



ENVIRONMENT PROTECTION AGENCY

SIERRA LEONE

OFFICE OF THE PRESIDENT

SOLID WASTE MANAGEMENT

TRAINING MANUAL

FOR

SCHOOLS

2015

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Overview of the Manual

This manual is prepared for the use of Teacher Coordinators, Supervisors and members of School Nature Clubs including Janitors. These Teacher Coordinators/Supervisors are primarily responsible for the implementation and monitoring of the project in their various Schools.

The manual is divided into three sections; introduction, basic principles of solid waste management and how to deal with solid waste.

The introduction comprises of a brief background of the Agency including its mandate, mission, vision, customers and partnerships.

In the basic principles, importance of solid waste management to the environment and public health were highlighted. Classification and types of solid waste generated specifically in schools, functional elements of the management system, main sources of these waste and practices in the management were also mentioned.

The last section explains how to deal with solid waste and the procedures involve for best environmental practices in solid waste management system in a school.

1.0 INTRODUCTION

1.1 Background

As a result of the growing global environmental awareness and in pursuit of sustainable environmental management and development, the Government of Sierra Leone established the Environment Protection Agency - Sierra Leone (EPA-SL) by an act of Parliament called the Environment Protection Agency (EPA) Act, 2008. This Act was amended in 2010.

The EPA-SL as an institution established to provide leadership for the effective protection and management of the environment and other related matters set up in 2010/2011 academic year school nature clubs with the aim of teaching pupils the core values of protecting the Environment and at the end acquire life skills they can take to their families and communities as they grow in life.

The EPA-SL is having a project called the Environmental Governance and Mainstreaming (EGM) project funded by the European Union (EU) and the government of Sierra Leone has a component to support and strengthen school nature clubs through small projects. It is against this backdrop that the Agency has developed this manual on Sustainable Solid Waste Management (SSWM) practices in Schools as part of its support to School Nature Clubs (SNCs) under environmental education and awareness raising portfolio.

1.1.1 Mandate of EPA-SL

To implement government's environment policies, plans and to coordinate, monitor, regulate, supervise and advice on all issues of the environment in Sierra Leone and serve as focal point for all international environment matters.

1.1.2 Mission of EPA-SL

In collaboration with all stakeholders effectively protect, sustainably manage the environment and natural resources to ensure a quality of environment adequate for human health and wellbeing of all Sierra Leoneans.

1.1.3 Vision of EPA-SL

To be a vibrant environmental management Agency at the core of sustainably developing middle level income Sierra Leone, fulfilling its international environmental obligations and serving its people.

1.1.4 Customers and Partnerships

The Agency's main customers constitute the entire population of Sierra Leone including Government Ministries and Institutions, Local Authorities, large, medium, and small scale business enterprises, Parastatals, Development Partners, Local and International Non-Governmental Organizations (NGOs), Media, Civil Society Groups and the International Community.

Under the Environmental Education and Awareness Raising programme, the Agency also make provision of information and education materials on the environment and give support to school nature clubs.

In view of the above, EPA-SL therefore, develops this training manual for teacher coordinators of nature clubs, Janitors and clearly establishes that the students are the Agency's valued partners in environmental education (EE). This is the reason why students are encouraged to establish nature clubs in their various schools so that they can control the SWM process in their schools.

1.2 Purpose of the Manual

This manual has been written to help understand and use Solid Waste Management Principles (SWMP) to enable a healthy environment in schools. It presents the useful guidelines and procedures that should be performed to manage solid waste specifically generated in schools.

1.3 Learning Aim and Objectives

The main aim of the manual is to develop a student population that is aware of, and concerned about, solid waste management and which has the knowledge, attitude, motivation, commitment, and skills to work individually and collectively towards solution of solid waste management problem and prevention of new ones.

After completing this training the trainee will be able to:

- ❖ define, Solid Waste Management.
- ❖ explain environmental and public health importance of Solid Waste Management.
- ❖ identify major sources and types of Solid Waste.
- ❖ demonstrate Solid Waste Management procedures.
- ❖ share information on resource mobilization on good practice on SWM.
- ❖ provide a framework for the improvement on national SWM and environmental education (EE) plans and its mainstreaming.
- ❖ enhance communication and share lesson/solution on generic SWM problems countrywide and continentally.

2.0 BASIC PRINCIPLES OF SOLID WASTE MANAGEMENT

A **Waste** can be defined as something which the original owner or user no longer values and has been discarded or discharged by the original owner or user. It is something you do not want any more and want to throw away. Waste is therefore, an inevitable by-product of any process that one can think of.

Solid Waste is any waste that is hard or solid and not water-like or liquid, for example; broken glass, used plastic bags, leftover food, torn cloth, yard sweepings, etc. It is the unwanted solid materials generated from combined residential, industrial, and commercial activities in a given area.

The main subject in this training manual is how to deal with solid waste in a proper way called solid waste management (SWM). **Solid Waste Management** is a systematic administration activity that provide for the collection, source separation (sorting), storage, transportation, transfer, processing, treatment and disposal of solid waste.

An increasing number of people, including yourself, realise that solid waste can be a big problem that needs to be handled with care as seen in Sierra Leone today.

2.1 Environmental and Public Health Importance of SWM

Management of solid waste reduces or eliminates adverse impact on the environment and human health, support economic development and improved quality of life. If for any reason these solid waste generated are mismanaged the following are expected;

- ❖ It can be best media for the growth of microorganisms.
- ❖ Attraction of arthropods such as common housefly, mosquito, etc.
- ❖ Attraction of rodents and other animals e.g. rats, mice, dogs, cats, etc.
- ❖ Open dumps can contaminate water sources.
- ❖ Can contaminate food supply and cause food borne disease such as diarrhoea.
- ❖ Hospital and pathological wastes are potential disease carrying waste products.
- ❖ Radioactive wastes are highly dangerous.
- ❖ It creates fire accidents.
- ❖ Serve as slum areas e.g. King Tom and Granville Brook dumpsites.
- ❖ It can create nuisance; bad odour, smoke, dust, aesthetical problem, and discomfort (sneezing and coughing).

2.2 Classification of Solid Waste

Solid waste can be classified into two broad groups. These are

- ❖ **Organic solid waste:** are generally waste that can decompose or rot in the process of which release offensive smell when left unattended. Examples are garbage and food remains.
- ❖ **Inorganic solid waste:** are generally waste that cannot decompose or rot at any rate. This class of solid waste may be combustible (can be burnt) depending on type of the nature of the material they are made of. Examples are papers, plastics (combustible) and glass bottles (non-combustible).

Solid waste can also be classified in terms of origin, contents and hazard potential as shown in table 1 below.

Table 1: Classification of Solid Waste

Origin	Contents	Hazard Potential
Domestic	Garbage/food remains	Toxicity
Industrial	Glass	Flammability
Commercial	Metal	Radioactive
Construction	Plastic	Infectious
Institutional	Paper	Cancerous
Mining	Electrical (E-waste)	Acidity

2.3 Types of Major Solid Waste Generated in Schools

- ❖ Organic material (garbage or food remains).
- ❖ Plastic bottles and bags.
- ❖ Papers, Pens and pencils.
- ❖ Glass bottles.
- ❖ Metals and wood planks

2.4 Functional Elements of Solid Waste Management System

For an effective management of solid waste, there are six functional elements in the activities associated with the management of solid waste from point of generation to final disposal site. These are

1. **Waste generation:** Those activities in which materials are identified as no longer being of value and are either thrown away or gathered together for disposal.
2. **On-site handling (sorting, storage and processing):** Activities associated with the handling, storage, and processing of wastes at or near the point of generation.
3. **Collection:** Those activities associated with gathering of solid waste and hauling of wastes to the location where the collection vehicle is emptied.
4. **Transfer and transport:** Those activities associated with
 - a) The transfer of wastes from the smaller vehicle or container to the larger transport equipment and
 - b) The subsequent transport of the wastes, usually over long distances, to the disposal site.
5. **Processing and recovery (recycling):** Those techniques, equipment and facilities used both to improve the efficiency of the other functional elements and to recover useable materials (recyclables), conversion products (recycle), or energy from solid wastes.

6. **Disposal:** Those activities associated with ultimate disposal of solid wastes.

2.5 Main Sources of Solid waste Generation

- ❖ Residential (domestic or household)
- ❖ Commercial (markets, shops/stores and entertainment centres)
- ❖ Institutional (schools, colleges, hospitals and offices)
- ❖ Construction (and demolition)
- ❖ Treatment plant sites
- ❖ Industrial (factories and firms)
- ❖ Agricultural
- ❖ Mining

2.6 Good and Bad Practices in SWM

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 regular dumping. These are the centre piece of the training manual.

On the other hand, mismanagement (bad practice) of Solid Waste is the case when waste is not disposed off in 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 uncontrolled 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 we breathe.
- ❖ Uncontrolled burying of waste can pollute the ground water and in turn the water we drink.
- ❖ Uncontrolled piles of garbage attract animals and insects that can be harmful and can spread diseases. Sharp objects like needles, broken glass and razor blades and other dangerous (hazardous) waste might be present in piles and harm children, scavengers and animals such as dogs and cats. Piles of waste look ugly, smell badly and make people living nearby feel uncomfortable (see figure 1).



Figure 1. Illegal dumping of waste in the community

3.0 HOW TO DEAL WITH SOLID WASTE?

There are three total selections 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.
3. The third option is the treatment of waste. This includes controlled burning (incineration) and controlled burying of waste (another type of composting). In this case waste can become a source of useful energy, for example, in the form of heat or gas for cooking.

The question now is which option fits to our own situation?

What is desired in community based solid waste management such as the school is summarised in the chart below depicting a well-developed solid waste management system.

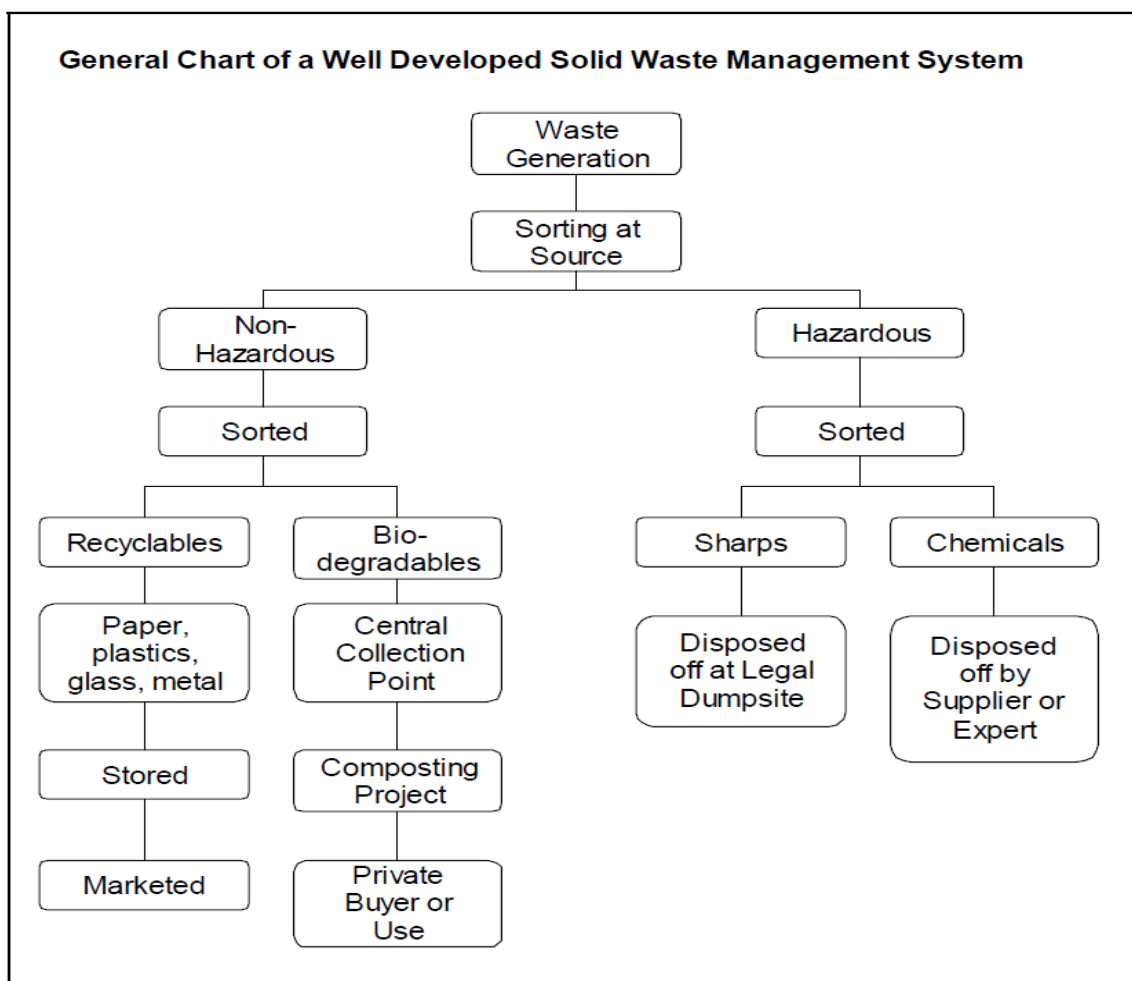


Chart 1.1 Well developed waste management system

3.1 Procedures for Good Solid Waste Management System in a School Setting

The most effective procedures for managing solid waste in Schools include waste handling and separation, recycling/reuse, thermal treatment and composting.

Note that, the best place to separate waste materials for reuse, recycling and composting is at the source of generation.

1. Identify the different types of solid waste generated (papers, plastics, garbage, bottles, etc.) and sort/separate them by category.
2. Provide drum containers for each type of waste. Distinguish the containers for the different waste by colourings/paints/stickers and signs or symbols. Place each sorted/separated waste into its designated container as shown in figure 2.



Figure 2. Colour coded recycling bins for waste separation at the source of production

3. **Thermal Treatment of Waste:** Incinerate (burn) the papers (**not plastics**) in a locally constructed incinerator using clay/mud bricks/blocks or a metal drum. Incineration is a high temperature dry oxidation process that reduces organic and combustible waste to inorganic, incombustible matter and resulting in a very significant reduction of waste volume and weight.

Advantages

- ❖ Reduce the volume of waste to be disposed.
- ❖ Rendering it harmless.
- ❖ Reduce the production of the greenhouse gas Methane.

How to build and use a simple drum incinerator for waste disposal

- ❖ Where possible, select a site downstream.
- ❖ Build a simple incinerator using local materials (mud/clay bricks or a used oil drum).
- ❖ Make sure the incinerator has:

4. **Recycling/Reuse/Recovery:** The process of turning waste into new useful things is called recycling. This refers to the removal of items from the waste stream to be used as raw materials in the manufacturing of new products. It is the most preferred option when managing solid waste and occurs in three stages.
- ❖ Waste sorting and recyclables (waste to be recycled or to be used for other purpose) collected.
 - ❖ Use of recyclables to create raw materials.
 - ❖ Use of raw materials in the production of new products.

Environmental Benefits Derived from Recycling

- ❖ Reduce or prevent greenhouse gas emissions.
- ❖ Reduce the release of pollutants.
- ❖ Conserve resources.
- ❖ Save energy.
- ❖ Reduce the demand for waste treatment technologies and landfill space.

Reuse and recovery/recycling of waste conserve energy and the practice is valued as it is environmental friendly. Waste product such as the non-decomposable ones, which include broken glasses, plastics, metal scrapes, and the like, can be recovered for further processing. Some materials can also be recovered for reuse without further processing.

5. **Composting:** Compost the garbage/food remains for agricultural purpose as manure. For this level it can be done in the following ways;
- ❖ In vessel composting using containers like drums.
 - ❖ Static pile composting using a heap.

Conditions for composting

- ❖ Do not allow the waste to be too dry.
- ❖ Avoid too much moisture.
- ❖ Ensure optimum temperature ($50^{\circ}\text{C} < t \leq 60^{\circ}\text{C}$).
- ❖ Allow sufficient oxygen by churning (turning upside down) the compost.
- ❖ Use only biodegradable solid waste (rotten waste).

Composting process

- ❖ Compost site may be arranged by digging a shallow hole the size of which may vary depending on the amount of waste to be compost or the waste may be placed above the ground. Placing it above the ground is easier to work with the waste in the process of composting.
- ❖ Pile the sorted and mixed solid waste on the ground to a height of about 0.15m (15cm). Lay horizontally four round sticks on top of the pile as shown in figure 5. The space in between the poles could be from 75 – 90cm.

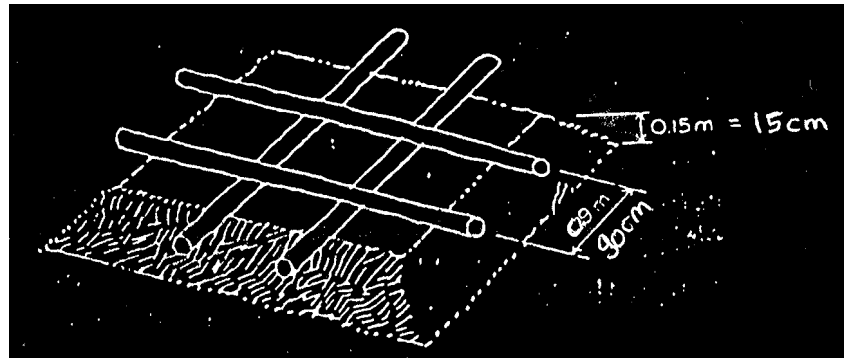


Figure 5: Piling the first layer of organic waste matter

- ❖ On the corner of the wooden poles laid horizontally (their meeting points) insert four poles vertically.
- ❖ Add the rest of the sorted out waste matter on top of the wooden poles for an additional 90cm high.
- ❖ Cover the completed pile of waste with 50cm earth and take out the poles from the pile as shown in figure 6.

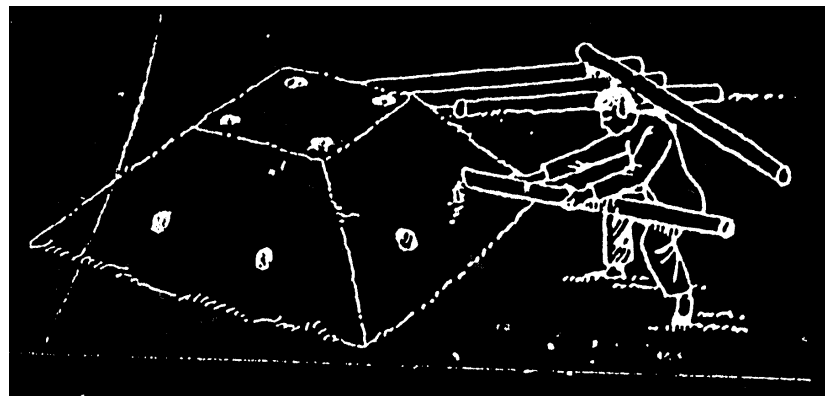


Figure 6: Final covering and taking out the poles from the pile.

- ❖ Alternatively, instead of using round wooden poles, the waste could be piled up as it is and aerate it once or twice a week by turning it so that aerobic bacteria can remain active and proliferate and stabilize the waste.
- ❖ Well stabilized compost is:
 - Dark looking
 - Does not smell and
 - Stable humus.
- ❖ The compost supplies the elements that plants require for growth except some deficiencies in phosphorus and nitrogen. This may be improved by adding urine together with the humus.

Conclusion

From your own experience of living in a School community you know that waste disposal is a problem and that there is no proper solid waste management system in Schools. This training has given a first introduction of the concept of solid waste management and has introduced you to some of the terminology used. Hopefully the training has given you some ideas for discussions on how to solve the solid waste management problems in your School.

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