams, etc. To avoid such bad waste dumping which harms the environment and the community, the Zambian law provides rules and regulations on how solid waste is to be collected and dumped or disposed of. Various government authorities have been given power to supervise and take care of these rules and regulations.

2.1 Existing Laws

The main laws and regulations that are in existence to regulate solid waste in Zambia are:

- Public Health Act Cap 295.
- Environmental Protection and Pollution Control Act, 1990
- Local Government Act No. 22 of 1991, under it are regulations such as the Street Vending and Nuisances Regulations.

2.2 Practice of the Main Laws

2.2.1 The Public Health Act Cap 295

The Public Health Act gives the councils the responsibility to prevent and control the outbreak and spread of infectious diseases like cholera. Therefore, under this Act, disposing waste in such a way as to cause disease or hazard to health is an offence. The Local Authorities (in our case the Lusaka City Council) has the responsibility to ensure that people do not dump waste indiscriminately and is empowered to correct any action or omission that it thinks creates a nuisance. The local authorities are responsible for the management and collection of municipal solid waste, besides any other type of waste.

Structure

For the LCC to enforce these laws the Public Health Department, headed by the director of public health, has been put in place to run public health affairs. Among the many sections falling under public health, cleansing and pest control is directly responsible for the cleansing of the entire city by collecting garbage and disposing of it at the designated dumpsite. The main sources of solid waste for which LCC does the collection are the city centre and industrial area (shops, hotels, colleges, streets), and some residential premises. The cleansing
and pest control section goes out daily to collect waste from these premises and transports it to the final disposal site.

At present, waste collection in Lusaka is restricted to selected low-density residential areas, the Central Business District and the industrial area. Refuse in these areas is collected on a weekly basis. Medium and high-density areas are not serviced unless in crisis times e.g. during outbreaks of diseases like cholera. Out of 210,000 tonnes of waste generated in a month only 10% or slightly more is being collected by LCC. Looking at these figures it is clear that a lot more effort is needed in order to adequately collect all the waste produced in the city.

Under the Inspectorate Section of the Public Health Department, inspectors are empowered to enforce the Public Health Act. As expected inspectors go out into the city and carry out inspections on daily basis. Any nuisance they find is investigated and the offender is ordered to stop causing the nuisance. If the council has to move in and to remove the nuisance, the offender is required to pay a fee to the council. At times the general public reports certain nuisances to the council and the council responds through the Public Health Department. Further, the Health Inspectors have a duty to supervise the final disposal of expired food products and any solid waste from traders.

Weaknesses
1. The number of Health Inspectors employed does not match with the workload.
2. The available resources, especially transport, are not adequate.
3. The general public that is expected to help in keeping the environment clean is not aware of this law.
4. The law does not provide for private operators involved in solid waste management. However, it empowers the Council to take lawful, necessary, reasonably, and practicable measures for maintaining its district or municipality. Whatever the council will decide as reasonable measures to enhance Public Health will apply and is included for in the law. Therefore, if the council decides to enter into contracts with private businesses for the collection and disposal of solid waste, this is possible under the Public Health Act.

Strengths
✓ When fully enforced, the Public Health Act can assist in putting in place effective solid waste management, improve the health situation, and curb present environmental pollution in the City of Lusaka.
✓ The laws are adequate in catering for council operations.
✓ On the penalties, the figures indicated in Kwacha have been strengthened by an Act of parliament that was passed to convert all kwacha figures into units. This means that if, say the penalty reads ZKw 50, this will be read as 50 units. There is a formula that is used in the courts of law to convert the units into Kwacha.
This helps to get a fine that is reasonable for any given time. At present a figure of ZKw 180 is used to denote 1 unit. So whatever number of units is indicated in the law, you multiply by 180. This figure of 180 ZKw is to be regularly updated.

2.2.2 The Environmental Protection and Pollution Control Act of 1990 (EPPCA)

Structure
The Environmental Council of Zambia (ECZ), which falls directly under the Ministry of Environment and Natural Resources, was formed to be responsible for the protection of the environment and control of pollution of water, air and land. The Director of ECZ heads the affairs of this council. Under this Directorate are Inspectors that are empowered, under the EPPCA, to carry out duties stated in this law. Among these, the ECZ has the responsibility to give specific or general direction to local authorities regarding their functions relating to the collection and disposal of waste operations. The ECZ is responsible for approving locations to be used for waste disposal. After approval of the site, the ECZ issues a license to the local authority, in our case the LCC, to allow them to dispose of waste in this location. ECZ is mandated to carry out inspections of the disposal site and an Environmental Impact Assessment needs to be conducted before a license is issued. The inspectors are also empowered to monitor the safety and health of workers at disposal sites.

This kind of scene has to be prevented by the Environmental Protection and Pollution Control Act.
ECZ is further mandated to issue licenses to any transporter of waste and to provide technical and advisory services to waste operators. One of the duties is to give guidance of correct means of storage, collection and disposal of any class or type of waste. Under section 49 of EPPCA the inspectors have the responsibility of maintaining data on the nature, quantity and volume of waste generated.

Under section 4 of this Act, any person interested in running business in waste management has to apply for a license, be it transportation of waste or managing of a dumpsite.

Part VI of the Environment Pollution and Protection Act states that the Environmental Council of Zambia has the power to:

- Formulate and provide standards on the classification and analysis of wastes as well as formulate and advise on standards, disposal methods and means
- Regulate the handling, storage, transportation, segregation and destruction of any hazardous waste (dangerous waste) and
- Provide the monitoring and regulation of any waste dumpsite or disposal site.

The Environmental Council of Zambia has issued a series of regulations on solid waste management. These regulations relate to licensing of solid waste transportation and control of activities and landfill and waste disposal sites. The following rules apply:

1. Unauthorised discharge of waste is prohibited
2. Waste is supposed to be collected by service operators, both from the private or the public sector operators that are licensed for that matter
3. Waste has to be transported to licensed waste disposal sites only
4. These licensed waste disposal sites have to be enclosed and secure from scavenging and operated in a manner that ensures that neither water nor air is contaminated
5. Entities generating hazardous waste have to be licensed for that matter.

**Strengths**

The law provides guidelines to any body who has potential to enter into solid waste management as a business venture. (Statutory instrument No. 71 of 1993) It provides for the licensing of waste transporters and waste disposal sites. Also, it provides a framework for inspection and enforcement of the licenses issued to guarantee proper solid waste management.

**Weaknesses**

1. The ECZ is severely understaffed and does not have the capacity to perform all duties assigned to them adequately. This results in insufficient advice to control of operators in the solid waste sector.
2. This law does not empower anyone else apart from the ECZ to slap a penalty on anybody violating the law. In other words, a private operator cannot slap any
charge on anybody who does not co-operate in waste collection.

3. This law is not directly formulated for the benefit of the private operators, but for the protection of the environment in which they operate.

NOTE: The licence that is given to the LCC by ECZ is for the operation of the legal dumpsite. In case you want to be involved as a private operator in the collection or transportation of solid waste, you officially also have to apply to ECZ for a licence. However, since your operations will be within the jurisdiction of a Local Authority there is no immediate need to get a license from the ECZ, as long as you get into an agreement with the Council. In that way you would operate under the license given to the council.

2.2.3 The Local Government Act

The Local Government Act is an Act to provide for the establishment of authorities for the purpose of local government and to define, certain of their functions, and to provide for matters incidental to or connected with the foregoing. Under this Act, the Councils are empowered to make by-laws to help them function. The Local Government Act refers to solid waste management through the township regulation and market by-laws. In the City of Lusaka, these by-laws:

- a) prohibit the burning of waste in public places
- b) specify fees to be charged for the removal of waste from non-domestic premises (specify how much enterprises, companies, industries and other places which are not homes have to pay for the removal of waste from their premises)
- c) define the obligation of property owners to provide waste bins with lids (define that every one is obliged to collect their waste in bins with lids)
- d) state that the storm drainage system has to be kept clear
- e) forbid the deposition of waste in public streets and the unauthorised disposal or dumping of waste (says that the disposal of waste on the street or elsewhere in the public is not allowed)

The above bye-laws have to be enforced by the city council. Inspection of compliance with the law is the responsibility of the inspectors of the Public Health Department. When unlawful activities are detected, the Police Department is called upon when necessary to help enforce the laws.

Strengths:
Rules and regulations are in place in the form of the bye-laws

Weaknesses:
1) No provisions are made in the bye-laws for sub-contracting (part) of the councils responsibility for solid waste management to private operators. This means that it is unclear how you can operate within the existing structure as a private waste collector.
2) The act and its bye-laws are not properly enforced due to:
   a) lack of staff and resources in the LCC, and
   b) lack of policy support and political will

2.3 Relevance of the Existing Laws

The laws and regulations provide guidelines for handling and final disposal of solid waste, which does not pose danger to the public. The laws are basically meant to empower LCC and ECZ to protect the environment and control diseases.

2.3.1 Effectiveness and Strengths of Existing Laws

- When fully enforced the EPPCA and PHA can assist in putting in place an effective system of solid waste management that improves the health situation and reduces the present environmental contamination and pollution.
- The laws are effective, as they cannot be overridden by any other laws.
- Further, the present laws provide an avenue for privatising solid waste management. For instance the EPPCA empowers ECZ to provide licenses, technical and advisory services to any waste operator. In this case this law is not only limited to local authorities, but includes private sector operators as well.

2.3.2 Weaknesses of Existing Laws

As the written laws’ strength is in providing a framework for enforcement, the major weakness is the lack of effective enforcement in practice. This is due to a lack of resources, such as manpower and logistical support like transportation, in the institutions charged with enforcement. For example a nuisance can be reported but the personnel responsible would have no means of getting to the scene due to lack of man power or transport.
- Lack of concern for statutory duties: unwillingness by shopkeepers, factories, and institutions to adhere to statutory duties such as maintaining storage containers for waste.

- Lack of public awareness of the existing laws and regulations and a general decreasing level of sensitivity and concern to aesthetic standards and quality of the urban environment by the population.

- Lack of proper guidelines on how the private sector can operate with the Council in providing effective Solid Waste Management.

It is important to note that these laws were not meant for profit making bodies, but for the protection of the environment within which business ventures of different kinds are conducted. The laws do provide certain guidelines for business operations in solid waste management, but are not there to protect those in business alone without considering the environment they work and live in. Therefore, as any other business venture, waste business need to follow laid down procedures of running business in Zambia.

2.4 Group Work

In the situation that you will be working in, it will be important that the community is cooperative and participates in waste collection and disposal. There are rules and bye-laws which have to be obeyed for this to happen.

1. Are the existing laws effective? If not, why? Give suggestions for alternative ways, and rules that might work in your situation.

2. If the existing rules were to be adhered to, would they be sufficient to make people cooperate with you?
   (a) If yes, give suggestions on how the existing rules can be made to work, so that your customers will co-operate with you in solid waste management.
(b) If no, give alternative by-laws and suggesting on how they can be adhered to in such a way that your customers will participate well in solid waste management?

3. Experience has shown that whether there are rules/laws to be obeyed or not, it is difficult for people to participate in solid waste management. More specifically it is difficult to get people to pay for waste collection services, to put waste in proper containers, or to place the waste outside the house at collection time, etc. In your case:
(a) How are you going to make your customers pay for waste collection?

(b) How are you going to make your customers put waste in proper containers?

(c) How are you going to make your customers put waste outside the house at collection time?

(d) For each of these mentioned examples (a to c), which rules are you going to apply and how?

4. Think of more examples similar to these and for each example, indicate which rule is
applicable and how?

Write all answers from the group on flip-charts for further discussion.
3. TYPES OF SOLID WASTE AND GENERATION RATES

3.1 Types of Solid Waste

Maybe you have never thought about waste very much. This session will make you think of the different types of waste that are thrown away by people and will make it clear why it is important to recognise some of these types of waste.

3.1.1 Types of Solid Waste According to Substance

To start with, consider solid waste produced in your area. You can recognise different types of solid waste that you produce by thinking of the material they consist of. For example a broken plastic dish or plate, a discarded plastic bottle, a torn plastic bag, etc. are all plastics. Similarly, broken glass, a broken glass plate, a bottle, or a jar, all belong to the type of waste called glass. Used newspapers, sugar bags, old exercise books, cardboard boxes, etc., all belong to the type of waste we call paper. Onion peels, left over spinach, a rotten potato, maize stalks and cobs, and banana peels belong to the organic waste. All of these and others are specific types of waste classified according to the kind of materials that the waste consists of.

These specific waste types or groups can be further split into more specific groups depending on one’s desire for detail. For example plastic can be specified as hard plastic or soft plastic, and different types of plastic can be given specific scientific names. But, that is beyond the scope of this training manual.

Waste can also be classified into two main groups on the basis of the kind of it consists of:

1. **Organic waste**: waste that can rot and that is made of natural materials.
2. **Inorganic** or **non-organic waste**: plastic, iron, glass, metal and all other waste that cannot.

Box 3: Hazardous waste in high-density settlements in Dar es Salaam

Experience from Dar es Salaam has shown that:

- Many people use and store a variety of different hazardous products in their home, such as polish, wood preservatives, stain removers, paint thinner, batteries, pesticides, expired drugs, rat poison, chemicals, etc.
- Some homes mix human excreta with waste.
- Some households have small industries in their backyards and tend to mix waste from these industries and home waste. Such activities/industries include hair saloons, tie and dye/batik, garages, welding, black smiths, etc.
3.1.2 Hazardous waste

It is also good to note whether a certain type of waste can be dangerous or not. Dangerous waste types are those that can bring about health risks as they can explode, wound, infect, or poison people. These dangerous kinds of waste are normally called hazardous waste. For example batteries might be hazardous as they contain lead, which is poisonous. Needles, knives, and razor blades can cause cuts and might transmit diseases. Chemicals, expired drugs, left over paint, etc. are called chemical waste and can often be poisonous or irritating for the skin, the eyes or the lungs. Sometimes they are highly inflammable, which means that they can easily catch fire or explode. Human excreta and hospital waste can be infected with diseases and are therefore also considered to be hazardous.

3.1.3 Types of Solid Waste According to Source

Another much used way of classifying types of waste is according to the source where the waste was generated. Below different groups of waste are described according to where they come from.

![Different Types of Solid Waste Diagram]
Household or domestic waste: Solid waste composed of garbage and rubbish generated by households or homes. In high-density neighbourhoods up to two thirds of this category consists of organic waste, including ash produced through traditional cooking and soil from floor sweeping. In communities where there are not enough toilets (sanitation facilities are limited) the waste might also include human excreta.

You may need to ask yourself if household waste from your compound can contain hazardous waste. If so what types of hazardous waste can you expect to find? How can these be handled? Think of the special care you have to take and the protective gear (including boots, gloves and face masks) you might need to wear to handle this waste.

It is necessary to ALWAYS use protective gear, as you cannot be sure of the contents of pile or bag of waste that you are collecting.

Commercial waste: This is all solid waste coming from business places such as stores, markets, office buildings, restaurants, shops, bars, etc. Commercial waste typically consists of packaging and container materials, used office paper, wood shavings, food waste, etc.

Industrial waste: Industrial waste comes from processing industries. Industrial waste might include chemical waste, which is hazardous waste.

Note: It is not the responsibility of a normal waste collector to handle hazardous waste. Such waste is to be handled by specialised, well-trained and well-equipped people. Industries or producers of hazardous waste are responsible for the collection and proper disposal of such waste.

Institutional waste: Waste from police barracks, schools, hospitals, prisons, and other public buildings. Where the institution involves residents, the waste composition is similar to those from households. Some institutions, e.g. hospitals, can generate hazardous waste.

Street Sweepings: These include dust/sand, leaves, paper, etc. In high-density neighbourhoods, street sweepings might also contain household refuse, drain cleanings, and human and animal excreta

Construction debris: The nature of construction waste depends upon the materials used for the purpose of construction. It can contain, wood, brick-stones, concrete, glass, and metals, to name a few.

Box 4: Hazardous hospital waste in Dar es Salaam

In Dar es Salaam there are many dispensaries within the residential areas, even in unplanned areas. Some of these dispensaries and hospitals mix dangerous hazardous waste with normal waste collected by a CBO or a company. Experience has also shown existence of hospital waste and industrial waste in various collection points and transfer stations, both of which are places where waste is stored temporarily.
3.2 Waste Generation Rates and Composition

The amount and composition of waste generated and to be collected at different locations differs. Offices and learning institutions or schools, produce a lot of paper waste, while restaurants and hotels produce a lot of food leftovers, bars usually produces a lot of empty bottles and cans, households often produces a bit of everything. There are ways to find out how much waste and what kind of waste a certain industry, shops, business entities, schools or households produce.

This kind of information is interesting to people who collect and dispose of waste. They need this information to decide on what equipment to buy and what kind of temporary storage facilities like midden boxes, collection points and transfer stations they need. Temporary storage facilities should have enough capacity, otherwise waste will be stored in the surroundings of these facilities, which pollutes the area.

3.2.1 Waste composition

Waste collectors are also interested in the composition of the waste. The composition of the waste will define how much the waste will weigh by volume unit. For example, soil or construction waste like bricks and concrete are heavy, whereas paper or maize stalks are light. The kind of waste and the expected weight have to be considered when deciding what kind of transport equipment is most suitable. In professional waste collection, waste with a low density (light) is usually compressed or compacted to reduce transport costs. This means that the amount of kilo’s per cubic meter are increased.

Another reason why waste collectors are interested in the composition of the waste is because some of it may be harmful or dangerous (hazardous). People could cut themselves on the sharp edges of metal and broken glass or get affected by chemicals mixed with waste. On the other hand, if you know the likely composition of the waste, you can decide if recycling will be attractive. The amount of waste generated is found in the form of waste generation rates.

3.2.2 Waste generation rates

The waste generation rate is the weight and volume of waste produced per unit in a certain amount of time. The unit can be a household or person it can also be a business entity or a known geographical area, for instance your compound.

Waste collectors need to know the waste generation rates in their area of operation, to help them to plan for the collection and dumping or disposal of waste. Generation rates also help to know the number and type of waste collection equipment and tools, and the waste storage and disposal facilities you will need. The rates also help to determine the frequency of
collection: how often should waste be collected from households in a certain area/street or compound. You will also need to know the waste generation rates to design or plan the best route to follow when you are collecting waste from the households in your compound.

To estimate the weight and the volume of the waste per customer in a given period of time (per day, per month), you will have to collect waste samples from households and business in your own community. This can be done by asking people to store their waste for a fixed number of days or a week. You can give them bags to store the waste in during this period. Afterwards you collect the bags with waste from these people. Then you have to weigh the waste samples to see how much is thrown away in the selected period and you have to check what kinds of waste these people have thrown away. You will do this in the group work at the end of this session.

Other people have estimated the weight, volume and composition of waste in Lusaka before. To that purpose, one exercise was conducted in 1996 in both high-density and low-density compounds in Lusaka. It was found that the domestic waste generation rate of high-density suburbs was about 0.56 kilograms per person per day. The respective waste generation rates for commercial waste (here: waste generated by market stalls) was about 1.7 kilograms per stall per day. Results for other types of waste were not applicable to high-density suburbs.

The density of domestic waste in high density suburbs of Lusaka was found to average 395 kilogram per cubic-meter. The density for commercial waste was 207 kg/cubic-meter.

The composition of the domestic waste in high-density compounds was about 66% soil mixed with minor amounts of dust, stones charcoal remains and ashes and about 25% putrescibles (materials that rot, such as food leftovers, leaves and grass). The remainder was made up of paper and cardboard (3%), plastic (3%), and other components (2%). In the composition of waste for markets stands, soil still makes up for about 50% of the total waste, followed by putrescibles at 23%, cardboard and paper at 12% and plastics at about 7%. All other items made up for less than 4% of the waste. The table below summarises these results.

<table>
<thead>
<tr>
<th>Solid waste particulars</th>
<th>Households</th>
<th>Businesses/markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of kilograms/day</td>
<td>0.56 per person</td>
<td>1.7 per stall</td>
</tr>
<tr>
<td>Density (kg/cubic meter)</td>
<td>395</td>
<td>207</td>
</tr>
<tr>
<td>Composition</td>
<td>Mixed soil 66%</td>
<td>Mixed soil 50%</td>
</tr>
<tr>
<td></td>
<td>Putrecibles 25%</td>
<td>Putrecibles 23%</td>
</tr>
<tr>
<td></td>
<td>Paper and cardboard 3%</td>
<td>Paper and cardboard 12%</td>
</tr>
<tr>
<td></td>
<td>Plastics 3%</td>
<td>Plastics 7%</td>
</tr>
<tr>
<td></td>
<td>Others 3%</td>
<td>Others 8%</td>
</tr>
</tbody>
</table>

The figures above might be taken as a starting point for your own analysis, but it is very likely that they vary from compound to compound. They vary because of different ways of living, activities taking place, culture, income, etc. Therefore, and to obtain exact figures, it is necessary for you to conduct your own analysis for your own compound.

3.3 Calculating Waste Generation Rates

The process of obtaining the composition of waste can be done practically during the training and will be done in the group work exercise. The waste generation rate for one household can be calculated after knowing the number of days it took a household to collect a certain amount of waste. By dividing the amount of waste collected by the number of days it took to collect the waste, you know the amount of waste generated daily by this household. If you do this for several households of different sizes and income groups (minimum 10 families, but preferably more) in your compound, you can calculate the average waste generation rate in your settlement. Now if you know the number of households in the area that you have to collect the waste from, you can calculate how much waste there is to be collected every day of the week.

3.3.1 Example: Calculating Waste Generation Rates

You have given empty mealy meal bags to 5 families and asked them to collect all their waste in it for 5 days. After the 5 days you collect the bags from the families and weigh them. These are the results:

<table>
<thead>
<tr>
<th>Family</th>
<th>Kg collected</th>
<th>Kg per day</th>
<th>Kg per person per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fam. Phiri (6 people)</td>
<td>22 kg</td>
<td>22/5 = 4.4</td>
<td>4.4/6 = 0.73</td>
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<tr>
<td>Fam. Banda (10 people)</td>
<td>34 kg</td>
<td>34/5 = 6.8</td>
<td>6.8/10 = 0.68</td>
</tr>
<tr>
<td>Fam. Zulu (4 people)</td>
<td>18 kg</td>
<td>18/5 = 3.6</td>
<td>4.5/4 = 1.13</td>
</tr>
<tr>
<td>Fam. Makonga (9 people)</td>
<td>33 kg</td>
<td>33/5 = 6.6</td>
<td>6.6/9 = 0.73</td>
</tr>
<tr>
<td>Fam. Mate (6 people)</td>
<td>25 kg</td>
<td>25/5 = 5</td>
<td>5/6 = 0.83</td>
</tr>
<tr>
<td><strong>Total of 5 families</strong></td>
<td><strong>132 kg</strong></td>
<td><strong>132/5 = 26.4</strong></td>
<td></td>
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</tbody>
</table>

So 5 families produce 132 kg in 5 days. This means that they produced 26.4 kg per day. If we now divide this figure by 5 (for the 5 families), we get the average amount of waste generated per family per day.

**Average waste generation rate**: 26.4/5 = 5.28 kg per household per day

Note in the table above that the amounts of waste generated per family per day can differ considerably. In this example Fam. Banda collected 6.8 kg per day whereas Fam. Phiri...
collected only 4.4 kg per day. Because of these differences it is important that you collect from a number of households (minimum 10) from different social and economic background to get a reasonable average.

Seeing that the average household consists of 7 persons, the average generation rate per person per day is: \( \frac{5.28}{7} = 0.75 \) kg.

Note in the table above that not only the amount of waste generated per family differs per family, but that also the amount of waste generated per person differs per family. This has to do with many factors like the income level of the family (more money, more waste), the size of their plot (sweepings), etc. Family Zulu generates 1.13 kg of waste per person per day whereas family Banda generates only 0.68 kg per person per day.

**Waste generation in the area your group has to cover:**

Now if you know that there are 253 households in the area you have to cover with your waste collection activities, this means that you will have to collect \( 253 \times 5.28 = 1336 \) kg of waste per day.

Imagine that you do not know the number of households in your area, but you do know that there are about 3500 people living in the area you have to cover. Than you can use the generation rate per person per day to calculate the amount of waste generated daily in the area you have to cover as follows:

\[ 3500 \times 0.75 = 2625 \text{ kg per day} \]

Similarly rates for markets can be obtained if the number of days to collect a certain amount of waste from a market stall is known for several stalls.

### 3.4 Group Work

**Requirements:**
- Waste from households in your compound
- Waste from a market or businesses in your compound
- Protective gear
- Weighing scale
- Calculator

The objectives of this exercise are to:
- Check what types of waste you are likely to find in your compound.
- Check if there is any dangerous waste (hazardous waste) in your compound.
- Check the composition of waste and generation rates in your compound.
• Have a rough idea of how to do a waste analysis.

The exercise:
Each group is provided with a bag or bin full of waste
1. Weigh how much waste is in the bag or bin you have brought or been given.
2. With gloves on your hands and coats over your shirt or dress, pour the waste from bag or bin onto the ground and sort the waste, identifying it by name and by types.
3. Group or classify different types of waste with similar appearance or features into bigger groups of waste.
4. Make suggestions about where you think the different types of waste came from.
5. How much is each type of waste compared to the rest? To find out weigh each type of waste on the weighing scale and calculate the percentage of the total amount of waste your were given. You calculate the percentage by taking the weight measured divided by the total weight and multiplying it by 100. (Weight measured/total weight*100 = percentage of this type of waste in the total weight).
6. Write the results in the table on the next page. (Also, make your own table on a flip-chart and write your results in it).
7. As pointed out earlier, generation rates of the households and markets in your area can be calculated if you know how many days it took to collect the waste in the bags you were given. If you divide the total amount by the number of days, you will get the waste generation rate per day. Note that this figure is very unreliable, as you used only one sample.
8. Table of Results

<table>
<thead>
<tr>
<th>Type of Waste</th>
<th>Percentage of total</th>
<th>Possible sources</th>
<th>Remarks</th>
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4.1 Solid Waste Management System

There are different steps between the moment waste is thrown away and the moment it is disposed of at the landfill. These steps are called the *Solid Waste Management System*.

![The Solid Waste Stream Diagram]

- **Waste Generation**
- **Storage at Source**
- **Primary Waste Collection**
- **Temporary Storage**
- **Secondary Collection or Transportation**
- **Dumping at Legal Landfill**
- **Scavenging for recycling**
- **Properly Disposed off**

*Primary collection* is the collection and transport of waste from the households and businesses to a communal temporary storage point.

*Secondary Collection* is the collection and transportation of waste from the communal storage point to the final disposal site.
The three main steps in the solid waste management system are:

1. Waste storage
2. Waste collection and transport
3. Waste disposal

The steps depend on each other. One step can not work if the others are not working or not working properly.

The success of the Solid Waste Management System depends on the frequency of collection, transport and disposal. Waste will have to be stored somehow and somewhere before it will be transported, and often it will have been stored several times before it is dumped at the landfill. In the diagram on the next page, you can see the different steps involved in a well developed SWM system for the kind of waste that you will be dealing with.

This handout will focus on Waste Storage. The Collection, Transportation and Disposal will be dealt with in the next handout.

Waste overflowing from the communal storage in Dar es Salaam

4.2 Waste Storage

The first step in solid waste management is the storage of waste. There are two global methods to store solid waste:

- at the source of generation, or
- at communal storage points

4.2.1 Storage at source

Usually all solid waste will be stored at the source for some time. Sources of waste are individual households, shops, industries or offices. Sometimes waste is stored in a container
or a bag which is easy to empty and clean, and sometimes it is stored on the ground in a corner of the yard or garden. Ideally, waste of individual households and commercial entities is stored in galvanised steel or plastic bins with a lid to keep out flies and other animals, like rats. However, these types of containers are a bit expensive and are usually not available in high-density suburbs. Many low-income households use small containers for which no other use can be found, or make a small pile of waste outside the house. For people in the high density unplanned settlements, storage at the source can be a big problem. Often there is not enough space to store a large amount of waste. Also, usually these people do not have enough money to buy a nice container (with a lid). In some cases it can be better to use a communal storage system.

**Box 5: Waste storage in Dar es Salaam**

For example in Dar es Salaam, the people will store the waste for some days in their homes. The contractor collects this waste with small handcarts and stores it in a transfer station until there is enough waste to hire a truck to transport it to the landfill. If the contractor has not enough money to hire a truck s/he will not be able to transport the waste to the landfill. The contractor’s storage point will become over-full. The contractor will either decide to postpone further collection or store the collected waste outside the contractor’s storage point. In both cases, the waste will cause problems such as bad smells and flies.

### 4.2.2 Communal storage.

There are two main ways of communal storage:

- Storage at a permanent location;
- Moveable storage facilities;
Permanent locations are collection points, midden boxes, transfer stations, etc. They can have different forms:

- The cheapest form is the open dumping place called collection point. Somewhere on the side of a street, on a square or in an open area a space is allocated where waste can be dumped. The environment is not protected against this waste.
- Open dumping places are sometimes improved by fencing them with a wall made of concrete, masonry, timber or iron sheets. This prevents the waste from spreading and the dumping place is still easily accessible.
- Other forms of permanent dumping places are little buildings or constructions. These constructions look like a box and are used to store the waste temporarily without doing too much harm to the environment. Good examples are midden boxes and transfer stations.

A transfer station in Dar es Salaam where the waste is being emptied into a truck.

Permanent dumping places have some disadvantages.

1. They are easily accessible by rain, and human and animal scavengers.
2. Sometimes these dumping places are used as toilets.
3. The waste at the bottom of the dumping place often starts to rot, as it is the first waste to be stored and often stays there longest, as the emptying of these places starts from the top.
4. The dumping places are often big. In high-density areas, there may not be enough space to build them.
5. The whole process to transfer the waste from this dumping point into a truck (or other transport equipment) to take it away is not only a lot of work, but also not without health risks. The workers have to be protected against the dust, smell, and hazardous waste.

The two most common forms of moveable storage facilities are large containers and dustbins. Unfortunately these containers and dustbins are too expensive for most people in the developing countries. A major advantage of moveable dumping points is the ease with which capacity can be increased by just adding one or more containers. Another advantage of containers is that they do not have to be reloaded, but are loaded entirely onto a container truck to be emptied at the landfill site.

A container (moveable storage facility) is used to remove the waste from a transfer station (permanent storage facility) in Dar es Salaam
4.3 Group Work

The objectives of this group work are:

- To describe different activities in the waste cycle or stream, and
- To identify different waste storage methods and prioritise which ones of these are useful for you.

Answer the questions in Exercise 1 and 2 and write the responses on flip chart papers.

Exercise 1:

1. What do you do with the waste you generate at home, or what is done with it? To answer this question trace what happens with your waste from generation to final disposal. Do all types of waste follow the same path or stream or cycle?

2. What are the different activities involved in each step of the waste cycle?

3. Can one step in the cycle work if other steps in the cycle are not working? (For example can collection be done without proper disposal?)
**Exercise 2.:**
1. Identify different methods used in storing waste, and note the advantages and disadvantages of each.

2. Which method is best? Which methods are best for your situation? Rank them as 1st, 2nd, 3rd, etc.

Write your answers on a flipchart paper in a similar table as shown below.

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3.</td>
<td></td>
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<tr>
<td>4.</td>
<td></td>
<td></td>
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<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. THE WASTE CYCLE PART 2: WASTE COLLECTION, TRANSPORTATION AND DISPOSAL

5.1 Introduction

If the garbage in high density areas is collected with for example hand carts and the nearest sanitary landfill is located 5 kilometres away, then it will take a lot of time to go with these hand carts to that landfill to empty them every time they are full. If on the other hand, you would replace the handcart with a truck and that truck has to stop every minute to collect a bit of waste from a family, the cost of the collection will increase dramatically. Therefore waste collectors prefer to make use of both types of transport equipment. Handcarts for the collection within the community and trucks for the transport from collection points, midden boxes or transfer stations in the community to the landfill.

This means that all collected waste has to be stored on temporary basis at these places and be removed and transferred to the landfill as soon as possible preferably within three days. Otherwise waste will go bad and become a nuisance for both neighbouring people and waste collectors.

In a system of good solid waste management in a developing country, the waste will finally be disposed of on a sanitary landfill. This results in minimal disturbances for the environment. The principle of a sanitary landfill is that the waste is spread in thin layers and that at the end of each working day it is covered with a layer of soil. If done properly the landfill once it is full and after its purpose of waste storage is fulfilled can be used as a sports field, a park or even as a farm. This is especially possible in developing countries where the waste contains a lot of soil and only a minor amount of chemical waste.

5.2 Waste Collection

In general there are three ways to collect waste:

- Street sweeping
- Collection of stored waste
- Collection of waste dumped at unregulated places, or clearing of backlog

As seen in the former session, waste can be stored in different waste ways before it is collected and transported away. However, sometimes no such collection system exists and waste accumulates over a long period of time at different places in and around the compound. Sometimes such accumulated waste is collected, which we call the clearing of backlog.
5.2.1 Street sweeping

Sweeping of the streets can be done both with manual labour and equipment. In this handout, we focus on street sweeping done by manual labour and the needed tools and organisation. It is not recommended to use modern equipment for street sweeping in developing countries, because in most developing countries there is high unemployment and it is better to give people a job than to buy expensive imported machines to do a simple task like street sweeping. Also to use these machines, the streets should have no potholes, or other obstacles, and the machines are often very sensitive towards maintenance requirements.

In most cities in developing countries street sweeping with manual labour is the most appropriate option to collect waste from the streets. It is important to find out how much time is needed to clean a street. On most streets you will mainly find dust, sand, leaves, food leftovers, paper and plastic and at some places glass. If many animals use the streets, they will be contaminated with a considerable amount of dung on the driveway. Otherwise most dirt will be found at the edges of the street where the pedestrians move.
To do street sweeping three kinds of tools are needed:

1. brooms
2. shovels
3. collection carts

The most convenient form of collection carts are wheelbarrows and handcarts. The use of buckets and small containers is not recommended as it increases the required time and efforts for transporting the waste. Normally the waste is swept together at the side of the street, shovelled into the transport vehicle and brought to a temporary storage place from where it will be collected by truck or tractor for disposal at the dumpsite.

5.3 Collection and Transportation of Stored Waste

As already pointed out in the last session, there are different levels of collection and transportation. These we call primary and secondary collection. **Primary collection** refers to the collection and transport of waste from the household to the temporary storage places within the community. **Secondary collection** refers to the collection and transport of waste from the temporary storage places in the community to the disposal site, usually the legal landfill.

![Handcarts used for primary waste collection in Dar es Salaam](image)

Usually, within high-density communities the primary waste transportation is done by hand, or in small transport vehicles like wheelbarrows and handcarts. From the communal storage places in or around the community, the secondary transport to the dumpsite usually needs transportation by tractor or truck.
The choice of the collection and transport method depends not only on whether it is primary or secondary collection, but also on many other factors like:

- The storage method used (see previous session);
- The nature of the waste to be collected;
- The availability and costs of collection equipment;
- The kind of neighbourhood, houses, offices, industries, high/low income areas, etc. to be collected from;
- The level of participation by the community;
- The population density in the area, the width of the streets, road conditions, distances etc.; and
- Availability of budget.

### 5.3.1 Waste collection methods

Different waste collection methods and activities include:

1. Waste picking by hand and throwing it into a container (bin, bag, bucket, basket, etc.);
2. Sweeping using brooms or local brooms (special grass/sticks tied together.);
3. Collection of garbage stored in household premises in dustbins, small containers, bags, or heaped in a corner of the yard;
4. Collection of garbage placed at the side of the road in dustbins, containers or bags, or piled up next to the road;
5. Collection of garbage piled up in open spaces;
6. Collection of waste from communal storage points (collection points, midden boxes or transfer stations); and
7. House to house collection with a vehicle in which the people deposit their garbage.

A system of collection of communally stored waste can only be successful with the participation of the community. If the people in the community think that the distance to these communal dumping points is too far, they will not make use of them. A global rule is that the distance should not exceed more than 150 to 200 metres.

Using a vehicle that passes the houses can reduce the effort of the community. A horn is blown to inform the people that they can deposit their garbage in the vehicle. An advantage of this method is that only two workers are needed. The collection has to take place at the same time at fixed intervals with an interval preferably not larger then three days.

The waste collector can also collect the waste from dustbins, containers or bags placed along the road. The people only have to put these dustbins, containers or bags at the roadside. It is very important that the waste is collected in time, otherwise scavengers and animal will
search the dustbins, containers or bags or they might even get stolen. If the dustbins or containers are pushed over, they may create a mess and hinder traffic.

A last option is to collect the stored waste from the houses themselves. This option is very reliable. It needs hardly any participation from the community, except for them to store the waste in one location, bag or small container in their yard. However, this method is very time consuming.

5.3.2 Collection and transport equipment

There is a whole range of possible vehicles to transport waste from one place to another. As seen in the previous session, waste contractors will probably choose for different vehicles for the collection of the waste (from the houses to the transfer station) and for the transportation of waste (from the transfer station to the landfill).

When you have to select vehicles (motorised and non-motorised) for waste collection and transportation you need to consider several issues:

- There should be enough spare parts available locally as well as enough experienced mechanics to maintain the vehicles.
- Choose the vehicles on criteria as reliability and costs, as well as required capacity and travel distances.
- Use the same kind of vehicles in similar situations.
- If the vehicle is loaded by manual labour the loading height should not exceed 1.5 metres.
- Make sure that the vehicle is easy to unload.
- Even for the simplest handcart, using tyres filled with air can cost you if they get punctured frequently. This is likely to happen in unplanned areas where the passages are poor and sometimes littered with sharp objects. It is therefore sometimes better to use solid rubber tyres on wheelbarrows and handcarts.

5.3.3 Energy sources for moving waste vehicles

There are three kinds of power to move vehicles:

1. Human beings
2. Animals
3. Fuel engines

Human traction

Human beings can push handcarts and wheelbarrows, and drive delivery tricycles as shown in the illustrations on the next page.
Waste Transportation Equipment used in Latin America

1. Equipment used by the street sweeping micro-enterprise in the district of Miraflores, Lima, Peru.
2. Handcart used for household waste collection by micro-enterprise in La Pal, Bolivia.
3. Collection cart used in el Salvador.
4. Collection cargo tricycle used in Peru.
5. Pick-up truck used for collection in various countries.
6. High-sided truck used in various countries for collection.
7. Farm tractor and trailer used in Costa Rica and Cajamarca, Peru. A mini-tractor is used in Niteroi, Brazil.
8. Cart used by the waste pickers in Brazil and Colombia.
Hand-carts
There are many different designs of handcarts. Some are pushcarts, others pull carts, some are made for heavy loads, others for light loads. When you consider buying a handcart it is important to think about your needs. The following are a few of the questions you will have to ask yourself: What is the load the cart should be able to carry in weight and volume? What type of wheels will make the cart easy to manoeuvre? Do you prefer pushing or pulling? What should be the loading height, and how do you want to empty the handcart when full?

It can be difficult to unload handcarts. Sometimes the efforts to unload the handcart can be reduced by using portable containers. For example loading carts with bags of waste rather than throwing the waste straight into the car. But this might reduce the amount of waste that can be transported. In general the use of handcarts requires a lot of collection points or small transfer stations, as handcarts are not suitable for long transportation distances. The distance between the collection points or transfer stations should normally be around 2 kilometres. The use of handcarts in areas with steep slopes can pose a lot of difficulties.

Wheelbarrows
In general, wheelbarrows should not be used for large transportation distances, as their capacity is normally too low and too much time would be spend on going to and from the temporary storage point. Therefore wheelbarrows are in general not very suited for the commercial collection of waste. There are adapted designs of wheelbarrows that have a larger loading capacity, but these are often difficult to handle.

Some areas are so crowded that handcarts cannot go through. For example there are such areas in Dar es Salaam. Waste collectors can use their heads, their shoulders or their hands (two people carry a bag) to carry waste from such places to a nearby place where a handcart can reach. Another option is to use wheelbarrows to collect waste from these crowded places.

Tri-cycles
In the illustrations on the previous page you can see an example of a tri-cycle as used for waste collection in Peru. A tricycle can make it easier to transport a bigger load over longer distances, as generally the speed is higher. A disadvantage of using tricycles is that they require decent roads with not too many bumps and potholes. This makes them unsuitable for the peri-urban areas in Lusaka.

Animal drawn carts
Animals like donkeys and horses can be used to pull carts. As animals are generally stronger than people, they can pull larger loads. In areas with steep slopes the use of animals can be more appropriate then handcarts for waste transportation. Often the animal drawn carts are easy to unload. Maximum travel distances should not be more then about six kilometres.
**Engine driven vehicles**

*Motorbikes*
Motorbikes on three wheels with a box of about two cubic metres are a form of engine-driven vehicles that can be used on high quality roads. Due to their high speed, the distance between the transfer stations can be increased up to 20 kilometres.

*Tractor and trailer*
On bad roads it is better to use tractors with trailers or trucks. The disadvantage of tractors with trailers is that they are not economical in use on longer distances. Normally the distance between the transfer stations and the final dumpsite should not exceed 10 km for this combination.

*Trucks*
Many different types of trucks can be used for waste transportation. Trucks are economical for use over long distances as their fuel use per volume of waste transported is low. In developing countries, open trucks are the most common form of vehicles used to transport waste from transfer stations to the landfill. While transporting solid waste on an open truck the waste should be covered by a wire-net to prevent it from being blown off by the wind.

**Motorised Waste Transportation Equipment**

A container truck
5.4 Waste Disposal

Waste disposal refers to the final storage of waste. If properly done, the waste will be
disposed of at a site specially prepared for that purpose, or, alternatively, it’s final treatment,
which can be permanent destruction or decomposition.
5.4.1 Unacceptable disposal methods:

The following are a few examples of waste disposal methods that are not advisable because of their negative effect on the environment and possible danger to people.

(a) Crude dumping is throwing waste at just any site without taking precautions for the environment. It can cause health dangers, soil, air and water pollution.

(b) Burning of waste: Burning of waste without special oven creates air pollution and the risk of fires breaking out or explosions taking place.

(c) Burying of waste: Buried waste can cause soil and water pollution. Also, in the buried waste gases might be formed that can contaminate the air, or burst into flame.

5.4.2 Acceptable disposal methods

The best waste disposal option is the one that has least impact on humans and the environment. In that regard, three waste disposal options are satisfactory:

- Sanitary land filling
- Incineration
- Composting

Sanitary land-filling is a term used to describe properly designed and controlled operation of a well-engineered waste disposal site where the waste is dumped, compacted and regularly covered with a layer of soil. A properly prepared site will protect the environment against leaching of pollutants to the groundwater and other negative environmental effects. Land-filling is the most commonly used method for disposal of municipal waste. A sanitary landfill is required to be sanitary, which implies that, waste in the landfill has to be controlled and maintained in such a way that there is no nuisance or health risk, and that the landfill does not cause any environmental problems. On a well-managed landfill, the waste is confined and compacted to the smallest practical volume and then covered with earth or soil. These operations follow the three ‘Cs’ – concept of Conﬁne, Compact and Cover.

When a landfill is not sanitary, i.e. not well designed and/or managed, what is being done is in fact crude dumping. This is the way in which most municipalities in developing countries dispose of the collected waste. So too in Lusaka, the waste that is collected is transported to the legal dumpsite, which in fact is just a place where concentrated crude dumping takes place.

Incineration refers to the controlled burning of waste, which is done in a special oven. With incineration the waste is burned with high temperature and it therefore produces less toxic gases. Also, incineration achieves the complete destruction of small-organisms and a large reduction in the volume of waste. Incineration is usually applied where waste cannot be recycled, re-used or safely disposed of on land. It is very expensive and therefore not commonly used in developing countries. Also, the type of waste collected in most developing
countries is almost always not suitable to be burned. It does not contain enough materials that can burn and too much organic waste, sand and dust. So to burn it, you need to add fuel, like oil, gas or coal. Fuel is usually too scarce and/or expensive to be used for this purpose in developing countries.

**Composting** is simply the process of turning any waste that can rot into humus. Humus is used as nutrients for crop and vegetable production. However, you are advised to first concentrate on waste collection and dumping and later explore the possibilities of composting. When such a time will come, you will require a separate training in compost making.

### 5.5 Group Work

Answer the following questions and write answers on flip-charts:

#### 1. Waste collection

(a) What is the current practice or method of collection of waste in the settlement where you live?

(b) Suggest other possible methods or practices of collecting waste.

(c) For each method what are the advantages and disadvantages?

(d) Which practices or methods would be best suited to be used in your settlement?

(e) What are the best tools and equipment in your situation and which ones are affordable?
2. **Transportation of waste:**
(a) What is the current practice or method used for the transportation of waste in your settlement?

(b) Suggest other methods or practices of transporting waste.

(c) For each method what are the advantages and disadvantages?

(d) Which practices or methods are best suited to your situation?

(e) What are the best tools and equipment for transportation of waste in your situation and which ones are affordable?

3. **Waste disposal**
(a) What is the current practice or method used for the disposal or dumping of waste generated in your settlement?

(b) Suggest other methods or practises for disposing or dumping of this waste.

(c) For each method what are the advantages and disadvantages?
(d) Which practices or methods are best in your situation?

(e) What are the best tools and equipment for disposal of waste in your situation and which ones are affordable.
6. RE-USE, RECYCLING AND COMPOSTING

In the first session we defined waste as things or leftovers that lost their value to the initial user. This does not mean that waste is useless for everybody. For example, at the waste dumpsite or the waste disposal site, there are usually waste pickers known as scavengers, who collect some of the disposed off waste as something which is valuable to them. They pick for example: cans, carton boxes, iron scrap, plastic and glass bottles, dumped food, etc.

Instead of having to collect still valuable materials from the waste that is dumped at the legal dumpsite, there are other ways of reducing the amount of waste dumped. Firstly, it is possible to refuse to accept taking things that have to be thrown afterwards like plastic shopping bags or unnecessary wrapping paper. Also, you can reuse plastic bags, bottles, etc. instead of throwing them. Lastly, materials that could be used for recycling can be separated from the waste before it is dumped at the legal dumpsite.

6.1 The Solid Waste Management Hierarchy

The SWM hierarchy represents an approach to SWM, which prioritises the various options in dealing with solid waste. According to this hierarchy, optimisation of any SWM system means focusing on moving it up the hierarchy, away from disposal into the direction of waste avoidance. See the illustration of the SWM hierarchy below. From this illustration you can see that avoidance of waste generation is the best option. The second best option is to minimize the amount of waste you generate. The third most desirable option for dealing with solid waste is the recovery of materials by practising recycling and reuse where possible.

Crude dumping of solid waste is not considered to be an option in a SWM system and is therefore, shown outside the pyramid. It is not part of the hierarchy because it represents an unsustainable and undesirable SWM option. So, disposal is the first step on the SWM hierarchy. It is the most practised option for municipal SWM, in which the solid waste is disposed of on a municipal solid waste landfill.

Even in highly sophisticated SWM systems there will always be a portion of the waste that will need to be disposed of. The landfill is therefore an essential component of any SWM system.
6.2 Waste refusal, Re-use and Recycling

6.2.1 Waste refusal or avoidance

This means not generating unnecessary waste. Not accepting unnecessary plastic bags, or wrapping papers and other containers when you go shopping is one way of avoiding to bring waste to your home. In this way the amount of waste you generate will be reduced.

6.2.2 Waste reuse

There are different forms of recycling. Waste reuse is a form of recycling, which refers to using something again which would otherwise have been thrown away. A good example for waste that is re-used is waste paper. Waste paper can be newspapers, magazines and books, cardboard and mixed papers etc. Waste paper is re-used as toilet paper, tobacco paper, wrapping paper for foodstuff and others.

Another example of re-use that was already given in earlier sessions is the re-use of glass bottles. Glass bottles are often not thrown away or picked from the waste to be sold to marketers for re-use in the bottling of cooking oil, beer, soft drinks, honey, etc. At household level both glass and plastic bottles and other containers are widely re-used in the kitchen to store drinking water, salt, sugar, pepper, etc. Things that can be re-used are called re-usables.
It is also possible to use a re-usable as a part of a new product. For example oil lamps can be produced from old tins and very nice toys are partly produced from tins as well.

### 6.2.3 Waste recycling

Waste recycling is the re-use of the material the waste is made off to make a new product of the same material. For example, did you know that it is very easy to produce paper from old paper or clothes? Or an even better example, that you can melt any discarded glass and produce a brand new bottle from it. This is what we call recycling of waste.

Waste recycling refers to methods of isolating certain waste materials and using them to produce new goods. Materials with a high potential for recycling are:

- **Paper.** Waste paper, like newspapers, magazines, card-board, books, and letters can be used to make new paper or cardboard.
- **Metal.** For example scrap metal, auto wrecks, aluminium (beverage) cans, used copper wire, etc. can be used to make new metal products.
- **Textile.** Textile off-cuts, old clothes, etc, can be used for the production of door mats, cushions, mattresses, kid’s underwear, home-made caps and duster coats, stuffing dolls and others. Also, textile can be used in the production of high quality paper.
- **Plastic.** Waste plastic such as broken buckets, plastic bottles, shopping bags and containers can be melted and formed into new products.

Materials, like the ones mentioned above, that can be used for recycling are called **recyclables**.

### 6.3 Recycling as a Business

It can be interesting to consider recycling as a business. Whether or not recycling is interesting for you depends on the composition of the waste that you are collecting. If there are large quantities of recyclables in the waste that you collect you might consider separating them from the rest of the waste, to sell them to middleman or industries.

Before you can start with the collection of recyclables you need to know who your clients are. You may find some potential clients in your neighbourhood (the informal sector uses a lot of recyclables). Usually these are small clients. Bigger clients are companies that produce (semi-)finished products, like the paper, plastic, metal, and glass industries. Not all of these companies are already aware of the benefits of using waste as a raw material. Also, not all these industries are available in Lusaka.
The product cycle of recyclable aluminium cans.

1. Consumption
2. Collection of empty cans
3. Pressing of cans
4. Transport to the processing plant
5. Manufacture of new aluminium ingots
6. Production of aluminium sheet
7. Production of cans
8. Filling the cans
9. Sale to consumer
After having identified your clients, you need to investigate how much these companies are willing to pay and what are the requirements towards both quality and quantity. The bigger companies usually only buy per minimum amount of recyclables. For example, a minimum quantity of one tonne (1000 kg) is not uncommon. The quality requirements can differ a lot, but often you may be required to sort and clean the waste. You may have to sort on colour (for glass and paper), kind of material (metals) or origin (plastics). But other requirements are found as well.

If you would seriously be thinking of starting recycling, you might have problems with meeting the quantity requirements of these companies. Therefore, in many cases you will have to join hands with other Community Based Enterprises before you can start recycling as a business. Through combined forces, you may be able to allocate enough space to store the recyclables until you have enough to hire a truck and transport them to the factory. Also, somebody may be interested to operate as a middleman. This means that s/he buys the recyclables from you and transports and sells them to the companies. In this way you will get less for the recyclables, but you also do not have the problems of storage, minimum quantity requirements and transportation of the recyclables. Therefore, if there are middleman who want to buy certain recyclables from you this might be the easiest way to start.

*Storage of recyclables in Dar es Salaam*

We have now looked at some options to meet the quantity requirements for recycling, let’s now take a closer look at how to separate the recyclables from the waste. The recyclables can be separated at different locations. **Separation at source** means that the producers (of the
waste) are already sorting the recyclables from the waste. In fact the recyclables do not mix with the waste. It is important that the producers of waste do receive the right incentives to keep these recyclables separated from the rest of the waste. A good method to stimulate people to keep the recyclables a side is to buy them from them. This means that you have become a middleman.

It is also possible to separate the recyclables at the transfer stations. The disadvantage of this method is that the recyclables are now mixed with the rest of the waste and often dirty or contaminated and that it takes more effort to clean them.

After separating the recyclables from the waste, you might have to sort or clean them before you can sell them to middlemen or industries. Cleaning of recyclables can be an art in itself as dirt can be enclosed in the recyclables. You may consider to cut or crush the recyclables, to make the inside of the tins, bottles, etc. accessible for cleaning. Cutting or crushing also has the advantage that you reduce the volume of the recyclables, which results in lower transport and storage costs.

6.4 Compost

A special form of recycling is composting. Compost contains a lot of humus. Humus is the stuff that remains when organic matter is broken down by microorganisms. It is also some kind of food for plants. Therefore, compost is used by farmers to improve the soil condition. Compost not only replaces fertiliser or dung, it also gives the soil more air and it has a high capacity to bind water. Especially in arid areas this is a great advantage. Although (natural) fertiliser, like cow manure, contains a lot more food for the plants, compost is a reasonable alternative. If you would like to use compost as food for the plants, you need to use a lot of it. If you have your own small farm or vegetable garden, try it! You might save a bit of money, because fertiliser is normally quite expensive.

Unfortunately there is often no existing demand for compost. People are not used to using it. Before you would start commercial production of compost, you need to study your future clients and think of how you are going to convince them to buy your compost.

Caution: As already pointed earlier, recycling and composting are useful and can generate income. But they can only be of economic interest if they are well organised and if there is a market for the products. Therefore, you are advised to first concentrate on setting up a waste collection and disposal system and later explore the possibility of recycling and composting as additional sources of income generation. You will also need further training before undertaking composting and recycling.
## 6.5 Waste Recycling in Dar Es Salaam

Below find a table that shows what kind of materials are recycled in Dar es Salaam, where they are found, who are the buyers and what is the price for which they are sold. This is to give you an impression of the potential of recycling.

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Examples</th>
<th>Potential Source</th>
<th>Potential Buyers</th>
<th>Sales /Price in Tanzanian Shillings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>office paper (mixed) cement bags cardboard,</td>
<td>supermarkets shops, households</td>
<td>collectors (newspapers only) d). Paper dealers / Middlemen</td>
<td></td>
</tr>
<tr>
<td></td>
<td>carton boxes old newspapers, etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>basins, bottles, dishes, sheets,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material Type</td>
<td>Examples</td>
<td>Potential Source</td>
<td>Potential Buyers</td>
<td>Sales /Price in Tanzanian Shillings</td>
</tr>
<tr>
<td>---------------</td>
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<td>------------------</td>
<td>------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Ferrous Metal</td>
<td>Oil drums, steel bars, motor scrap, etc.</td>
<td>Workshop garage, construction sites, Industries. Scrap dealers</td>
<td>a). Tazara workshop, b). Ubungo Farm Implements, c). Mangula mechanical Workshops d). Middlemen f). Exported to Kenya</td>
<td>300/= per Kg. at factory gate. But very difficult to reach factory. Middlemen and dealers buy at 30/= per kg.</td>
</tr>
<tr>
<td>Glass</td>
<td>Broken pieces’, bottles, (beer, spirits, soft drinks, ) etc.</td>
<td>Bars, restaurants, hotels, households, workshops, construction sites, etc.</td>
<td>Kioo Ltd. Door to Door Collectors (bottles only)</td>
<td>12/= per kg. at factory gate.</td>
</tr>
<tr>
<td>Organic Waste</td>
<td>Food remains, Market waste, vegetables etc.</td>
<td>Households, Hotels, etc.</td>
<td>Investors in composting</td>
<td>Not established yet.</td>
</tr>
<tr>
<td>Others</td>
<td>Textiles (Cloths) Leather (Shoes) Etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.6 Group Work

The objectives of this exercise are to:
1. Find out how much waste remains for dumping after all recyclable and re-usable materials have been sorted out.
2. Describe the type of waste that is finally to be dumped (in terms of volume of total, composition, weight, etc.).
3. Identify the types and quantities of recyclable materials you are likely to find in the waste from your compound.
4. Have a rough idea of how to do a waste analysis.

Exercise 1:
1. Each group is provided with a bag or bin full of waste
   (a) Weigh how much waste is in the bag or bin you have brought or been given.
   (b) With gloves on your hands and coats over your shirt or dress pour waste from the bag or bin on to the ground.
   (c) Sort the waste identifying it by name or by type.
   (d) Sort out all recyclables and re-usables, including organic waste (for composting).
   (e) Observe and analyse what is remaining for dumping or final disposal.
   (f) Check the volume and weight of the remaining waste or give estimates.
   (g) Suggest possible sources of each type of recyclable waste, that is, where do you think such waste came from.
   (h) How much of each type of recyclable waste is there compared to the total amount of waste? To find this out, estimate the composition of the recyclable waste. That is: weigh each type of recyclable waste on a weighing scale, and calculate the percentage of the total as: weight measured divided by total weight times 100% (weight measured / total weight x 100%).
   (i) Tabulate the results in the table shown below. (Make your own table and write all results on a flip-chart).

Table of Results

<table>
<thead>
<tr>
<th>Type of Waste</th>
<th>Percentage of total</th>
<th>Possible sources</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

65
<table>
<thead>
<tr>
<th>Type of Waste</th>
<th>Percentage of total</th>
<th>Possible sources</th>
<th>Remarks</th>
</tr>
</thead>
</table>

2. What is the total weight or amount of all materials to be recycled?

3. Describe the waste that remains for dumping.

4. How much waste is to be dumped as compared to what can be recycled (weight, volume)?
Exercise 2: Waste Recycling in Lusaka:
Find potential buyers and price and fill in the last two columns, when you are ready to start recycling

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Examples</th>
<th>Potential Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper Waste</td>
<td>Computer, printing-cuttings, office paper (mixed) cement bags cardboard, cardon boxes old newspapers, etc.</td>
<td>Computer users, printing shops, offices, factories, learning institutions, supermarkets shops, households</td>
</tr>
<tr>
<td>Plastic Waste</td>
<td>Plates, jars, cups, mugs, jerry cans, buckets, basins, bottles, dishes, sheets,</td>
<td>Households, shops, hotels, markets, etc.</td>
</tr>
<tr>
<td>Non Ferrous Metal Waste</td>
<td>Aluminium cans and scrap, Copper, brass, etc.</td>
<td>Bars, restaurants, hotels, households, workshops,</td>
</tr>
<tr>
<td>Material Type</td>
<td>Examples</td>
<td>Potential Source</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Ferrous Metal</td>
<td>Oil drums, steel bars,</td>
<td>Workshop garage, construction sites, industries, scrap dealers</td>
</tr>
<tr>
<td></td>
<td>car and engine scrap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>metal, etc.</td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>Broken pieces’, bottles,</td>
<td>Bars, restaurants, hotels, households, workshops, construction sites, etc.</td>
</tr>
<tr>
<td></td>
<td>(beer, spirits, soft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>drinks, ) etc.</td>
<td></td>
</tr>
<tr>
<td>Organic Waste</td>
<td>Food remains, Market</td>
<td>Households, hotels, markets, etc.</td>
</tr>
<tr>
<td></td>
<td>waste, vegetables etc.</td>
<td></td>
</tr>
<tr>
<td>Material Type</td>
<td>Examples</td>
<td>Potential Source</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Others</td>
<td>Textiles (Cloths)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leather (Shoes)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Etc.</td>
<td></td>
</tr>
</tbody>
</table>
7. GENDER ROLES IN SWM: AN OVERVIEW

7.1 The Concept of Gender and Sex

Gender is a new concept to many particularly the people at the grassroots level. It is also a confusing concept as it is viewed as a women’s issues by many people. For most people it is not easy to point out the differences between gender and sex unless s/he has been made aware of it for instance by gender sensitisation. This session aims at increasing your awareness of gender issues and focuses on integrating them into solid waste management.

7.1.1 Definitions of concepts

- **Sex**: is the term that identifies the biological differences between men and women, characteristics that are universal and unchanging.
- **Sex Role**: is a role that a male or female performs by virtue of their biological makeup. A sex role can be performed by only one of the sexes. There are very few sex roles, for example: getting pregnant by women, bearing babies by women, breast-feeding by women, men making women pregnant, speaking with a deep voice by men, etc.
- **Gender**: is the term that identifies the social differences between men and women that are learned, are changeable over time, and have wide variations within and between cultures.
- **Gender Roles**: are learned behaviour in a given society. Gender roles condition activities, tasks and responsibilities that are considered feminine and masculine. Gender roles are interchangeable, this means that they can be swapped between man and women. For example it is considered to be a woman’s job (gender role) to sweep the house, but there is nothing that makes it impossible for a man to do the sweeping.
- **Gender Sensitisation**: Is the systematic effort to promote awareness of gender differences and implications that these differences have on planned change and in development efforts.
7.1.2 Summary: Sex and Gender

The following are some distinctions between sex roles and gender roles;

<table>
<thead>
<tr>
<th>Gender Roles</th>
<th>Sex Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differ from society to society</td>
<td>Same in all societies i.e. universal</td>
</tr>
<tr>
<td>Change with history or over time i.e. dynamic</td>
<td>Do not change with history or over time i.e. fixed</td>
</tr>
<tr>
<td>Vary within the society</td>
<td>Do not vary in any society</td>
</tr>
<tr>
<td>Affected by social and cultural factors e.g. religion</td>
<td>Not affected by religion or other social and cultural factors</td>
</tr>
<tr>
<td>Are very many and complex</td>
<td>Few and mostly limited to reproductive functions</td>
</tr>
</tbody>
</table>

7.1.3 Gender Myths and Stereotypes

Gender myths and stereotypes are society’s biases that ascribe certain roles to men and others to women. They are based on how women and men are related and interact in society. They involve several constructed roles, types of accepted behaviour, accessibility to resources, and the manner that power is held and exercised in the society and the family. A good example in waste is women not driving waste trucks and men not sweeping the house. The two case studies given in 6.4 and 6.5 below highlight such typical myths and stereotypes.

7.2 Gender and Waste

Due to gender roles and myths, women and men do have different attitudes towards solid waste. In many societies or communities, women and children have the responsibility for keeping the family courtyard clean, taking out the garbage, and dumping it somewhere.

Women also appear to be very creative in recycling and re-use of waste in their own houses, especially in the low and middle-income families. The following are examples of materials that are re-used or recycled by households:
1. Glass bottles and plastic bottles are washed and reused for storing cooking oil, drinking water, salt, sugar, kerosene, local beer, etc.
2. Newspapers and other waste paper are used for: wrapping things like buns, covering school exercise books, lighting of cooking fires, as toilet papers, etc.
3. Food waste is collected to feed livestock and used to make compost.
4. Empty cooking oil containers and paint tins are re-used as plant or flowerpots.
5. Plastic and paper bags are re-used as shopping carrier bags.
Try to write down who is doing what in your family with waste:
Who produces waste?
Who collects waste?
Who stores waste?
Who disposes of the waste outside the house?
Is waste reused and if yes, how, and by whom?

In many societies, it are mainly young men who go from door to door to collect recyclable materials. For example glass bottles: beer, soft drinks, and medicine bottles, as well as newspapers and magazines. They sell these items to middlemen or industries for recycling or to other individuals for re-use.

*Can you describe who are doing these activities in your community?*

**The Work Load on Women in Africa:**
Box 6: Women in waste management: the case of Dar es Salaam

In Dar es Salaam both women and men gain an income from collection and disposal of solid waste. Some contractors in solid waste management have only female labourers. It turns out that women are as capable as men to carry out solid waste management activities, including recycling.

During a training in mobilisation skills, organised by ILO, a discussion was raised on the question why it was mostly women who were sweeping streets and carrying waste, as well as doing various voluntary jobs in waste management, while handcarts were only pushed by men. Often the person who pulls the cart is better paid than a sweeper. Participants in the course, all of them members of groups involved in solid waste management or local leaders, had a lively discussion and concluded it was only because of the idea that women would not be strong enough. An old woman stood up and said: “Look how ideas about the strength of women change, whenever it is convenient. We women do all kinds of heavy work in the fields, we carry heavy loads, why should we not be capable of handling a handcart?”

Immediately after the training, two women groups mobilised women to pull/push hand-carts instead of boys who were employed until then. It was soon noted that they were collecting more money than before, because the boys had been dishonest, pocketing part of the money they collected.

It is now a usual phenomenon in Dar es salaam, to see women (young as well as middle-aged) pulling or pushing carts with garbage. Women have proven to be good waste fee collectors and many companies, and Community Based Organisations (CBOs) involved in Solid Waste Management services are using women as revenue collectors.

Scavengers (waste pickers) may sort solid waste that is dumped outside the household area looking for things they can re-use or sell. These scavengers can be both female and male, and often also include children.
Men tend to dominate the salaried jobs in waste management. On the other hand, women do most of the unpaid work at home. In most countries, truck loaders and drivers and most of the management of solid waste departments or enterprises are men. Women often do street sweeping.

*How is this in your community? Is it possible to use more women for loading and driving of waste collection vehicles and for management activities? If yes, how?*

### 7.3 The Situation in Lusaka, Zambia

As you will all know, at household level, women and girls and servants, the majority of whom are women, are the ones normally handling solid waste management. These people are the ones who are responsible for the cleanliness of the homes. At economic level women are involved in activities as street sweeping and men are the ones who work as labourers and drivers on collection vehicles.

Women are few at the decision making level in solid waste management. A notable exception is the proprietor of Cleanfast Ltd., a company involved in solid waste collection in Lusaka. In the Solid Waste Issue Specific Working Group of the Lusaka City Council, women constitute about 40% of the membership.

### 7.4 Case study: Accident

A father and his son were driving to a party when their car stalled on the railroad tracks. In the distance a train whistle blew a warning. Frantically, the father tried to start the engine, but in his panic, he couldn’t turn the key, and the car was hit by the onrushing train. An ambulance sped on the scene and picked them up. On the way to the hospital, the father died. The son was still alive but his condition was very serious, and he needed immediate surgery. The moment they arrived at the hospital, he was wheeled into an emergency operating room, and the surgeon came in, expecting a routine case. However, on seeing the boy, the surgeon blanched and muttered, “I can’t operate on this boy – he is my son”

*Who is the surgeon?*

*Why?*
7.5 Case study: dialogue between Mr. Mbuzi and a Doctor

Doctor: What type of work do you do?
Mbuzi: I am a peasant farmer.

Doctor: Do you have any children?
Mbuzi: Oh! God has been not good to me, out of 12 only 7 are alive.

Doctor: Does your wife work?
Mbuzi: No, she stays at home. She wanted to work as road sweeper but I do not like that idea at all. It is a shameful job.

Doctor: I see! What does she do at home, from when she wakes up until bed-time?
Mbuzi: Well, she wakes up between 5.00 and 5.30 a.m., prepares water for me for taking a bath, prepares breakfast for me and the children, at the same time cleans the house and sweeps the compound.

Doctor: What do you do during this time?
Mbuzi: I stay in bed listening to the radio until the water is ready for bathing.

Doctor: What does she do afterwards?
Mbuzi: She goes to farm, comes back with firewood and prepares lunch, she then fetches some water and does the washing. If it is market day she goes with one of our daughters to sell vegetables and do some shopping.

Doctor: What do you do yourself after breakfast?
Mbuzi: I escort my wife to her farming or go out and talk business or go to the local beer shop to discuss with friends.

Doctor: When do you take your lunch?
Mbuzi: I time when it is ready or my wife sends a message if I am late and she happens to know where I am.

Doctor: At what time does your wife go to bed?
Mbuzi: At around 23.00 hours after finishing washing dinner dishes and ensuring all children are in bed.

Doctor: But you said your wife does not work?
Mbuzi: Yes, I told you. SHE DOESN'T WORK. SHE STAYS AT HOME!! (angrily).

Do such myths or biases still exist in your society?
If so to what extent do they exist? Give some examples.
7.6 Group Work Gender Roles: how much are women and men involved in SWM activities?

Exercise:
1) Fill in the table on the following pages. Specify for each activity who is involved and what percentage of the activity you think is done by whom.
2) After filling in the percentages: compute the total percentage for each column and check who is involved more and why.
3) Is there any activity in Solid Waste Management (SWM) that cannot be done by men?
4) Is there any activity in SWM that cannot be done by women?
5) Which of the activities in the table are concerned with:
   a) Waste generation
   b) Waste collection
   c) Waste transportation
   d) Waste disposal
   e) Waste Recycling
   f) Waste Composting
6) How much total percentage are women involved in each of the activities listed under 5) ?
7) Why the differences in involvement in different tasks and roles between man and women (if they exist)?
8) Brainstorm on strategies for how best these different gender roles in SWM can be integrated and utilised to benefit both men and women.
9) Give any other comments in the column: Remarks.
Table: Gender Roles: how much are women and men involved in SWM activities?

<table>
<thead>
<tr>
<th>No.</th>
<th>Activity in Solid Waste Management (SWM)</th>
<th>Who is involved and by how much in percentage?</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Men or Fathers</td>
<td>Women or Mothers</td>
</tr>
<tr>
<td>1</td>
<td>Sweeping / cleaning of bedroom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sweeping / cleaning of kitchen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sweeping / cleaning of sitting room</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Wiping dust from windows / furniture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Removing spider webs from your houses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Removing garbage from the kitchen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Storing garbage at home</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Sweeping of yards or compound around your house</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Removing waste from the compound of your house</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Re-using waste (bottles, tins, plastic containers, boxes, etc.) at home</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Digging or preparing a ditch for dumping garbage from home</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Burying of garbage at or near home</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Activity in Solid Waste Management (SWM)</td>
<td>Who is involved and by how much in percentage?</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------</td>
<td>-----------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Men or Fathers</td>
<td>Women or Mothers</td>
</tr>
<tr>
<td>13</td>
<td>Burning of waste at or near home</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Collecting waste from households to collection points or illegal dumps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Paying for waste collection services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Doing voluntary community cleaning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Pulling / pushing hand-carts with waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Sweeping of roads / streets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Loading of waste into vehicles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Driving trucks with waste for dumping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Unloading of waste from trucks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Scavenging at legal or illegal dumps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Deciding on what is to be done or who should do what in SWM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Starting of waste enterprise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Management of waste enterprise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Collecting fee for waste collection services</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

78
<table>
<thead>
<tr>
<th>No.</th>
<th>Activity in Solid Waste Management (SWM)</th>
<th>Who is involved and by how much in percentage?</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Men or Fathers</td>
<td>Women or Mothers</td>
</tr>
<tr>
<td>27</td>
<td>Making rules and regulations for waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Enforcing rules and regulations for waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Other activities (specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Percentage of each</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Average Percentage</th>
<th></th>
</tr>
</thead>
</table>
8. SITE VISITS TO SOLID WASTE MANAGEMENT SITES

Apart from the theory and explanation of existing practices with regard to solid waste management, it is important to go on a site visit. The visit will help you to look at the existing situation with new eyes. This will help you to apply what you have learned in a better way. The visit will consist of a Walking tour of the community and a Visit to the city landfill (legal dumpsite). During the visits, it is important to carefully observe the existing situation and compare it with what you have just learned. Start thinking of how you can manage to improve on what you see. Make use of the guidelines that are provided below and fill in the detailed checklists given in section 8.3: group work.

8.1 Walking Tour of the Community

The walking tour should be done in a community where waste management is already practised. If in your own community others already practise waste management you can do this exercise in your own community. Otherwise you will have to go to another, similar community where waste management is being practised.

While in the community:
1) Identify various types of storage methods for waste used at household and community level.
2) Distinguish the waste you find per type: hazardous and non-hazardous waste, organic and non organic waste, recyclables, re-useable, etc.
3) Suggest possible sources for the types of waste identified. Describe where you think the waste is coming from.
4) Assess the risks involved in collecting the types of waste you find and precautions to be taken when handling this waste.
5) Identify what waste related activities are taking place, e.g. street sweeping, recycling, scavenging. Why is this activity done, by whom and why is this person or are these persons involved?
6) If the following activities are in progress, try to participate and check how easy or difficult it is to do these jobs:
   a) Loading a pull cart or a vehicle with waste,
   b) Pushing or pulling a hand-cart full of waste,
   c) Unloading waste from a handcart to a midden box or collection point.
7) Observe, analyse and record any other useful information.
8.2 Visit to the City Landfill

While at the dump-site or landfill:
1) Identify various types of hazardous and non-hazardous waste, organic and non organic waste, and recyclables and re-useable.
2) Suggest possible sources of the wastes you see.
3) Assess risks involved in handling the waste and precautions, which can be taken.
4) Assess what is done to the dumped waste.
5) Identify activities taking place, e.g. scavenging: who does what and why?
6) Try to participate in the unloading of waste from a vehicle if possible.
7) Check how easy or how difficult it is to do such a job.
8) Observe, analyse and record any other useful information.

Similar activities should be done in case you make such visits in future. Use the detailed checklists provided below for these particular visits.

8.3 Group Work

8.3.1 Table of Observations at The Legal City Dumpsite / Landfill

Check the following and fill in the table accordingly. Answers can be treated as comments or remarks

<table>
<thead>
<tr>
<th>Items To Be Checked / Observed</th>
<th>Yes or No?</th>
<th>Comments or Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of Dumpsite Manager or any officer responsible for the landfill visited.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If YES get answers for the following questions from him/her (the answers might be helpful in establishing and dealing with a temporary collection point or SWM in general in your area of operation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a). When, why and how was the landfill established?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b). Why is it located where it is?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c). What were the reactions of the residents around, during the establishment of the landfill?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d). What was done with these reactions to ensure successful establishment of the landfill?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e). What is the opinion of the residents around the landfill now?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f). How many years more is the landfill going to be used?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Items To Be Checked / Observed</td>
<td>Yes or No?</td>
<td>Comments or Remarks</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------</td>
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</tr>
<tr>
<td>g). What are the reasons to stop using the landfill?</td>
<td></td>
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</tr>
<tr>
<td>h). What is done to the waste dumped at the landfill?</td>
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</tr>
<tr>
<td>i). Is hazardous waste (if any) treated differently than other waste?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>j). If so what hazardous waste is dumped here and how is it treated?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>k). How is waste handled during the rainy season?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>l). Are scavenging activities allowed at the landfill?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>m). What safety precautions or measures are taken while handling waste at the landfill?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n). Is there a fee charged for dumping waste at the dumpsite?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o). If yes, how much is this dumping fee?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>p). Any other question, information (specify).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2 Presence of different types of waste: for each type of waste, suggest possible sources and think of how you can handle such waste safely.

| a). Hazardous (specify at least 5 examples) | | |
| b). Non-Hazardous (specify at least 5 examples) | | |

82
<table>
<thead>
<tr>
<th>Items To Be Checked / Observed</th>
<th>Yes or No?</th>
<th>Comments or Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td>c). Organic (specify at least 5 examples)</td>
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<td>d). Non-Organic (specify at least 5 examples)</td>
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<td>e). Recyclable (specify at least 5 examples)</td>
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<td>f). Re-usable (specify at least 5 examples)</td>
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<td>Items To Be Checked / Observed</td>
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<td>g). Any other (specify at least 5 examples)</td>
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</tbody>
</table>

| 3 Presence of tools/equipment or machines for handling waste                                |            |                     |
| a). Is there a weighing bridge or machine?                                                  |            |                     |
| b). Are there vehicles unloading or dumping waste?                                          |            |                     |
| c). If so try to unload waste from a vehicle and feel how it is. Have you done it? If so: How is it? |            |                     |
| d). Are the vehicles arriving at the landfill with garbage covered or protected from wind? |            |                     |
| e). Are there any bulldozers, compactors or other machines (specify) present to deal with the dumped waste? |            |                     |

| 4 Presence of safety measures                                                              |            |                     |
| a). Is there a fence around the landfill?                                                  |            |                     |
| b). Is there a guarded entrance gate to the landfill?                                       |            |                     |
| c). Presence of Guard’s/Inspector’s house                                                   |            |                     |

| 5 Health risks                                                                             |            |                     |
| a). Presence of residential houses within the landfill                                      |            |                     |
| b). Presence of river or water sources near or within the landfill                         |            |                     |
c). Presence of nice wide road or path to the dumpsite

### 6 Presence of scavenging activities

<table>
<thead>
<tr>
<th>Yes or No?</th>
<th>Comments or Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>a). Are women (adults) involved in scavenging? In which activities?</td>
<td></td>
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<tr>
<td>b). Are men (adults) involved in scavenging? In which activities?</td>
<td></td>
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<tr>
<td>c). Are girls (youths) involved in scavenging? In which activities?</td>
<td></td>
</tr>
<tr>
<td>d). Are boys (youths) involved in scavenging? In which activities?</td>
<td></td>
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<tr>
<td>e). Are children (boys) involved in scavenging? In which activities?</td>
<td></td>
</tr>
<tr>
<td>f). Are children (girls) involved in scavenging? In which activities?</td>
<td></td>
</tr>
<tr>
<td>g). Are there people (middlemen) buying waste from scavengers?</td>
<td></td>
</tr>
<tr>
<td>h). What is involved in scavenging in general?</td>
<td></td>
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</tbody>
</table>

#### 8.3.2 Table of Observations during Working Tour of The Community

Check the following and fill in the table accordingly. Answers can be treated as comments or remarks.

<table>
<thead>
<tr>
<th>Items To Be Checked / Observed</th>
<th>Yes or No?</th>
<th>Comments or Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Are there illegal dumps, or scattered/piled of waste in the compound? If YES get answers for the following questions from whoever is willing. (the answers might be helpful in establishing and dealing with a temporary collection point or with SWM in general in your area of operation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a). Why does the pile of garbage exist?</td>
<td></td>
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<tr>
<td>b). Why do people choose this place to dump their waste?</td>
<td></td>
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<tr>
<td>c). What are the reactions of the residents around?</td>
<td></td>
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<tr>
<td>d). What is done with these reactions to ensure successful dumping by people?</td>
<td></td>
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<tr>
<td>e). What is done with the waste dumped illegally?</td>
<td></td>
<td></td>
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<tr>
<td>Items To Be Checked / Observed</td>
<td>Yes or No?</td>
<td>Comments or Remarks</td>
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<tr>
<td>--------------------------------</td>
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</tr>
<tr>
<td>f). Is there any hazardous waste in the pile of garbage?</td>
<td></td>
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<tr>
<td>g). Are scavenging activities present at the pile of garbage?</td>
<td></td>
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<tr>
<td>h). What safety precautions or measures are taken while dealing with waste at the pile?</td>
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<tr>
<td>j). Any other question, information etc.</td>
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<tr>
<td>2 Presence of different types of waste: for each type of waste suggest possible sources and think of how you can handle such waste safely.</td>
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<tr>
<td>a). Hazardous (specify at least 5 examples)</td>
<td></td>
<td></td>
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<tr>
<td>b). Non-Hazardous (specify at least 5 examples)</td>
<td></td>
<td></td>
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<tr>
<td>c). Organic (specify at least 5 examples)</td>
<td></td>
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<tr>
<td>Items To Be Checked / Observed</td>
<td>Yes or No?</td>
<td>Comments or Remarks</td>
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</table>

d). Non-Organic (specify at least 5 examples)

|                               |            |                   |
|                               |            |                   |

e). Recyclable (specify at least 5 examples)

|                               |            |                   |
|                               |            |                   |

f). Re-usable (specify at least 5 examples)

|                               |            |                   |
|                               |            |                   |

g). Any other

<p>| | | |
|                               |            |                   |
|                               |            |                   |</p>
<table>
<thead>
<tr>
<th>Items To Be Checked / Observed</th>
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<th>Comments or Remarks</th>
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</table>

3 Do you detect any health risks?

a). Presence of residential houses near the pile of garbage
b). Presence of river or water sources near the pile.
c). Presence of a person dumping waste at the garbage pile

4 Are there people scavenging?

a). Are women (adults) involved in scavenging? In which activities?
b). Are men (adults) involved in scavenging? In which activities?
c). Are girls (youths) involved in scavenging? In which activities?
d). Are boys (youths) involved in scavenging? In which activities?
e). Are children (boys) involved in scavenging? In which activities?
f). Are children (girls) involved in scavenging? In which activities?
g). Are there people (middlemen) buying waste from scavengers?

6 Is waste stored at the household or family level?

If YES how is it stored?

a) in bags
b). in buckets?
c). Any other (specify)
<table>
<thead>
<tr>
<th>Items To Be Checked / Observed</th>
<th>Yes or No?</th>
<th>Comments or Remarks</th>
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<tr>
<td>7 Is stored waste present at community level?</td>
<td></td>
<td></td>
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<tr>
<td>If YES how is waste stored?</td>
<td></td>
<td></td>
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<tr>
<td>a) in bags</td>
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<td></td>
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<tr>
<td>b). in buckets?</td>
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<tr>
<td>c). in midden boxes?</td>
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<tr>
<td>d). Any other (specify)</td>
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<tr>
<td>8 Is there any sorted waste stored?</td>
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<tr>
<td>If YES what type(s) and what is it for?</td>
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<td>9 Is street / road sweeping done?</td>
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<tr>
<td>a) If YES by whom (men, women, boys, or girls?)</td>
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<tr>
<td>b) Who pays for this service?</td>
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<td>c) How much is paid?</td>
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<tr>
<td>10 Is cleaning of drains done?</td>
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<tr>
<td>a) If YES by whom (men, women, boys, or girls?)</td>
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<td></td>
</tr>
<tr>
<td>b) Who pays for this service?</td>
<td></td>
<td></td>
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<tr>
<td>c) How much?</td>
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<td></td>
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<tr>
<td>11 Are waste collection and disposal activities present?</td>
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<td></td>
</tr>
<tr>
<td>a). If YES by whom (individual, group, company etc.)?</td>
<td></td>
<td></td>
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<tr>
<td>b) Who pays for the services?</td>
<td></td>
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<tr>
<td>c) How much?</td>
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<tr>
<td>d). Are pull/push carts used in waste collection and transport?</td>
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<tr>
<td>Items To Be Checked / Observed</td>
<td>Yes or No?</td>
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<tr>
<td>e). Are there people loading waste onto pull/push carts</td>
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<td>f). Are there people unloading waste from the pull/push carts</td>
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<td>g). If so try to load and unload waste from carts and feel how it is. Have you done it?</td>
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<tr>
<td>h). Are there midden boxes, collection points or transfer stations?</td>
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<tr>
<td>i). What type of activities is taking place at midden boxes, collection point or transfer station?</td>
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<td>j). Are there any people loading waste into a truck?</td>
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<tr>
<td>k). If so try to load waste into the truck and feel how it is.</td>
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<tr>
<td>l). Are any vehicles transporting waste?</td>
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<td>m). If YES is the waste covered or protected from wind or spilling over?</td>
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<tr>
<td>12 Are recycling activities undertaken?</td>
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<tr>
<td>a). If yes where is it done (big industry, small industry, individual houses etc.?)</td>
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<tr>
<td>b). What is involved (sorting only for selling or producing new products from waste?)</td>
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9. **ROUTING AND SERVICE SCHEDULE**

9.1 What is Routing?

In any neighbourhood, there are hundreds of possible routes to collect the waste from the households to the transfer stations. The question one needs to ask is, which route is the best. That is to say, which route is the easiest to manoeuvre on, or which one takes you to the desired destination in the shortest possible time with minimum effort. As seen in the Waste Collection, Transportation and Disposal Session, most of the costs of the Contractor are related to transportation of the waste. The type of route you choose therefore has an effect on the profit levels of your waste collection Business.

Routing is therefore the process of determining which is the best or easiest way to collect waste from households to the disposal site. Routing is a practical activity, which must be conducted at the site where the waste collection and transportation will be taking place. Routing is important because it helps you establish certain factors needed for the overall planning of your Waste Collection Business.

9.2 Factors to Consider during Routing

Designing the route for waste collection before the job is important because it gives you an opportunity to eliminate potential obstacles to the business and helps you to keep costs to the minimum. When deciding on which route is the best and most appropriate, certain factors about a particular locality must be considered. These factors include some of the following: housing styles, waste generation rates, location of midden boxes, the road network and available equipment.

9.2.1 **Housing styles and household income levels.**

The amount of waste generated also depends to a certain extent on density of houses and the income levels in a given area.

For example, in a street with several blocks of flats or with houses built close to each other, the amount of waste produced will be higher than in a street of the same length but with the houses built far apart. In an area where people earn a bit more money, the amount of waste generated will be higher per household than an area where people earn less money. This is because those with more money are likely to buy more goods and will have more packaging and used goods to throw away than people with less money. So, you may need to make more trips to the transfer station in certain areas than in others.
9.2.2 Waste generation rates

Different households generate different amounts of waste. Normally the waste generation in any household is measured by considering how much waste each person generates per day and multiplying it with the number of people in that household. This means therefore that in households where there are many people, the waste generation rate is much higher than in households where there are few people. This in turn means that in areas where households have more people, there is a lot more waste to be collected than in areas where households have fewer people.

9.2.3 Location of Midden Box

The location of the Midden boxes or transfer stations is a factor that must be seriously considered in relation to the route to be chosen. Sometimes the Midden boxes are located uphill or in a place, which is not easily accessible at certain times of the day.

In hilly or uneven areas, more effort is required to move the waste from one place to another. It is easier to move an empty cart uphill than a full one, so when planning the route, you should make sure that you do not have to move uphill with a full cart if you can avoid it. In such cases a good study of the road network must be done. This also means that transfer stations should be built at low places, not at high ones.

Also, when the slopes are too steep, sometimes you might have to use another route. The alternative route may be longer, but it might still save you time because it is easier to move on it. The same can be true if a road or track is very uneven. It can sometimes be easier to take a longer route to the transfer station, because it is easier to travel on it.

9.2.4 The Road Network

The road network must also be considered carefully because some roads are blocked during peak hours and it is better to avoid such roads or streets when designing your routes for waste collection.

9.2.5 Equipment

Keep in mind that every time the main equipment you are using (cart or wheelbarrow) is full, you have to go to the transfer point to empty it. It is therefore important to consider the weight of the full load and to find a route with minimum travel time. The loading capacity of the chosen equipment depends on the type of waste and the weather. You can load more dry waste (if pressed) in a cart than wet or moist waste that is heavy and makes pushing difficult. As a result, the loading capacity of the cart is reduced during the rainy season. The travel time has to take into account the loading time at different households and the offloading time at the transfer station.
9.2.6 Timing and service schedule

It is important that a service schedule is drawn up which indicates when the waste will be collected where. A well-designed service schedule facilitates collection of waste at minimum costs because it ensures that collectors visit an area only when there is sufficient waste to collect. It also ensures that waste does not pile up in the community due to poor service scheduling. A service schedule involves the following:

- Planning time and place for waste collection. This can be in the form of a timetable, which states when specific areas will receive the service. Families and households then have to adjust to the given schedule. The collectors on the other hand have to stick to the timetable to avoid inconveniencing the community.
- It also involves planning when to repeat waste collection for each area and how many times in a week waste collection should be done. For example, waste can be collected from households once a week while it is collected twice a week from market places.

9.3 The Classroom Exercise (Group Work)

It is preferable that an exercise is conducted in class before a practical routing exercise is done in the field.

The objective of this exercise is to:

- Locate the position of the transfer stations and midden boxes on the map.
- Use peoples’ experiences and knowledge of the community to plan and design a network of routes to be used during routing.
- To plan how and when to do collections.

Activity 1:
Each group is provided with a map of their community or an area similar to theirs. With a pencil:

- Indicate the transfer stations on the map.
- From your experience and knowledge of the area plot on the map a network of routes that can be used for waste transportation.
- Indicate areas where a cart can be used and areas where a cart cannot pass.
- If there are areas, which are inaccessible by cart: what will you do to collect waste from these areas?
- Show on the map where the tools and equipment will be stored.
- Indicate the major waste generation points.
- Indicate how the trips will be done.
The following tips can help you in planning and designing:

- Start collection from where the equipment is stored to avoid moving long distances with empty carts.
- Start from the major sources of waste.
- Design routes that go down the slope.
- The routes should as much as possible not go through the same street more than once.

Activity 2:
Estimate the approximate time needed to establish which routes give the shortest travel time. Note that the shortest route may not always be the fastest if there are obstacles in the way like heavy traffic, hills, etc.

9.4 The Practical Routing Exercise (Group Work)

9.4.1 Location of the routing exercise
As earlier stated, it is important that the routing exercise takes place in the very location where waste collection and transportation will be taking place. This is because you need actual information to help you plan your activities and calculate how much time and equipment you will need to collect and transport the many kilos of waste in your area from the houses and the market to the transfer stations.

9.4.2 Requirements for the routing exercise
The following are the requirements for the routing exercise:

- Community Map
- Writing paper and pen
- One weighing scale
- Waste collection equipment (comprising one handcart, two wheel barrows, two shovels, one rake and protective wear)
- Information on the average waste generation rates of that particular community or others for similar communities in Lusaka.

Members of the community in which the routing exercise will take place must be informed in advance (at least one week) so that they can accumulate the waste to be collected for the exercise.

9.4.3 The Process
Before going to the site of the exercise, you need to understand the objectives and importance of the routing exercise.
i) Once in the community:

- Check the location of the Midden Boxes or designated transfer points on the Community Map (as established during the classroom exercise).
- Identify the main roads and streets and paths, then, bearing in mind the factors discussed earlier, plan the possible routes for transporting the waste to the designated transfer points.
- Estimate or calculate the volume of the cart to be used.
- Establish the approximate density of the waste.

ii) With the available equipment set, conduct a waste collection exercise using the routes mapped out in preparation for the exercise.

**Note:** that depending on the waste generation in a particular area, the pushcart might fill before you reach the transfer station and you might have to make more than one trip to the transfer station in one route.

The exercise should be conducted on more than one route so that you can get balanced results.

The following findings must be documented during the routing exercise:

1. Amount of waste it takes to fill the pushcart.
2. The average time it takes to collect the waste from the households.
3. The average time it takes to transport the waste to the transfer station and come back to where you were collecting.
4. The number of trips it takes to collect the waste from all the houses in a particular route.

### 9.4.4 Equipment choice

The Routing exercise offers the opportunity to assess the suitability of available tools and equipment and to suggest possible adjustments. The routing exercise also provides an opportunity to practically determine the number of people needed per collection group.

Factors to consider when using the equipment include:

- The size and capacity of the pushcart in relation to its weight, the load it can carry and the ease with which it can be manoeuvred.
- The height of the pushcart: does it allow for easy loading and tipping.
- The ease of unloading.
- The type of tools and equipment required to efficiently collect, transport and dispose of the waste.
- Choice of equipment that will enable you to handle waste in a hygienic manner.
Compare the finding of the physical exercise with those of the exercise conducted in class and make the relevant conclusions.

9.5 Calculating the Number of Trips Required to Service a Given Area

The information gathered during the routing exercise is used to make certain calculations that will help the group arrive at factual estimates of how much time and equipment is needed to manage the waste collection business. The information will also help the group determine how many people are needed to do the work and how many days in a week waste collection should be done.

Below is an example of how these calculations are done.

9.5.1 Basic Information needed

In Compound X there are 1200 households to be served by the Waste Group. It was estimated that each household generate 7 kg of waste per week. The Waste Group uses a handcart with a loading capacity of 200 kg. The average travel time per return trip in Compound X is 80 minutes.

9.5.2 Calculations

The total amount of waste generated in Compound X per week is:

\[ 1200 \times 7 \text{ kg} = 8400 \text{ kg per week} \]

The number of trips required to move this waste to the different transfer stations using a 200 kg capacity handcart is:

\[
\begin{array}{c}
\text{Total amount of waste} \quad 8400 \text{ kg} \\
\text{Capacity of the push cart} \quad = \quad 200 \text{ kg} = \quad 42 \text{ trips per week}
\end{array}
\]

The number of trips the Waste Group has to make per day to take all the waste generated in a week to the transfer station is:

\[
\frac{42 \text{ trips}}{6 \text{ working days}} = 7 \text{ trips day per day}
\]
The total travel time required to make 7 trips is calculated as follows:

\[
\text{7 trips x 80 minutes} = 560 \text{ minutes per day}
\]

\[
\begin{align*}
560 \text{ minutes} \\
60 \text{ minutes} \\
\end{align*}
\]

\[
= 9.3 \text{ hours per day}
\]

**Note:** A working should have 8 working hours at maximum, but this group needs more than 8 hours in a day to move the waste from the households to the transfer points.

### 9.6 Calculating the equipment and minimum number of people required for the work

#### 9.6.1 Working Units

Considering that waste is normally heavy matter and that waste transportation needs the use of some basic equipment, it will be difficult for one person to do the process of waste collection alone. It is therefore preferable that those in the business of waste collection work in teams or working units. A working unit is centred on the main equipment to be used. In our example, it is a 200 kg capacity handcart.

A single working unit could comprise of for example the following:

- 1 Handcart as the main transportation equipment.
- 1 or 2 wheelbarrows to transport the waste from the house to the pushcart in the main route (where necessary)
- 2 shovels for loading waste onto and off the pushcart
- 1 rake for gathering scattered waste and to put waste on a heap

One working unit will require at least two people, one to handle the pushcart, and the other to handle the waste. However, depending on the amount of waste to be dealt with, this number can be increased.

In our example, the Waste Group, which consists of with 12 people, needs to make 7 trips per day to remove the 8400 kilograms of waste generated in one week by the community in Compound X. We calculated that 7 trips will take them 9.3 hours a day at 1 hr 20 minutes per trip. Since waste collectors should ideally not work for more than 8 hours per day, the Waste Group will need more than one working team per day.
To find out how many working teams they need, the group made the following calculations: In an 8 hour working day, one team can make:

\[
\frac{8 \text{ hrs} \times 60 \text{ minutes}}{80 \text{ minutes}} = 6 \text{ trips per day}
\]

This leaves a balance of one trip. Since waste collection is very demanding, the Group agreed to form two working teams. Each team is tasked to make at least three trips per day. On alternate days, the teams make four trips to ensure that all the seven trips needed to transport the 8400 Kilograms of waste generated in one week are made.

Based on these calculations, the group then agreed that it is possible to operate with at least two working units and they made these further calculations to verify:

If it takes about 9 hours to make 7 trips of waste collection in a day, then it will take two working units:

\[
\frac{9 \text{ hours}}{2 \text{ units}} = 4.5 \text{ hours per working unit per day}
\]

It will take each working unit about 4.5 hours to make 4 trips so if the two working units operate simultaneously, they will be able to make the required 7 trips per day in one morning. This will leave them with the whole afternoon to conduct other business activities such as record keeping and collection of money. This would, however, mean that they need two sets of equipment, as both working units will be in the field at the same time.

**9.6.2 Working in shifts**

It is also possible for the Waste Group to work in shifts. The Group has put 3 people in each working team. Since a working unit of three people needs about 4.5 hours to do 4 trips, (equivalent to working from 07:00 hrs to 11:30 hrs) the equipment is free for the rest of the day. Another team of people can therefore utilise it for the remaining time (12:00 to 16:30 hrs). One set of equipment can thus be shared by two teams per day. This is called **working in shifts**.

In such a case, the Community Based Economic group will need only one set of equipment, which the two working teams can share. The group (12 members) can operate as two groups (of six members each) working on alternate days. The subgroups can be divided as follows:
9.6.3 Calculating the Required Equipment

If the group decides to work in shifts it needs only one set of equipment. The group can however also wish to work with Team 1 and Team 2 at the same time in which case they will need two equipment sets calculated as follows:

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
<th>Total Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Push cart</td>
<td>1 Push cart</td>
<td>2 Push carts</td>
</tr>
<tr>
<td>2 Wheelbarrows</td>
<td>2 wheelbarrows</td>
<td>4 Wheelbarrows</td>
</tr>
<tr>
<td>2 Shovels</td>
<td>2 Shovels</td>
<td>4 Shovels</td>
</tr>
<tr>
<td>1 Rake</td>
<td>1 Rake</td>
<td>2 Rakes</td>
</tr>
</tbody>
</table>

Note: that this would make the operations of the Waste Group a lot more expensive!

Overview of waste generation rates and travel times for two compounds in Lusaka

<table>
<thead>
<tr>
<th>Compound</th>
<th>Average waste generation rate/household</th>
<th>Average travel time/route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kamanga</td>
<td>7 kgs/week</td>
<td>1 hr 20 minutes</td>
</tr>
<tr>
<td>Mandevu/Marapodi</td>
<td>5 kgs/week</td>
<td>1 hr 20 minutes</td>
</tr>
</tbody>
</table>
10. OCCUPATIONAL SAFETY AND HEALTH

10.1 Importance of Occupational Safety and Health

Occupational Safety and Health refers to the safety and health risks of workers in their day to day working environment. Occupational Safety and Health for solid waste collectors or handlers is important because solid waste handling can be dangerous. It can negatively influence one’s health and cause harm if not properly done.

The main dangers in solid waste management are:

- Cuts and wounds from sharp objects;
- Contamination from hazardous waste such as hospital waste;
- Poisoning by chemical waste;
- Respiration problems caused by breathing polluted air. This can come from chemicals, from the fumes that are generated by waste or by dust created when handling the waste or sweeping;
- Burns caused by biting chemicals;
- Muscle and back strains due to wrong posture or having to lift heavy waste;
- Violence, mainly by citizens opposing temporary dumping of waste near their premises and by scavengers at the dumpsite. Also due to late or lack of payment of salaries;
- Risk of road accidents, particularly for road sweepers;
- Risks involved with the handling of dead animals and other hazardous waste;

Occupational safety and health measures try to prevent diseases, accidents and injuries to workers in solid waste management.

10.2 Accidents

90% of accidents are caused by negligence, and could easily have been prevented. Negligence is influenced by certain factors such as: habits, attitude and behaviour (e.g. failure to use safety regulations and equipment), emotions, physical environment, weather, equipment and facilities used, and the season of the year. Increased risks of negligence can result from alcohol or drug abuse, tiredness (e.g. too long working hours), lack of supervision, and ignorance and poor education, etc.

Accidents can be reduced, if not avoided completely, if ignorance is avoided.
10.3 Household Hazardous Waste

Community based waste collection and disposal deals mostly with household waste, which might contain hazardous waste, as we have seen in earlier sessions and during the field visits.

It was pointed out in earlier sessions that many people use and store a variety of different hazardous products in their home, such as: polish, wood preservatives, stain removers, paint thinner, batteries, pesticides, etc. Some households have small industries in their backyards and tend to mix the waste from these industries and household waste. Such industries include: hair salons, tie & dye and batik makers, garages, welding shops, black smiths, etc. All of these produce chemical waste to a greater or lesser extend.

Some households mix human excreta with waste. This is dangerous for it can spread diseases and can infect the collectors.

All these household hazardous waste materials may threaten the health and safety of waste handlers when improperly handled.

10.4 Different Hazards

Solid waste management workers are exposed to dangers during their day to day work. Hazardous waste materials can affect waste handlers through various exposure routes. They include:

### 1.1 Current Protection Measures in Dar es Salaam

**Shoes:** The weather is mostly hot in Dar es Salaam. Most workers (sweepers, collectors, truck loaders) wear open shoes or light shoes. Some workers wear stronger leather shoes or boots to protect their feet. However, even when available, some do not wear the boots, as they complain that these cause blisters or are too hot.

**Gloves:** Are used to some extent. They wear out easily and have to be replaced often. Most sweepers do not use them. Leather gloves are too hot hence not preferred.

**Face masks:** Most street sweepers use mouth and nose caps. Those who do not have them cover their mouths and nose with a piece of cloth.

**Uniforms:** A few waste contractors provide uniforms to their workers. The wearing of protective gear and uniforms makes the worker recognised and respected as belonging to a waste organisation. Due to the colours used (green and dark blue) the uniforms do not give increased protection from accidents by increasing the workers visibility.

Occupational safety and health has been addressed in many training sessions, but these were usually attended by community leaders and company owners. As such most workers are not aware of the importance of wearing protective gear. On the other hand none of the workers has so far been seriously affected by waste.
(a) Through the mouth (ingestion route): eating without washing your hands may result in toxic substances entering your body where they can cause immediate or long term health problems.

(b) Through the nose (inhalation route): dust that is contaminated or contains poisonous particles can be breathed in. So can poisonous gases that pollute the air. These are breathed in and come into the body where they can create health problems.

(c) Through the skin (dermal contact): Skin is an excellent barrier to many toxic substances. However, some may be absorbed or affect the skin. In mild cases this can result in skin rashes, in serious cases the skin may be damaged and the body wounded by aggressive chemicals.

### 10.5 Safety Measures

For safety and health protection measures, the following things are important:

1) Educate workers about specific occupational hazards;
2) Exposure to dangerous (hazardous) situations should be minimised;
3) Ensure use of protective gear such as gloves, boots, dust mask, goggles, etc. where appropriate;
4) Workers who have taken drugs or alcohol which may affect their performance should be excused from work;
5) The use of alcoholic drinks or drugs during work should be avoided;
6) Workers should not work too long hours, exposing them to fatigue;
7) Ensure availability of first aid kit within reasonable reach of the work site;
8) Use reliable equipment and maintain it in good condition;
9) Undergo medical check-ups regularly;
10) Undergo immediate treatment after observing any of the following:
   a) Headaches, dizziness, blurred vision,
   b) Irritation of the eyes, skin, or respiratory track and behavioural changes,
   c) Breathing difficulties,
   d) Abnormal coughing,
   e) Lack of co-ordination,
   f) Change in complexion, skin discoloration,
   g) Changes in speech pattern;
11) Do not eat or drink anything while working;
12) Wash hands and face before leaving the place of work.

Solid waste management and workers should try to understand and take into consideration all these measures.
10.6 Group Work

1. For the following activities, identify and list the health hazards and the kind of accidents that are likely to occur to you when doing these activities:
   (a) waste collection,
   (b) waste storage,
   (c) waste transportation,
   (d) dumping of waste,
   (e) waste burning,
   (f) recycling of waste, and
   (g) burying of waste.

2. Indicate for each of the identified health risks or accidents what the causes are.

3. What precautions can be taken to minimise the health risks and prevent these accidents from happening?

4. What will you do in case you find a dead animal in a path or road in your compound of operation?

Write your answers on flip charts.
11. COMMUNITY PARTICIPATION AND ROLES OF STAKEHOLDERS IN SOLID WASTE MANAGEMENT

11.1 Why Community Participation?

In the past the government took responsibility for the delivery of services such as water supply, construction of roads and waste collection. However, to date, due to lack of resources the government in Zambia is unable to provide all these services. In Lusaka, especially the low-income areas suffer from the lack of services provided by the Lusaka City Council. In the past the Council had council workers to construct and maintain public works and deliver services such as waste collection. This direct employment of workers has proven to be an expensive and not very cost-effective way to provide services. Now new options are tried in which the council contracts out some of its responsibilities to provide services in the city to companies or communities.

As a result the government is looking more to communities and the private sector for assistance with service delivery. Communities often have knowledge and experience that can be used in the delivery of services. They can also often contribute and provide resources. Enterprises are often more efficient and cost effective in delivering services than the council and they are only paid after the work is carried out satisfactorily.

In Lusaka the various departments of the Lusaka City Council are responsible for the delivery of different services. They do not have to do all the work themselves, but can also make sure it gets done by contracting part of the work out to private businesses or to communities.

For example the engineering department of the City Council can design and construct a transfer station using its own staff and hiring skilled labourers. However, this could be costly and would not allow the community to have a say in the design and location of the transfer station. The community will be the user of the transfer station and can provide ideas on the type of transfer station they need and its preferred location. Also, community members, experienced in building, can assist in the construction of the transfer station and often the community is able to do (part) of the work themselves if they receive technical advice from the council.

An other example of private sector and community involvement is the collection of waste backlog recently carried out by the Lusaka City Council in three compounds of Lusaka. The LCC signed a contract with the NGO PUSH to collect backlog waste in certain settlements. The NGO PUSH hired the labourers from within the settlements after consultation with the
RDC. The RDC ensured that the work was properly carried out. After it was confirmed that the waste backlog was removed PUSH was paid by the LCC.

### 11.2 Types of Community Participation

There are various ways in which a community can be involved in its own development. They can participate:

- In decision making (for example in deciding that waste in the compound should be collected by a Community Based Enterprise and that residents have to pay a fee);
- In planning and design (for example in discussions on where the transfer stations should be located);
- In implementation of the works (for example by constructing the transfer station);
- In operation and maintenance (for example by repairing the transfer station, or improving the path to the transfer station);
- By contributing money (for example by paying the waste collection fee);
- By contributing labour (for example by supporting a cleaning campaign on Saturdays)

There are two basic approaches to community involvement. The first is community participation, where control over the services largely remains with the relevant government authorities in this case the LCC. The second approach is community management, in which case the community becomes responsible for the management of the service provision. This is a more radical approach in which the LCC gives the responsibility for the provision of the service to the community and devolves power and responsibilities to the community.

### 11.3 Advantages and Disadvantages of Community Participation

Some advantages and disadvantages of community participation are listed in the table below:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Advantage</th>
<th>Disadvantage/challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision making</td>
<td>Residents support decision and will contribute.</td>
<td>Time consuming</td>
</tr>
<tr>
<td></td>
<td>A feeling of ownership is created in the community.</td>
<td>Who can represent the community?</td>
</tr>
<tr>
<td>Planning and design</td>
<td>Community knowledge will be used</td>
<td>Time consuming</td>
</tr>
<tr>
<td>Implementation</td>
<td>Community experience will be used.</td>
<td>Can the quality be guaranteed?</td>
</tr>
<tr>
<td>Subject</td>
<td>Advantage</td>
<td>Disadvantage/challenges</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Jobs can be created in the community.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Skills for operation and maintenance remain within the community.</td>
<td></td>
</tr>
<tr>
<td><strong>Operation (e.g. collecting waste) and maintenance</strong></td>
<td>Jobs are created in the community.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Under communities control and not relying on outside help.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Developing partnerships with City Council that can also be used for other initiatives.</td>
<td></td>
</tr>
<tr>
<td><strong>Contribute resources</strong></td>
<td>(Partial) ownership within community.</td>
<td>Unplanned settlements are mostly very low-income.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How to deal with people who can not pay?</td>
</tr>
<tr>
<td><strong>Supervision</strong></td>
<td>There is direct accountability to the community.</td>
<td>External supervision might be necessary to ensure laws and standards are met.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Risk of corruption?</td>
</tr>
<tr>
<td></td>
<td>More transparent.</td>
<td></td>
</tr>
</tbody>
</table>

### 11.4 Roles of Stakeholders in Solid Waste Management

For any activity to take place, people have to be involved with commitment. The people, who are involved in an activity or have a stake, are known as stakeholders. These stakeholders can be organisations, institutions, companies, individual people, etc. For example in the activity of solid waste management in Lusaka, the stakeholders include, Lusaka City Council (LCC), Sustainable Lusaka Programme (SLP), Residential Development Committees (RDCs), Private Companies, Local Government Authorities, Community Based Organisations (CBOs), individual waste collectors, community members etc.

#### 11.4.1 Group Work: Stakeholders and Their Possible Roles

It is always good for the specific roles of each stakeholder to be known to all parties involved in an activity. The roles are to be specified and agreed upon. First of all we want you to think of solid waste management in your situation and of how you would like the roles to be
divided between the stakeholders. Also we want you to think of the roles you would want to fulfil as a Community Based Enterprise.

Exercise 1:
Before you can divide roles over the different stakeholders, you will have to think of the different roles that have to be fulfilled in order for the SWM system to function properly in your compound.

1. *Think back of all the previous sessions and the waste cycle and what tasks need to be performed to make it all work. Write all the roles and tasks your group comes up with on a flipchart.*

2. *Now think of all the stakeholders that have to be involved in the SWM in your compound to make it a success. Write them all down on a flipchart.*

3. *You now have the stakeholders involved and the roles to be performed in SWM in your compound. Try to divide the roles over the different stakeholders the way you think best.*

Exercise 2:
In the table below you find some of the roles various stakeholders in solid waste management can play. *Please discuss which stakeholder in Lusaka performs which roles and tick or circle the roles performed by each stakeholder. Where you are not sure or the role division is not clear, indicate which roles you think are appropriate for the stakeholder in your situation and give remarks in the column for remarks.*

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Possible roles</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholder</td>
<td>Possible roles</td>
<td>Remarks</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>The Environmental Council</strong></td>
<td>1. Making regulations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Enforcement of regulations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Issuing licences</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Managing the landfill</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Others:</td>
<td></td>
</tr>
<tr>
<td><strong>Residents Development Committee</strong></td>
<td>1. Issuing contracts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Supervision</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Monitoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Awareness raising</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Enforcement of regulations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Fee collection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Payment of services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Provide waste collection services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. Secondary transport</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10. Primary Transport</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11. Others:</td>
<td></td>
</tr>
<tr>
<td><strong>Waste service provider/CBE</strong></td>
<td>1. Provide waste collection services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Awareness raising</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Monitoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Enforcement of regulations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Fee collection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Primary Transport</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Secondary transport</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Cleaning of roads</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. Cleaning of drains</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10. Others:</td>
<td></td>
</tr>
<tr>
<td><strong>Community members</strong></td>
<td>1. Payment of services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Handing waste to service provider</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Bringing waste to midden box</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Awareness creation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Cleaning of paths and small drains</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Others:</td>
<td></td>
</tr>
<tr>
<td>Stakeholder</td>
<td>Possible roles</td>
<td>Remarks</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Truck owners</td>
<td>1. Secondary transport</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Others:</td>
<td></td>
</tr>
<tr>
<td>Recycling enterprises</td>
<td>3. Buy materials for recycling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Other:</td>
<td></td>
</tr>
<tr>
<td>Other stakeholders:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Exercise 3:**
Compare the results of exercise 1 and exercise 2. *Is there a big difference between how the role in SWM are divided in Lusaka and the way you would want it to be organised in your compound?*
12. SOLID WASTE MONITORING SYSTEM

12.1 Why Monitoring?

As a businessperson, you would like to know how successful you are. Do you make profit with your activities? In other words you want to know what your performance is. Monitoring is studying this performance. The question is when are you successful and when are you not. To answer this question you first need to think of what the objectives of your business are.

12.2 Business Objectives

As a businessperson, you want to make a profit and you want to make a profit in the short and long term, you have to live today, but also next year and the year after. To sustain a successful business, you need to have satisfied clients. Satisfied clients are paying and give you new assignments and contracts. A waste contractor has mainly two kinds of clients:

➢ the households, enterprises and government offices in their serviced area
➢ the organisation giving out the contracts

It is possible that the organisation, which gives out the contracts pays the waste contractor, but it is also possible that the waste contractor has to collect the fees from the first group of clients. In both cases, it is important that the clients are paying you for your service (waste collection and disposal) and that they continue doing so.

So, your objective of sustaining your business as a waste contractor is closely related to the objectives and expectations of your clients. What do the clients expect from you? The organisation, which gives out the contract, will write their expectations down in a contract. The contract should describe the product or service you have to deliver and the requirements towards that product or service.

In the case of solid waste management, often your client will have requirements related to the timing and quality of the service. The organisation, which gives out the contract, is not your only client. You need to think if the service specified in the contract meets the expectations of your other clients, especially if they are the ones paying you.

*Try to describe for yourself the product/service and the quality of this product/service that your are going to deliver.*
12.3 Performance Monitoring

The organisation, which has given you the contract, will monitor your performance. They want to find out if you deliver your product/services as agreed; if you live up to your end of the deal. It is wise to monitor your own performance as well. Where your clients are only interested in monitoring if you provide a good service, you should also focus on the different activities that need to be performed to produce the service. Each activity results in a sub-product, with its own requirements. You have to monitor all of these activities and sub-products. In that way you will have a good overview of how your activities are going and what your strong and weak points are.

The success of your activities depends sometimes also on others. For example if somebody else is responsible for secondary transport of the waste to the landfill, but does not do it, than you will have a problem with keeping the surroundings of your transfer station clean. This means that you in turn will not be able to meet your clients’ expectations. It is therefore important also to monitor the performance of your partners and to document their performance.

If people are not paying their fees (on time) for your services we call these people defaulters. Try to write down procedures for, when your clients are not paying their fees (on time). These defaulters may influence the success of your business. You need to pay for your expenditures in time (equipment, employees, etc.), but how will you do so if people are not paying? You might even need to borrow money and would have to pay interest. You may even need to take the defaulters to court. But, how will you collect your evidence? Beware that going to court will consume your time. And time is money!!!

12.4 Performance Indicators

The monitoring performance strategy is very important in Solid Waste Management activities. It helps to see at an early stage what goes well and what goes wrong. It helps to improve performance.

One way to monitor is to develop performance indicators. A performance indicator can be defined as an item of information collected at regular intervals to track the performance of a system. Indicators are essential in monitoring and evaluation. Examples of performance indicators for community based solid waste management are:

**Number of households served:** this will tell you if you are serving the number of households that you expected to serve and need to serve to gain enough income for your company.
Number of people paying for the waste services: This will show you if the people you are serving are also paying you and will give you an indication of whether or not your fees collection system is performing well and if your business can be sustainable.

Absence or presence of waste in the streets, open spaces, drains, etc.: this is an indicator to see if you meet your objectives with regards to providing a clean environment.

Adherence to timetable / schedule of waste collection: this gives you an idea if you serve your customers in time and often enough.

No. of complaints registered: the no. of complaints registered can give you an indication of the satisfaction or dissatisfaction of your customers.

No. and status of the equipment: the no. of equipment in use compared to the number of people served will give you an idea of the efficiency of the use of your equipment. The status of your equipment will tell you when you can expect to have to spend money on major repairs or replacement of equipment.

No. of staff members of the waste business: this will give an indication of the efficiency of the operations, when compared to the number of clients served.

Number of trips to transport waste to the landfill: another indicator showing the amount of work being done by the business.

Tools and protective gear used by the waste collector: this will indicate if the operations comply with safety and health regulations and if the right tools are being used.

No. of supervision visits: this indicates if the institution responsible for supervision take their work seriously and if you can expect any assistance from them in dealing with difficult customers.

Financial situation: It is important to always have a good overview of the financial situation of your business. Are you making a profit or loosing money? Is there enough cash available for making expenditures, paying salaries, etc.

Awareness raising activities in the community: by keeping track of the awareness raising activities done in the community by yourself or others, you can have an idea if awareness is sufficient in the community. For example when a lot of awareness building has been done and still people do not pay for your services, than there could be another reason for the non-payment than that people are unaware of the problem.
A set of indicators proposed for Dar es Salaam city can be used as an example to develop your own indicators, strategies and plan. You find them in the section Group Work.

12.5 Group Work

**Exercise 1:**
*Develop your own indicators based on the proposed indicators for the Dar es Salaam case (see next page) and the above examples.*

**Exercise 2:**
How are you going to implement the monitoring? Write down your plan for the implementation process.

1. *Identify stakeholders in the monitoring process, and discuss who should be involved in what kind of monitoring, how and why.*

2. *Suggest indicators for monitoring yourself as a business organisation*

3. *Suggest indicators for monitoring other specified stakeholders*
### 12.5.1 Indicators for Solid Waste Management Monitoring in Dar es Salaam

(Proposed by Dar es Salaam City Commission, with added suggestions by ILO)

<table>
<thead>
<tr>
<th>Activities</th>
<th>Indicators</th>
<th>Means of Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Collection and disposal of refuse</td>
<td>• No. of households and business premises served</td>
<td>➢ Records of waste contractor</td>
</tr>
<tr>
<td></td>
<td>• Observed cleanliness in different areas of the city</td>
<td>➢ Field observations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Transportation of refuse to the landfill</td>
<td>• No. of trucks in working condition</td>
<td>➢ Dump site records</td>
</tr>
<tr>
<td></td>
<td>• No. of trips/tonnes of waste brought to the landfill</td>
<td>➢ Check the truck log books</td>
</tr>
<tr>
<td></td>
<td>• The truck log book</td>
<td>➢ No. of streets kept clean</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ Absence/presence of complaints</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ General environmental cleanliness</td>
</tr>
<tr>
<td>3. Protection of refuse from wind during</td>
<td>• Presence of trucks cover to prevent spillage of waste during transport</td>
<td>➢ Observe refuse handling by crews from collection to</td>
</tr>
<tr>
<td>transportation to the landfill</td>
<td></td>
<td>disposal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ Regular checks at weigh bridge and observe condition of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the loaded trucks</td>
</tr>
<tr>
<td>4. Preparation of timetable for refuse collection</td>
<td>• Timetable prepared and made available at the office and to the</td>
<td>➢ Office visit and observation of the timetable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ Community visit, discussion with community members</td>
</tr>
<tr>
<td>5. Equipment (other than trucks)</td>
<td>• No. of: spades, hard brooms, rakes, forked spades, wheel barrows,</td>
<td>➢ Field visit and observation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➢ Check office inventory of the equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activities</td>
<td>Indicators</td>
<td>Means of Verification</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 6. Provision of staff uniform and protective gear | • No. of staff wearing uniform  
• Availability and use of protective gear (boots, gloves, mouth caps, etc.) | ➢ Observe staff at work                                     |
| 7. Employment of adequate and skilled staff      | • Presence of skilled staff, e.g. engineer, health officer  
• No. of labourers employed | ➢ Check employment records                                  |
| 8. Payment of staff                              | • Number of paid staff, whether casual or permanent, per day/week/month    | ➢ Check payrolls                                           
➢ Check records                                           
➢ Interview staff                                        |
| 9. Maintaining financial capability of the waste contractor | • Number of clients who pay for service provision  
• Continuity of services of waste collection and disposal  
• Absence of complaints from the community | ➢ Office records                                           
➢ Observe cleanliness                                     
➢ Interviews with community members                      |
| 10 Collection of refuse charges                  | • Presence of relevant copies of the receipt books  
• Amount of collected refuse charges | ➢ Field checks                                             
➢ Office records                                           
➢ List of defaulters                                       
➢ Data on law enforcement for defaulters (letters for reminders, court cases, etc.) |
| 11 Supervision on waste collection              | • No. of supervisors compared to their respective areas of supervision    | ➢ Office records                                           
➢ Interviews with supervisors                             |
<p>| 12 Record keeping on waste collection           | • Presence of relevant records and basic data                              | ➢ Office records                                           |</p>
<table>
<thead>
<tr>
<th>Activities</th>
<th>Indicators</th>
<th>Means of Verification</th>
</tr>
</thead>
</table>
| 13 (In-)efficiency in receiving, handling and solving of complaints related to the refuse collection | • No. of complaints  
• Presence of written documents on complaints resolution  
• Measures taken to solve complaints/problems | ➢ Discuss with focus group from the community  
➢ Use of stakeholders through working group discussion |
| 14 Community mobilisation process | • No. of meetings/mobilisation events held  
• No. and type of participants in meetings/events | ➢ Minutes, records of meetings/events |
| 15 Support/ co-operation by Dar es Salaam City Commission at community, municipality and city level | • Actions to create community awareness  
• Assistance in follow up on defaulters  
• Assistance in transport of waste | ➢ Minutes and records of visits, meetings and discussions |
13. COMMUNITY CONTRACTING

13.1 What Is a Contract

A contract is a binding agreement between two partners. For example if two people have agreed on something they write down exactly what they agreed. This contract is then signed by both people to bind them to what they have agreed to. If, for example after 2 months, there is a conflict because the people forgot what they exactly agreed to, they can refer to the contract to solve the conflict.

In the case of waste collection, there could be a contract between the business group and the Resident Development Committee. In this contract the RDC agrees that the business group can collect solid waste in a certain area and is allowed to collect fees for their services from the residents.

To say it more difficult: A contract is a set of agreements, which serve as a mutual reference for the client and the contractor with regard to the implementation of a specific action or service, be it waste collection, running a water tap etc.

The client is usually the party that benefits from the services provided under the contract and the one to make full payments after successful completion of the obligations agreed to in the contract.

The contractor is the party that agreed to provide the services specified in the contract within a certain time and for a specified remuneration.

13.2 Different Types of Contracts

13.2.1 Conventional Contracts

The type of contract referred as conventional contracts is the type of contract normally used in the private sector. Especially in the construction sector, conventional contractors need to be registered as contractor to be allowed to compete for a job. A tender procedure will be used to decide on which contractor put in the best bid and gets the job. As often large sums of money are involved the contracts have a certain format approved by the government and are in a legal language to ensure they can be used in court.
13.2.2 Community Contracts

Community contracts facilitate the development of constructive partnership between community groups or a community group and a government institution, or between a community group and a co-operating partner or NGO. Community contracts are used to define the tasks and responsibilities of different community groups and/or the government and/or a co-operating partner or NGO. Therefore community contracts should be written in simple language using the local language. The community contract has to be completely understood by all parties before it is signed. The main aim of community contracts is to actively involve communities in the planning and implementation of activities. Whereas, conventional contracts are written in a legal language that is difficult to understand for people who do not have a legal background, community contracts are made as simple as possible, as it is normally not expected that they will have to be used in court.

13.2.3 Advantages and Disadvantages of Conventional and Community Contracts

<table>
<thead>
<tr>
<th>Conventional Contracts</th>
<th>Community Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Disadvantages</strong></td>
</tr>
<tr>
<td>Clear task division</td>
<td>Difficult language</td>
</tr>
<tr>
<td>Clear responsibilities and legal status</td>
<td>Educated people can take advantage</td>
</tr>
<tr>
<td>Costs clearly defined</td>
<td>Costly to draft (needs lawyer)</td>
</tr>
<tr>
<td>Can always be referred to</td>
<td>Can be referred to in case of conflict</td>
</tr>
<tr>
<td>Can be taken to court in case of conflict</td>
<td>Good reminder of what was agreed</td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Disadvantages</strong></td>
</tr>
<tr>
<td>Simple language</td>
<td>Not suitable for use in court</td>
</tr>
<tr>
<td>Task, responsibility, and profit clear</td>
<td>Legal status not clear</td>
</tr>
<tr>
<td>No need for a lawyer</td>
<td>Only suitable for limited amounts of money</td>
</tr>
</tbody>
</table>

13.3 Contract Partners

Who are the contract partners?
The main contract partners are:
  - The contractor
  - The client
  - The support organisation
13.3.1 Contractor

The contractor carries out the work as specified in the contract and receives payment (or is authorised to collect the payment). In the case of waste collection the business group is the contractor.

Unlike in conventional contracting, in a community contract situation the contractor is from within the community and is therefore at the same time beneficiary of the service provided or assets created. In conventional contracting there normally is a bidding procedure whereby the cheapest and best quality offer gets the contract. In community contracting the prices are normally established in joint discussions and bidding is normally not necessary.

If a community group enters into a contract with an external organisation it is important that they have a proper legal standing which conforms to the laws of the country. This can be a registered CBO or association or a small-scale enterprise.

13.3.2 Client

The client is normally providing the funds or authorises the collection of funds. For example in waste collection, the RDC is the client as they represent the beneficiaries and they authorise the collection of funds.
A municipal department (department from the City Council) can also act as the client in a contract. In community contracting the municipal authority and the community groups can work together in partnership to set the goals for the development work. For example the Lusaka City Council signed a contract with the NGO PUSH to remove the backlog waste in some settlements in Lusaka. The contract specified what work PUSH needed to carry out and what payment they would receive if the work was carried out correctly.

13.3.3 Support Organisation

Sometimes a third party is present to help the contractor or the client to supervise the work. We could call that a support organisation. Often the community does not have enough experience to implement the community contract on their own. Therefore assistance is needed from an external support organisation. These can be government departments, NGOs, private sector consultants, international agencies and national institutions. Also, the government and/or other contract partners do not always have the capacity to deal with community contracts and they too sometimes need assistance. The level and type of technical assistance needed depends on the experience of the different partners and the complexity of the works. It is therefore important to find out what the capacity and experience of the different contract partners is in doing similar work before entering into a contract. The technical assistance, and/or training that a community and/or partners will receive, has to be put clearly in the contract. The goals and activities have to be put as specific as possible in the contract. This will help to decide which organisation(s) can best give the needed technical assistance.

13.3.4 General

The responsibilities in contract are divided over the client (the RDC) and the contractor (a CBO from the compound). Both come from the same compound. If the responsibilities are not made clear properly or not well divided within the community, there might be conflicts of interest within the community. As the client and the contractor are both from the same community, the community has to give incentives and sanctions to its self. It is therefore very important to clearly define the relationship between the different actors involved, and to clarify their respective roles, rights and obligations.

13.4 Role Play

The main aim of this role-play is to give you a better understanding of the different roles involved in contracting and how a contract document can help in clarifying roles and responsibilities.

Split the group in four sub-groups: The contractor (business group), the client (RDC), a support organisation (SLP) and the residents of the area.
Solid waste management:
On the flip chart the basics of a community contract are written down. For example business group X has agreed to collect waste in a certain area Y including 50 houses. The RDC has given authorisation to the business group X to collect fees from the households of Kwacha 500 per month per household.

This contract started two months ago and in the first month the waste was collected well and everybody was happy. However, this month:

- The residents complain that the waste is only collected once a week, polluting the environment and giving a bad smell. In addition the contractor does not collect the waste that has “fallen” in the drain. The residents complain to the contractor but if nothing happens they go to the RDC asking them to intervene.

- The business group (contractor) complains that the residents are not paying the fee and do not pay on time. They also feel that the RDC is not giving good instructions to the residents on how the waste should be packed.

- SLP should assist the RDC and the contractor to solve this conflict and maybe the contract should be made more specific.

13.5 Simple Community Contract

Below you find an example of a community contract form. A specific form for the Zambian situation will have to be developed. This should contain standard clauses that are applicable to the type of work to be carried out.

13.5.1 Group work

Take the situation from the role-play and fill in the example contract document on the next page. Try to go into details such as who exactly will represent the contractor and the client and give names and addresses of the official representatives.
Form of contract

The first party to the contract is:

The Client is:

Name:
Address:
Telephone/Fax:

The Client is represented by the following person or his/her nominee:

Name:
Address:
Telephone/Fax:

The second party to the contract is:

The community contractor is the CBO

Name:
Address:
Telephone/Fax:

The community contractor is represented by the following person or his/her nominee:

Name:
Address:
Telephone/Fax:

Description of Services and Conditions:

The Works are (LIST THE WORKS)
The site is (LIST THE SITE OR AREA OF OPERATIONS)
The starting date is (INSERT THE DATE)
The completion date is (INSERT THE DATE)
The total price is (INSERT THE PRICE)
The schedule of payment is (INSERT SCHEDULE OF PAYMENT HERE)

The contractor shall perform the works/services within the contract duration for the payment made by the client according to the contract.
The following documents are part of the contract:
(list the documents as per the individual contract, for example, the contract document usually consist of)

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>the agreement (this document)</td>
</tr>
<tr>
<td>2</td>
<td>the contractors offer or tender (or equivalent document like minutes or letters)</td>
</tr>
<tr>
<td>3</td>
<td>the conditions of contract (a set of standard clauses which govern the work, for example this includes what will happen if the contractor fails to do the work or if payment is not on time, who will assist in case of a conflict)</td>
</tr>
<tr>
<td>4</td>
<td>reference to drawings and site information (could be just a sketch of the area which will be served)</td>
</tr>
<tr>
<td>5</td>
<td>Specifications and description of work (how often will waste be collected and from where and to which location, during which hours will the water point be open etc.)</td>
</tr>
<tr>
<td>6</td>
<td>price list (what will the contractor get and from whom, which costs are included and which will not be reimbursed etc.)</td>
</tr>
</tbody>
</table>

(INCLUDE OR EXCLUDE THE ABOVE DOCUMENTS AS APPROPRIATE)

Signatures of the Client/Partner (partners are the parties to the contract) with full names and addresses:

<table>
<thead>
<tr>
<th>Date</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>Contractor</td>
</tr>
</tbody>
</table>

Signature of the two witnesses with full names and addresses:

<table>
<thead>
<tr>
<th>Date</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Witness 1</td>
<td>Witness 2</td>
</tr>
</tbody>
</table>