Project: "Promotion of BAT/BEP to reduce uPOPs releases from waste open burning in the participating African countries of SADC sub-region"

Module 1

Best practices in solid waste management to reduce open burning of waste

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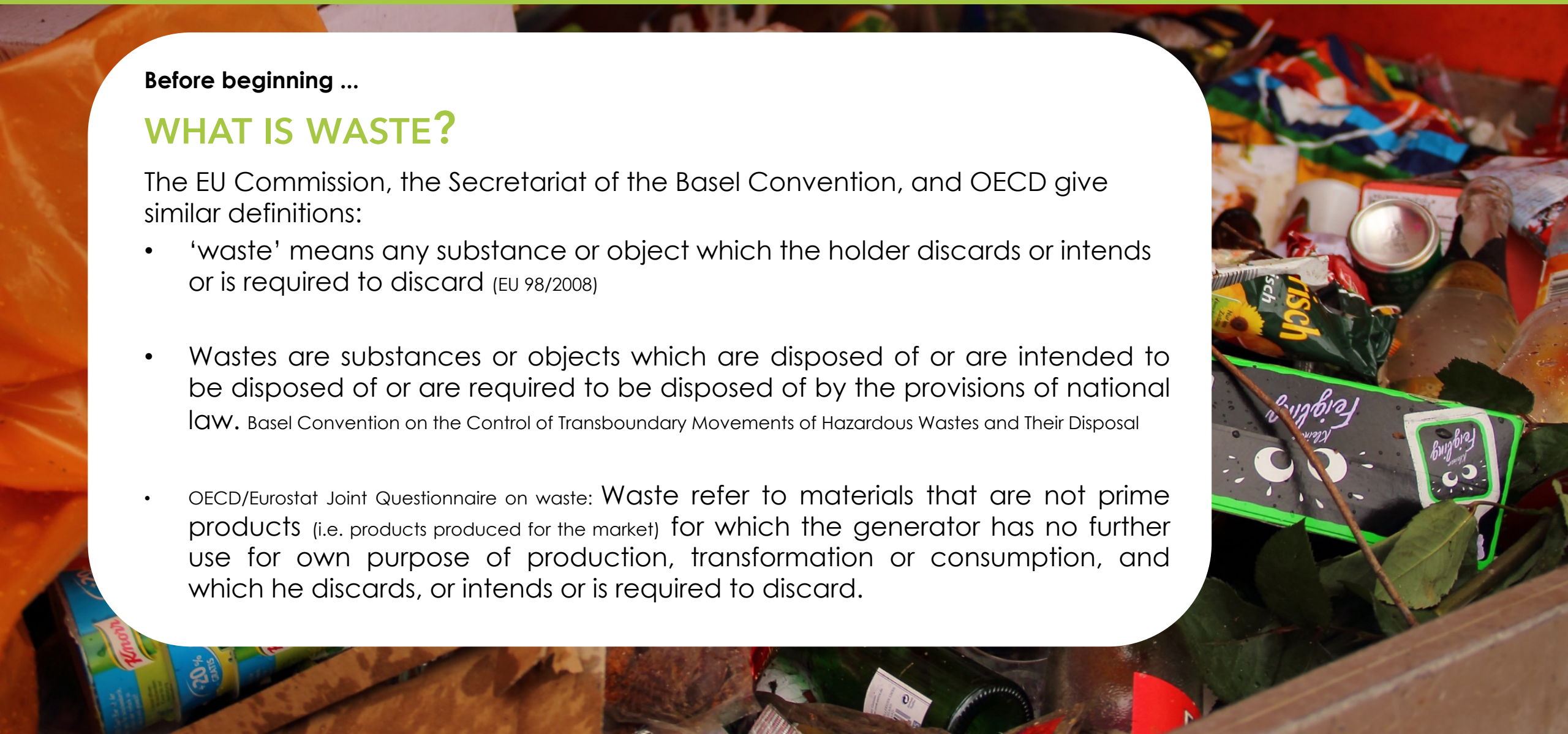
I. Definitions



Before beginning ...

WHAT IS WASTE?

The EU Commission, the Secretariat of the Basel Convention, and OECD give similar definitions:

- 'waste' means any substance or object which the holder discards or intends or is required to discard (EU 98/2008)

- Wastes are substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal

- OECD/Eurostat Joint Questionnaire on waste: Waste refer to materials that are not prime products (i.e. products produced for the market) for which the generator has no further use for own purpose of production, transformation or consumption, and which he discards, or intends or is required to discard.

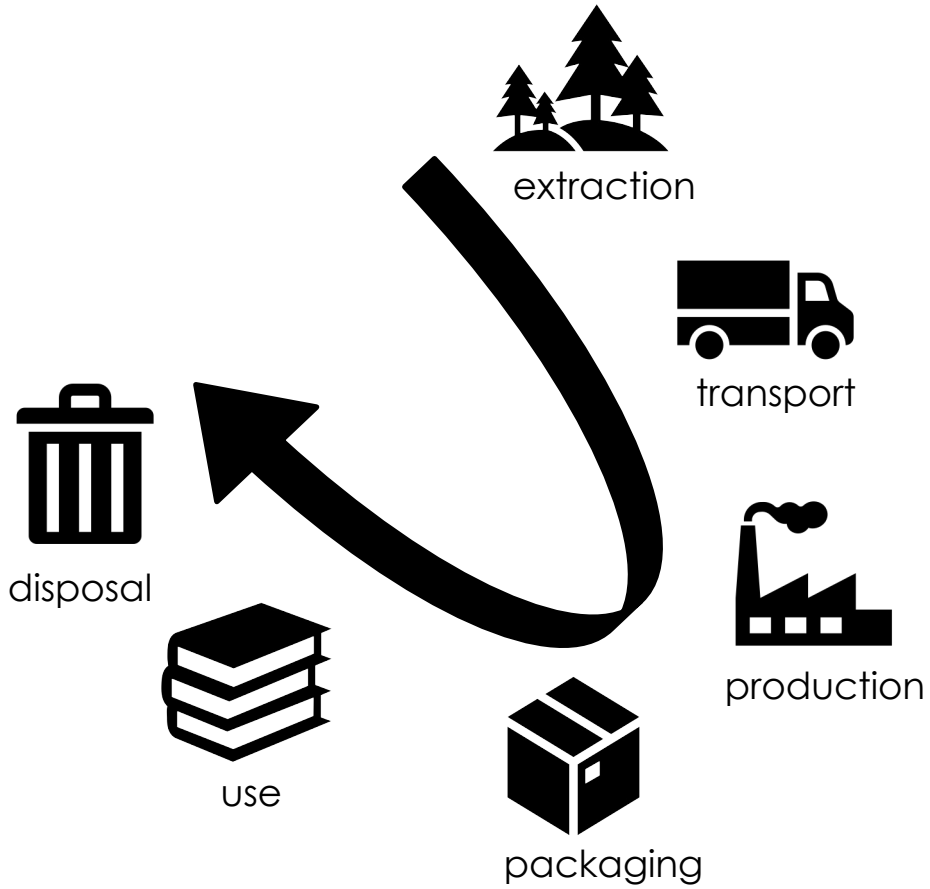
I. Definitions

Considering the whole Life Cycle of a product:

Wastes is generated during the extraction and the processing of raw materials to intermediate and final products, the transport and packaging, the consumption of final products, and when the product is discarded and becomes a waste.

What is relevant is that waste in every definition is associated with **DISCARD**

When during production something is not discarded it could be considered as a **by-product** and its recovery should be facilitated in line with the principles of the Circular Economy



I. Definitions

What is open air burning of waste?

Open air burning of waste indicates the combustion of any type of waste carried out in open air without the adoption of sanitary or environmental measures to reduce the high impacts it generates ((*i.e.,* combustion with no equipment or containment present).

courtesy of S. Tunesi

I. Definitions

An official definition

"Open burning is the combustion of unwanted combustible materials (e.g. paper, plastics, waste oils etc.) in nature or open dumps where smoke and emissions are released directly into the air without passing through a stack."

(2006 IPCC Guidelines for National Greenhouse Gas Inventories)

When and why do open air burning of waste occur?

The practice of burning waste without any technical control and without the application of any safety procedures takes many forms and it may answer different needs ALL ORIGINATING FROM AN INEFFICIENT EXISTING SWM

1. **Burning municipal waste in the streets:** when collection coverage is low or incomplete

2. **Controlled burning in non sanitary landfills or open dumps:** open air burning of waste, without protection neither for workers nor for nearby residents, is a common management practice because it facilitates waste volume reduction, and it increases compaction.

3. **Burning of specific waste stream such as plastics as a means to recover material:** an important recovery practice but the operation needs to be carried out under safety measures

When and why do open air burning of waste occur?

4. Burning of specific waste stream - such as electric and electronic waste – as a form of materials recovery from electric and electronic waste: a recovery practice with an intense market but highly hazardous

5. Accidents - spontaneous ignition can take place in non sanitary landfills or in temporary storage areas (even in high income Countries)

6. Backyards: this is a hazardous and unnecessary practice carried out solely for the ignorance of citizens about the damages

The problem

How serious is the problem?

The hazard and public health damages produced by open burning of waste are large and should be taken seriously.

Even is a single fire may seem small, the addition of fire after fire dramatically worsen the overall quality of the air in the city, resulting in chronic (sometimes even acute) health problems.

And every fire adds to the global pool of dioxins, furans and other emitted pollutants

The release inventory for persistent organic pollutants established by UNEP under the Stockholm Convention estimated that, from 1999 to 2009, the **most importance source of dioxin** from the 68 reporting countries was "the open burning of biomass and waste, accounting for 48% of the total release".

Why it concerns policy-makers and administrators

Current research indicates that open burning of waste is a more serious threat to **public health** and the environment than previously thought, for this reason it becomes a matter that **needs to be confronted by public policies**.

Moreover, it is almost always generated by an inefficient SWM system: it thus needs to be solved by defining a SWW strategy able to make the system evolve and become effective.

More generally, **uncollected waste and poorly disposed of** waste significantly affect public health and the environment, with long-term economic impacts of health burden and environmental recovery, often resulting in **multiple times the costs** of developing and operating simple, adequate waste management systems. (from SEPA)

The substances that generate the hazard for public health

Open burning of waste - even seemingly harmless materials like paper, cardboard, yard waste, and construction debris - releases a hazardous mixture of cancer-causing compounds and other toxic substances.
In the short term, exposure to smoke can cause headaches, nausea, and rashes; in the long term it can manifest the effects of dangerous carcinogens like dioxins and furans, and black carbon, a climate pollutant that contributes to climate change.

Smoke and particulates from open burning sources can trigger respiratory health problems, particularly among children, the elderly, and people with asthma or other respiratory diseases, and those with chronic heart or lung disease.

II. The problem

Open waste burning activities is a leading source of unintended Persistent Organic Pollutants (uPOPs) and other priority pollutants:

- ✓ Polychlorinated dibenzo dioxins
- ✓ Polychlorinated dibenzo furans
- ✓ Polychlorinated biphenyls
- ✓ Hexachlorobenezene
- ✓ Pentachlorobenezene

Relevant for both public health and environmental quality is the emission of:

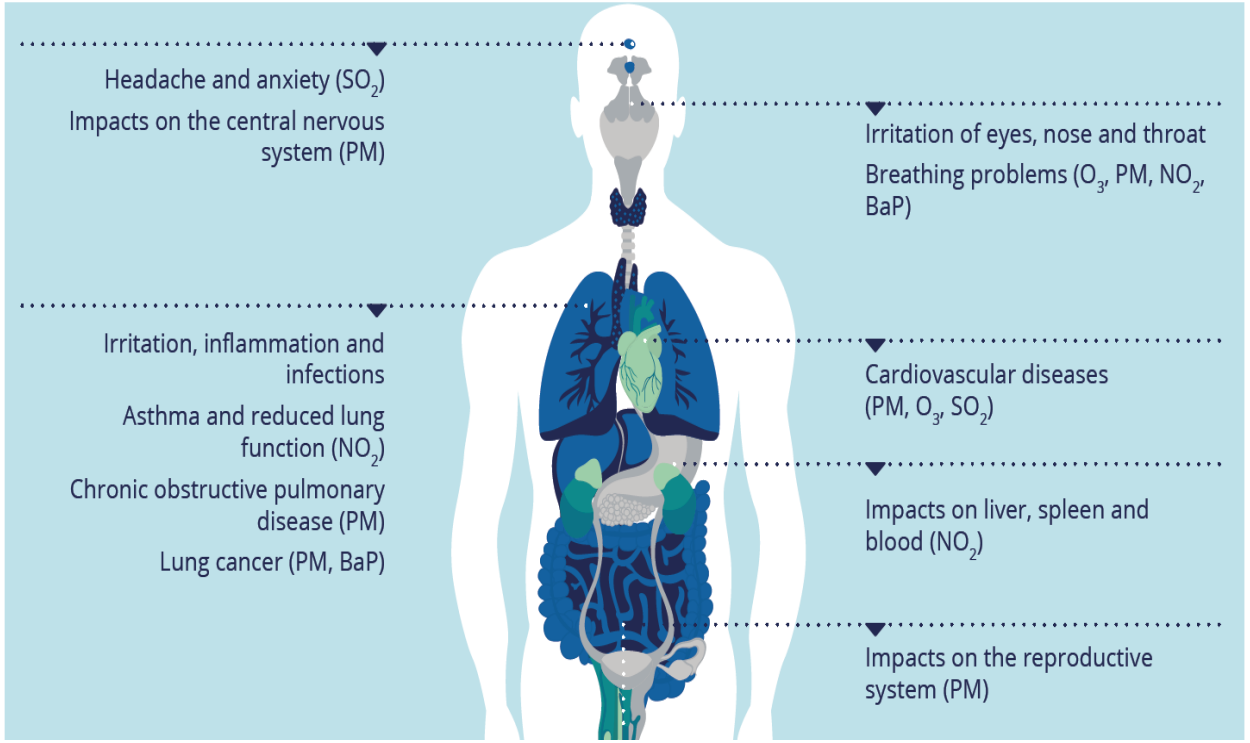
- ✓ Particulate matter (also called: black carbon, soot).

Depending on the composition of the burnt waste, the pollutants released also include:

- ✓ Arsenic
- ✓ Mercury
- ✓ Lead
- ✓ Carbon monoxide
- ✓ Nitrogen oxides
- ✓ Sulphur oxides
- ✓ Hydrochloric acid.

Some pollutants and their effects on public health

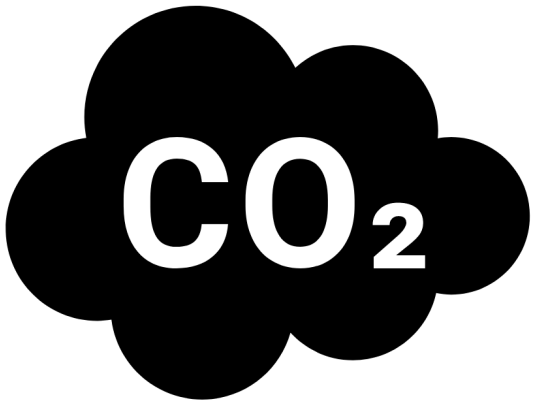
Figure 4.3 **Major sources of ambient air pollution and potential human health impacts**



In addition, some very toxic substances emitted from waste burning also has severe effects. Notably **mercury** (Hg) affects the nervous system and cardiovascular system at very low concentrations. **Dioxins and furans** also have severe effects at very low concentrations.

It significantly contributes to the climate change crisis

It was also estimated that globally the CO_2-eq emitted from the open air burning of waste reached the 5% of the 2010 global annual anthropogenic emission: this contribution is usually neglected in official SWM inventories. (Wiedinmyer et al., 2014)



II. The problem

The chemicals released by open air burning of waste do not degrade in nature, they build up in our foods and our bodies. This is why international environmental agreements have been made to protect humans and the environment - for us today and for future generations.

Once it is in the air, we all breathe and one cannot escape it.

https://stopopenburning.unitar.org/

Open waste burning, cwm@unitar.org – this slide by leucon.ch, with permission

The solution

BEST PRACTICES

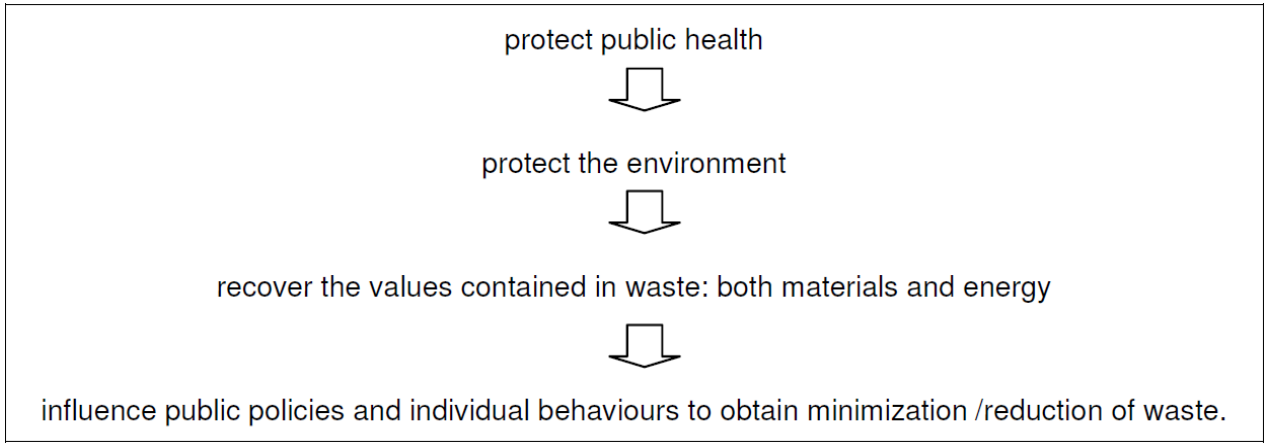
to build an **efficient SWM system** to eliminate the open air burning of waste

III. The solution

For the evolution of a SWM system and to create the condition for the elimination of open air burning of waste, **objectives and targets for the evolution of an ineffective SWM system must be set specifically** for each socio-techno-economic national and municipal context.

National and local policy-makers, administrators and stakeholders must engage in a **complex and difficult** exercise that takes time.

In highly industrialized countries, over the last 150 years, the objectives of SWM have changed significantly:



- In fully integrated SWM systems all four objectives are achieved
- In other realities - where SWM still faces the challenge of protecting public health and the environment - **not *all* these objectives can be quickly achieved.**

The following best practices are relevant

to build an **effective SWM system** to eliminate the open air burning of waste

IV. Best Practices

Best practices begin with understanding how an effective SWM system works

The only way to eliminate open air burning of waste – either municipal of from specific waste stream (such as plastics and electronic waste) - is to establish, step by step, an EFFECTIVE SOLID WASTE MANAGEMENT SYSTEM.

Where open air burning of waste occurs the first SWM objective that must be achieved is **reaching 100% collection coverage.**

The following BEST PRACTICES indicates the first essential steps necessary to build an effective SWM system.

Best Practices

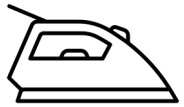
- ✓ Understand how an effective SWM system works
- ✓ The legislation should provide the basic definitions necessary to classify waste
- ✓ Quantify the amount of waste from the different sources
- ✓ The legislation must define hazardous waste and the procedure to classify it
- ✓ The waste hierarchy
- ✓ The legislation must provide definitions necessary to define all Phases of an integrated SWM system
- ✓ Organise source segregation
- ✓ Policy-makers must understand what different SWM plants and equipments are useful for
- ✓ Describe the current SWM system by quantifying flows of waste

IV. Best Practices

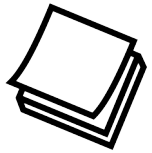
Best practice: Waste must be classified by origin because the legislation might assign different responsibilities to different waste generators

The **SOURCES** of waste include:

household



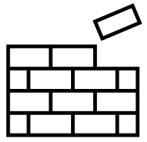
businesses



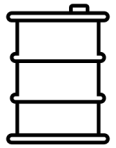
commerce and restaurants

green waste from public and private parks

construction & demolition



industries

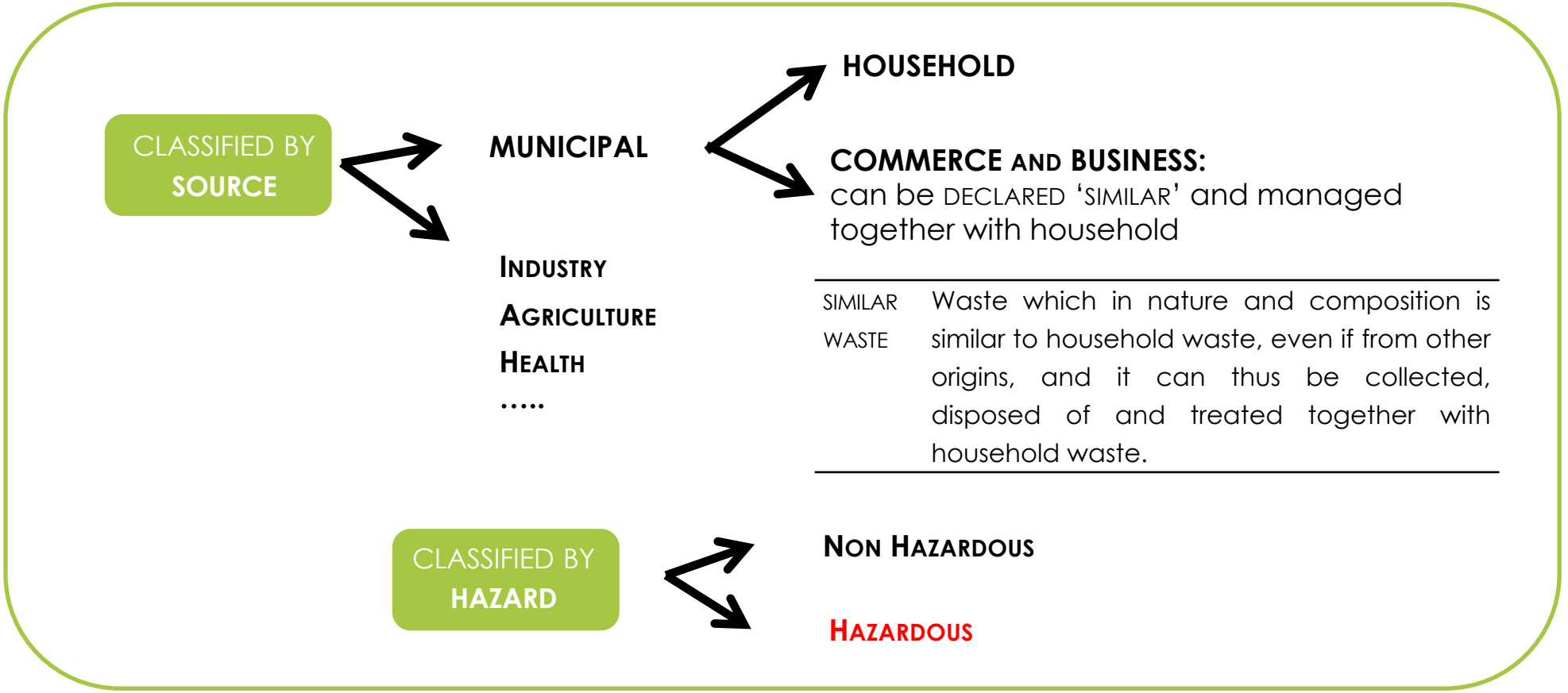


agriculture

hospitals and health structures

...

Best practice: Waste must be classified to efficiently organize its management



Best practice: The legislation should provide the basic definitions necessary to classify waste

TYPES OF WASTE	Waste that needs to be collected separately and managed by specific treatments, and may require specific legislation, including: – Construction & Demolition waste (C&D) – WEEE – Car batteries – PCB containing fluids
STREET SWEEPING	Street sweeping is the removal of mud, litter, leaves, grit and debris from the roadside. Often, local authorities responsible for municipal waste collection are also responsible for street sweepings.

MUNICIPAL WASTE (e.g. from 2018/851 EU Directive)	(a) mixed waste and separately collected waste from households, including paper and cardboard, glass, metals, plastics, bio-waste, wood, textiles, packaging, waste electrical and electronic equipment, waste batteries and accumulators, and bulky waste, including mattresses and furniture; (b) mixed waste and separately collected waste from other sources, where such waste is similar in nature and composition to waste from households. Municipal waste does not include waste from production, agriculture, forestry, fishing, septic tanks and sewage network and treatment, including sewage sludge, end-of-life vehicles or construction and demolition waste.

Best practice: Quantify the amount of waste from the different sources

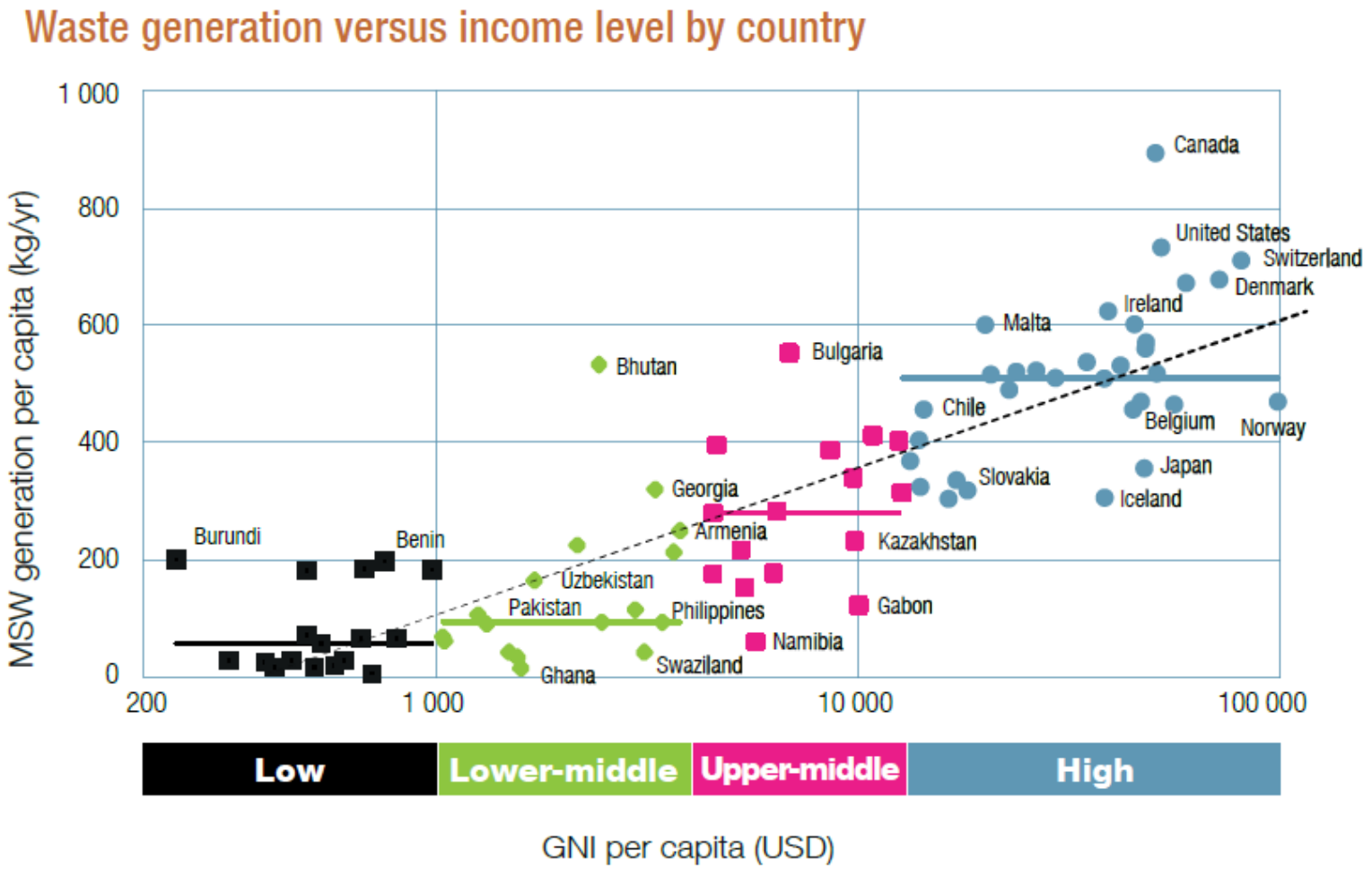
When talking about SWM the first things to determine or to estimate is the amount of waste generated for each different type (municipal, C&D,..).

The composition of the municipal waste generated, in terms of organic waste, paper, plastic, etc. is also important. It may be difficult to estimate, but rough estimates are better no estimates.

In addition, waste properties, such as the moisture content, the density and the lower calorific value are also important to design adequate waste management systems.

From SEPA

IV. Best Practices



Based on data from 82 countries using the latest available data within the period 2005-2010. For 12 countries, the latest availa
than 2005.

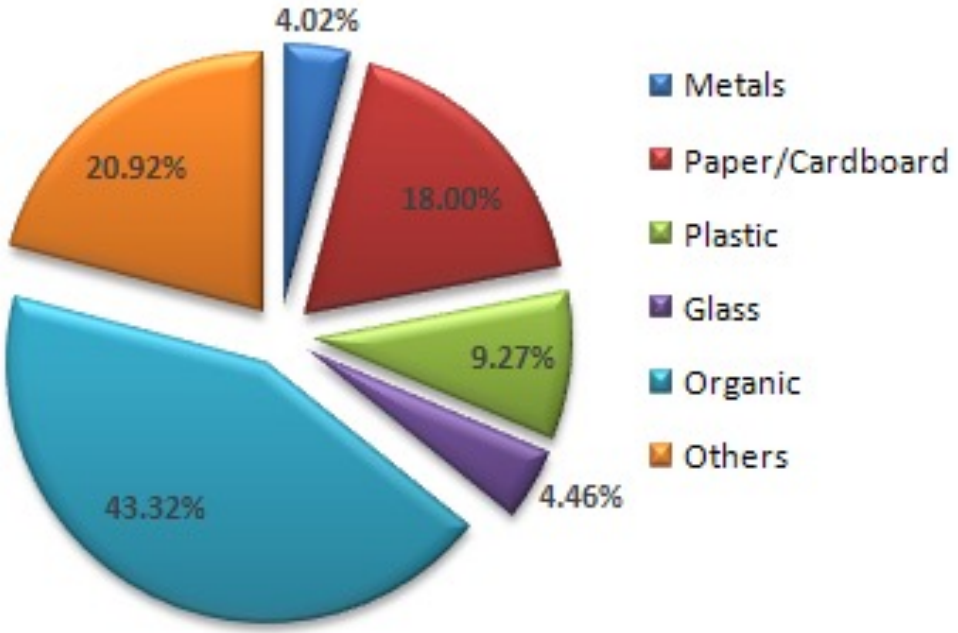
The problem is going to get worse: the amount of waste grows with national income

GLOBAL WASTE MANAGEMENT **OUTLOOK (UNEP-ISWA) SEPT. 2015**

Best practice: Define the waste composition

Waste composition is, after the amounts of waste by source, the most important planning information that needs to be obtained or estimated from literature

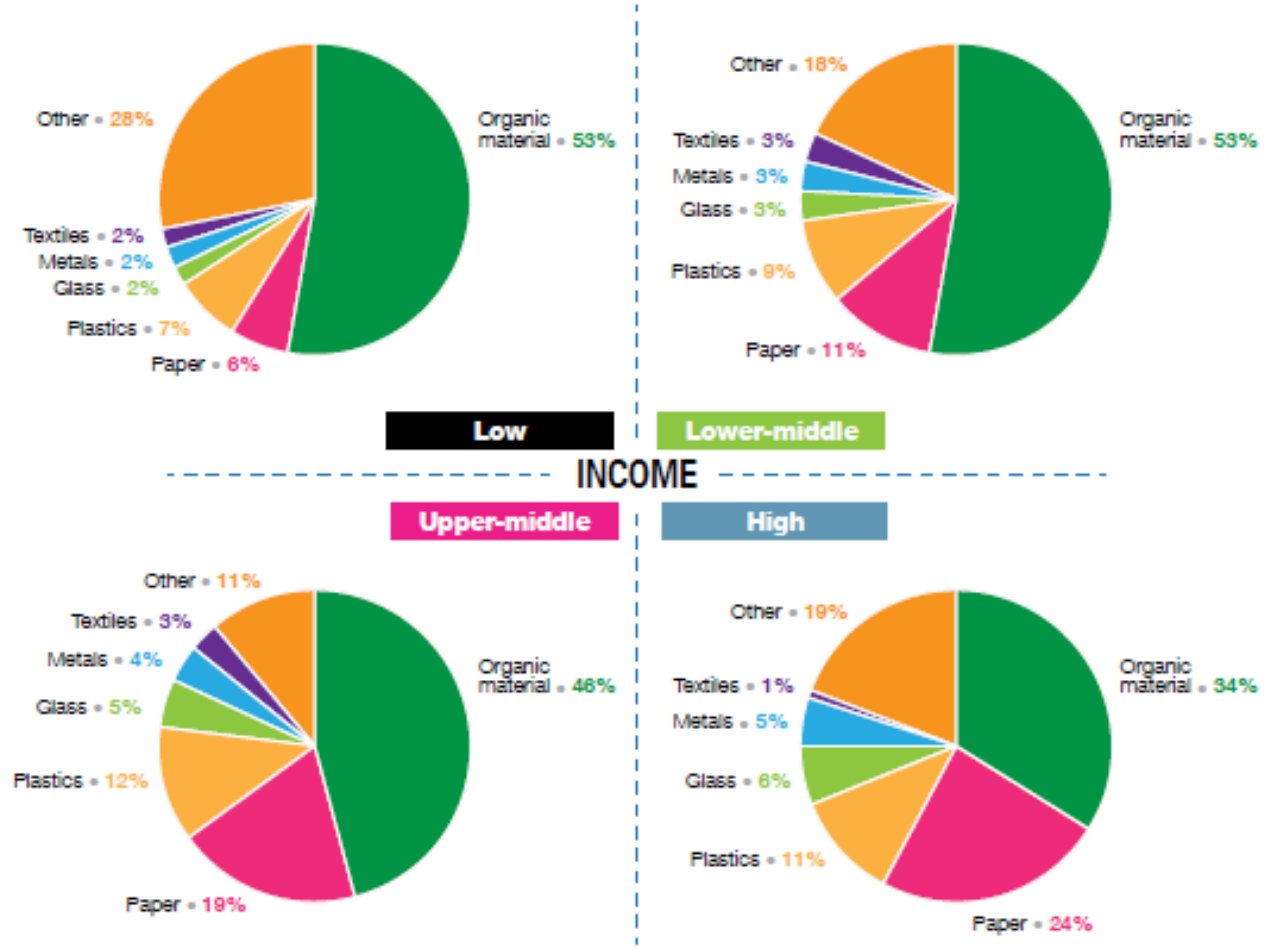
Composition of municipal solid waste generated in the world 2012



Data from D-WASTE™ waste management for everyone

IV. Best Practices

Figure 3. 3 Variation in MSW composition grouped by country income levels



the **OVERALL WASTE COMPOSITION** varies with the national income

IV. Best Practices

Municipal waste characterisation in Ouagadouogu (Burkina Faso) in 2019

courtesy of S. Tunesi

Best practice: The legislation must define hazardous waste and the procedure to classify it

HAZARDOUS WASTE	Hazardous waste can be identified by a nationally approved list or its classification may require chemical or physical characterisation, or specific tests. For the European Union, the European Waste Catalogue identifies waste which by source and type is always hazardous and waste which *could be* hazardous if it displays one or more of the hazardous properties (such as explosive; irritant, carcinogenic, toxic for reproduction) established by regulation.

To assess whether the waste has a hazardous property its composition must be known. Information can be obtained:

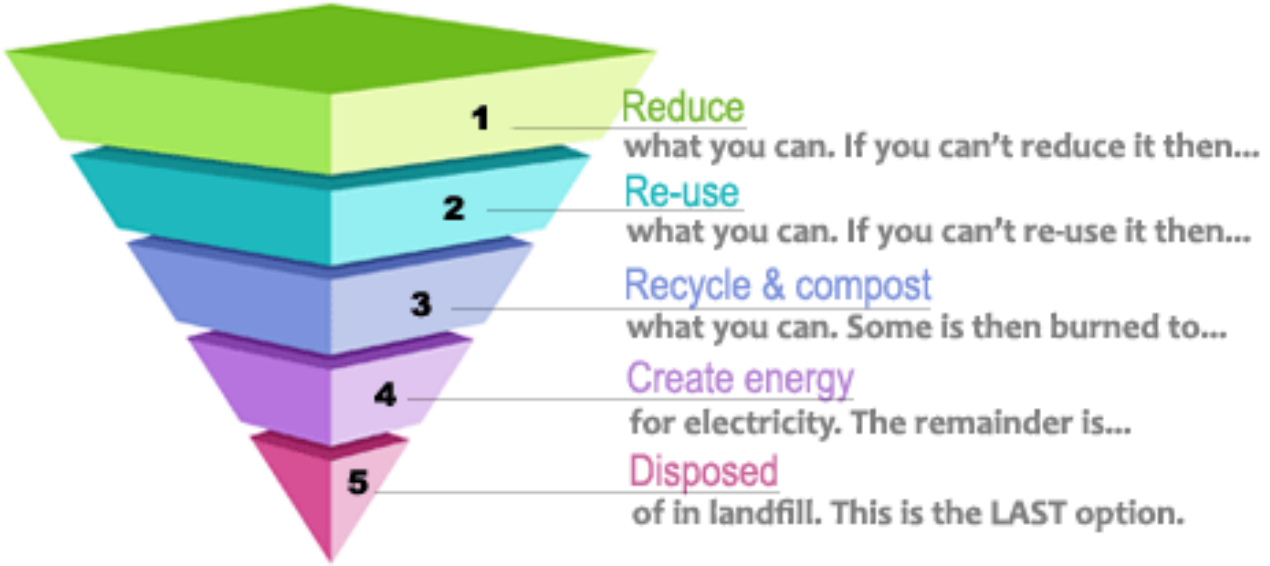
- ✓ from a well understood industrial process and the composition of the wastes produced are well understood
- ✓ by sampling and analyzing the waste to determine its composition, the sampling must be appropriate, representative and reliable

International BEST PRACTICE the waste hierarchy –

DEVELOPED FOR HIGH INCOME COUNTRIES SITUATIONS – MIGHT NOT BE IMMEDIATELY APPLICABLE IN LOW- AND MEDIUM-INCOME COUNTRIES WHERE COLLECTION AND LANDFILLING MIGHT BE THE FIRST OBJECTIVES TO BE ACHIEVED.

It is a priority order in waste prevention and management :

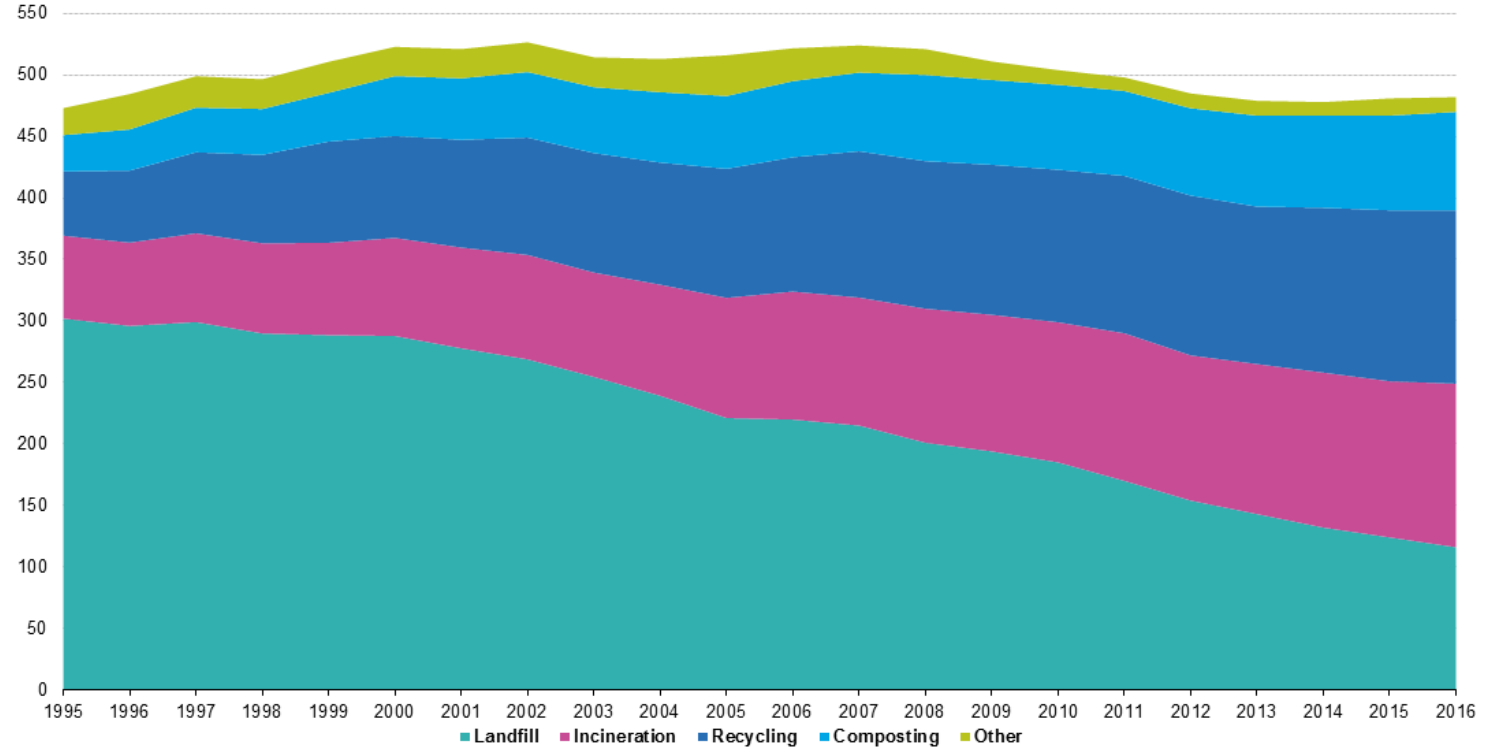
a) prevention
b) preparing for re-use
c) recycling
d) other recovery, e.g., energy recovery
e) disposal



IV. Best Practices

Best practices in SWM evolve with time and money to finance the introduction of recovery plants

MUNICIPAL WASTE TREATMENT BY TYPE - EU-28 (KG PER CAPITA) 1995 - 2016



EUROSTAT **Municipal waste statistics** *Data extracted in April 2018*

eurostat

Best practice: Further definitions to be given by the legislation

RESIDUAL WASTE	When segregated collection is ensured, several waste fractions are separated and collected in specific containers: the remaining waste is undifferentiated and is termed 'residual'. Its characteristics vary depending on the original waste and the amount of segregated collection performed on it.
BIO-WASTE	Biodegradable garden and park waste, food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers and retail premises and comparable waste from food processing plants.

Best practice: Further definitions to be given by the legislation

WASTE **GENERATOR /PRODUCER**	Each household or unit (office, commerce unit, industrial site, ...) generating the waste from which service tariffs might be collected.
RESPONSIBILITY FOR SWM	The responsibilities given to each waste producer are to be specified in the legislation. The legislation establish in which cases the waste producer is to retain legal responsibility for potential damages and impacts induced by their waste along the entire management chain and in which cases the responsibility of the producer can be shared or delegated to other actors of SWM. (EU 98/2008 framework Directive)

Some of the difficulties of implementing best practices and building an effective SWM SYSTEM

It is difficult to define and implement effective environmental and SWM policies, for several reasons. Here, just a few:

- policy makers and technical personnel often do not know the full range of techniques and technologies that can be adopted and don't know their specific role and function in an integrated SWM system
- effective SWM requires the involvement of many actors and thus COORDINATION among the relevant Institutions
- SWM is not suited for one-size-fits-all: it requires a site specifically tailored approach
- policy-makers have many other infrastructural issues which are considered priority for development - energy, roads, ITC….. – and compete for funding

IV. Best Practices

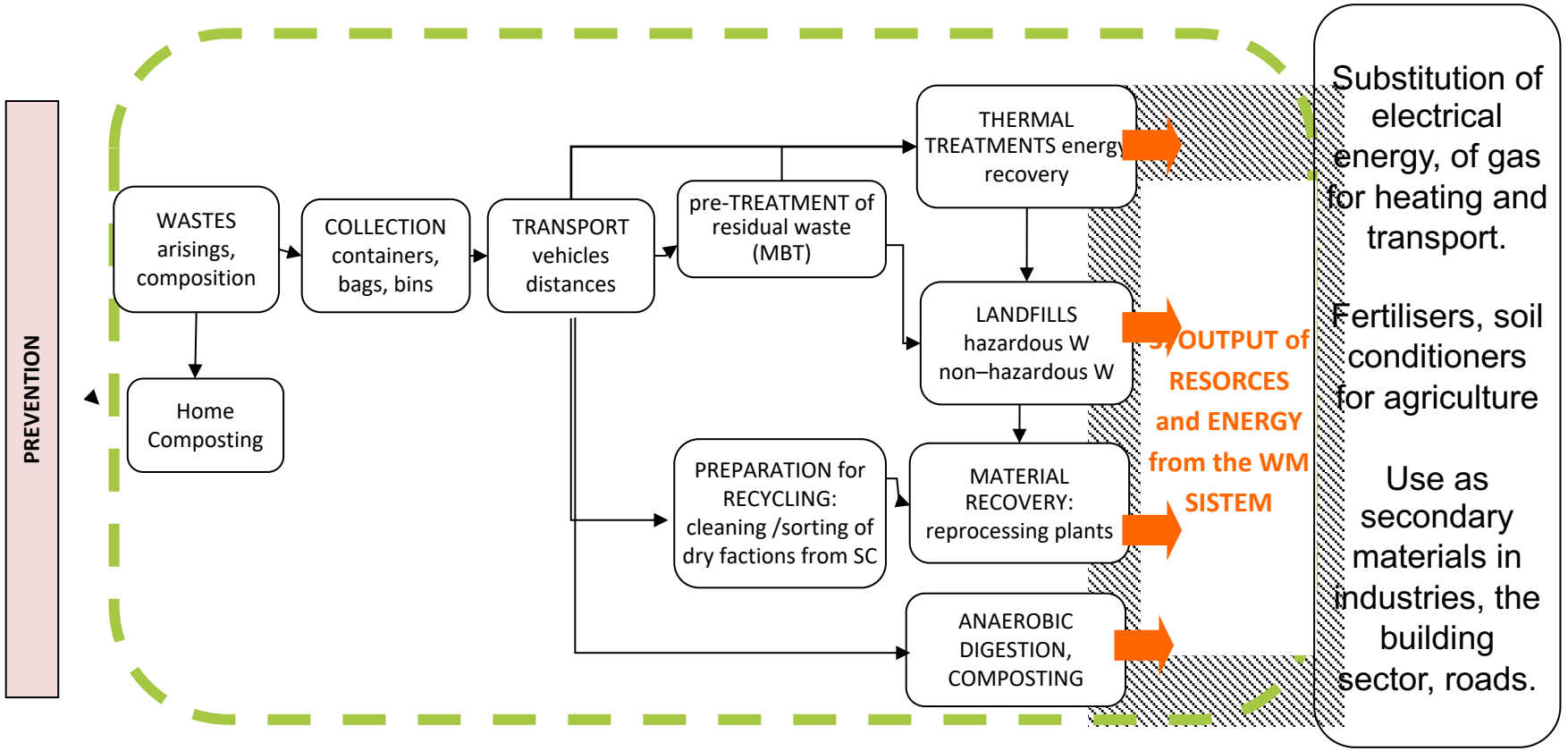
The overall goal of the application of the previous Best Practices is – step-by-step – the development of an Integrated SWM System

The goal, in 20-30, years is to build an integrated SWM system

- from the *technical* point of view an integrated WM system recovers both materials and energy from waste; it contextually deals with household and other waste streams, such as similar waste from commercial units, restaurants, agriculture, industries. Moreover, the safe treatment of sanitary waste is guaranteed;
- from the *economic* perspective it is able to optimize the performance of the recovery from waste while being financially sustainable;
- from the *social* perspective:
  - it guarantees the protection of public health and the environment
  - it provides collection service to all citizens irrespective of their ability to pay for the cost of the service they receive
  - it guarantees safe working conditions to both the formal and informal sectors
  - it involves stakeholders in the decision-making process.

With contributions from the "Global Waste Management Outlook" – UNEP – ISWA. 2015

IV. Best Practices



The phases of an integrated SWM systems

AND RELATIONSHIPS WITH THE EXTERNAL PRODUCTION AND CONSUMPTION SYSTEM

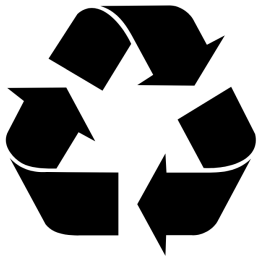
S. Tunesi - Modified from Gentil E. C. *et al. "Models for waste LCA: Review of technical assumptions". Waste Management. 30, 2010, pp. 2636-2648.*

The most relevant Best practice

The efficiency of the whole management is determined by the organisation of collection

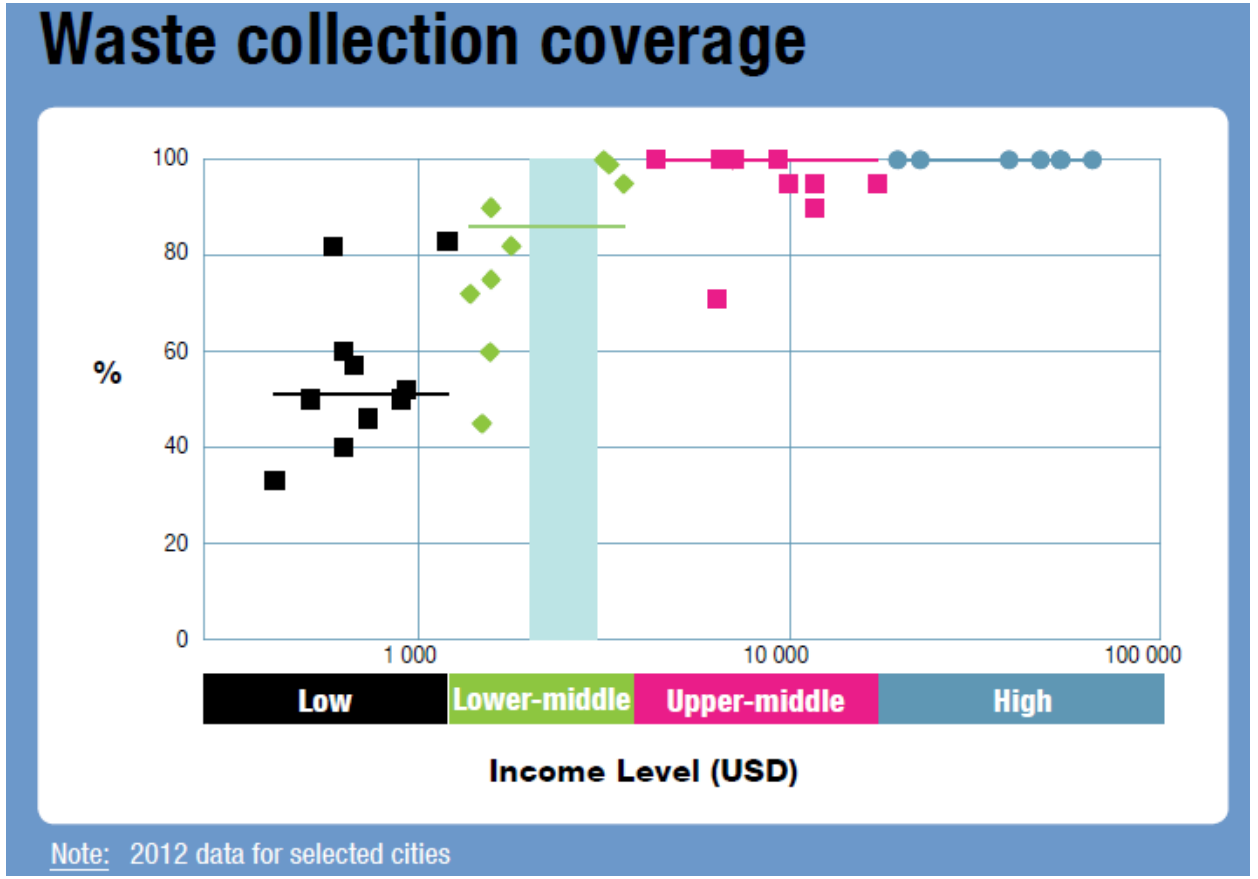
there must be waste segregation at the source to obtain

recovery of materials (recycling)



IV. Best Practices

collection coverage is proportional to GDP



GLOBAL WASTE MANAGEMENT **OUTLOOK (UNEP-ISWA) SEPT. 2015**

IV. Best Practices

Policy-makers need to:

- Understand how an integrated SWM system works

- Know the best practices that can step-by-step be set the system in place

Best practice: Understand what different plants and equipments are useful for

WASTE MANAGEMENT	The collection, transport, recovery (including sorting), and disposal of waste, including the supervision of such operations and the after-care of disposal sites, and including actions taken as a dealer or broker.
WASTE TREATMENT	Recovery or disposal operations, including preparation prior to recovery or disposal.

Best practice: Understand what different plants and equipments are useful for

For the recovery of materials → need segregated collection of the dry fractions of waste (paper, plastics, glass, ferrous, non-ferrous,….)

RECOVERY	Any operation of which the principal result is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, such as recycling of metals or energy recovery from residual waste.
RECYCLING	Any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery.

Best practice: Recovery of materials from waste: the industrial recovery chain

courtesy of S. Tunesi

Best practice: Understand what different plants and equipments are useful for

For the recovery of a clean organic fraction → need segregated collection of the organic fractions of waste (food and green from park)

COMPOSTING	Composting is the natural biological breakdown of organic material, such as food, green waste, wood or agricultural residues, wastewater sludge. During aerobic composting (in the presence of oxygen) microorganisms consume the organic matter and release heat and carbon dioxide (CO2), compost is generated that can replace manufactured fertilisers and/or peat, reduce the need for pesticides, improve soil structure, and reduce the need for irrigation.
ANAEROBIC DIGESTION	Anaerobic digestion engineers the capacity of anaerobic bacteria to degrade organic matter in the absence of oxygen. The main products are methane and carbon dioxide, which form biogas, and decomposed organic material. An anaerobic digestion plant recovers both compost (digestate) and energy: biogas can be used to generate electricity in dedicate engines; it can be distributed in the gas grid or, upgraded to biomethane, used to substitute transport fuels.

IV. Best Practices

Best practice:

Sample temperature taking at pilot composting facility in Kangemi - Kenya

https://no.myclimate.org/no/klimaprosjekter/projekt/kenya-waste-management-7190/

Best practice: Understand what different plants and equipments are useful for

When high capital is not available, the construction of a sanitary landfill, with the recovery of energy from biogas, is the most effective solution.

LANDFILL	Landfill refers to the final placement of waste in or on the land in a controlled or uncontrolled way according to different sanitary, environmental protection and other safety requirements.

Best practice: Understand what different plants and equipments are useful for

The recovery of energy from residual waste requires intense capital expenses and high operational skills

ENERGY FROM WASTE (ALSO WASTE TO ENERGY)	Energy from waste is the process of recovering energy in the form of electricity or heat from the thermal breakdown of waste through any thermal conversion technology or combination of conversion technologies.
THERMAL TREATMENT	Thermal waste treatment technologies refer to mass-burn incineration, co-incineration, pyrolysis, gasification and plasma gasification.

IV. Best Practices

Best practice:

Describe your current system

Flow diagrams are an essential tool to understand a SWM system and what is missing to make it effective

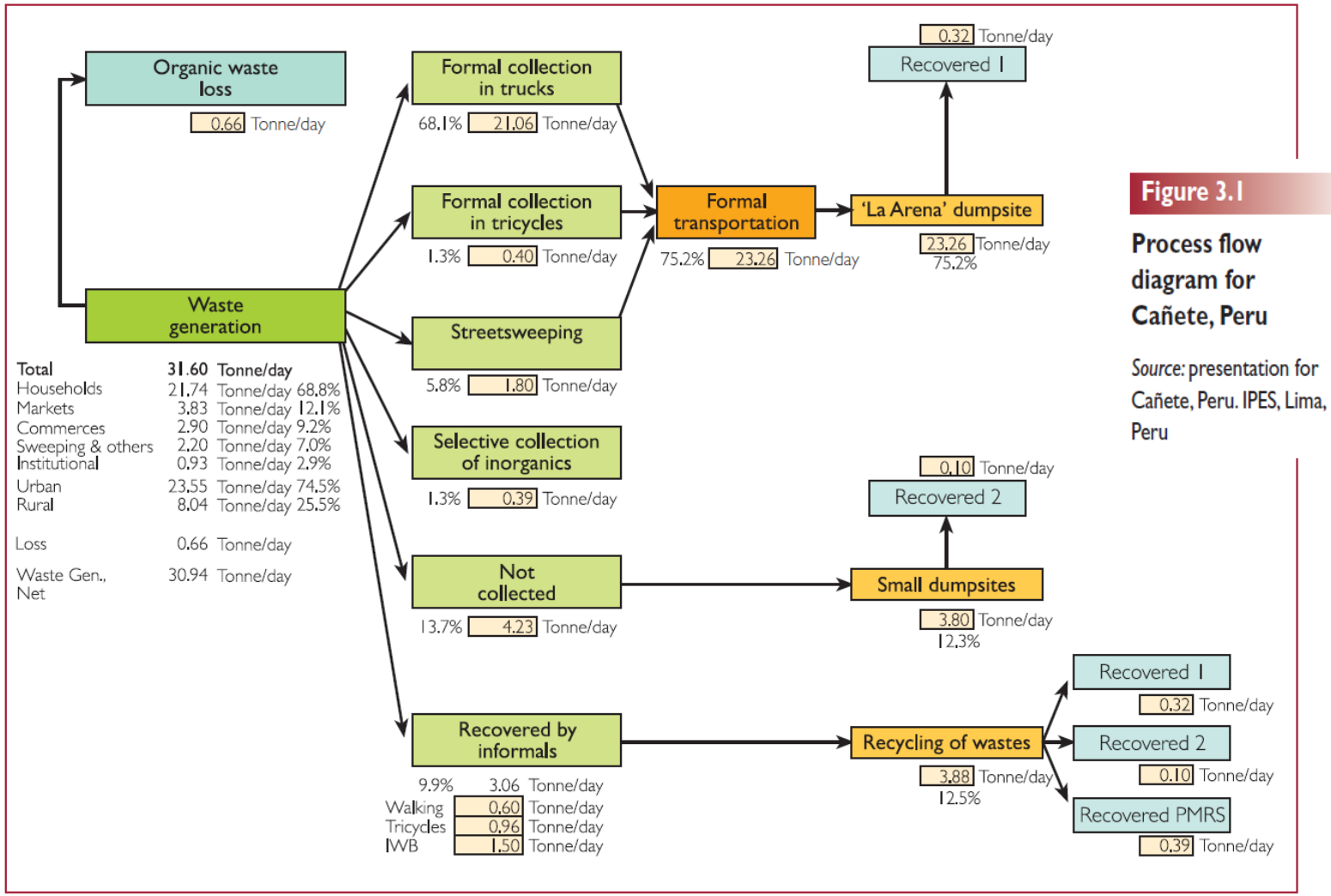


Figure 3.1

Process flow diagram for Cañete, Peru

Source: presentation for Cañete, Peru. IPES, Lima, Peru

"SOLID WASTE MANAGEMENT IN THE WORLD'S CITIES - WATER AND SANITATION IN THE WORLD'S CITIES"
2010 United Nations Human Settlements Programme – Earthscan

Best practice: Describe your current system

Flow diagrams are essential to understand a SWM system and the critical elements

- "Understand the entire waste and recycling system through the construction of a *PROCESS FLOW DIAGRAM* which:
- "gives a fast picture of what is happening to which streams;
- is a good way of ensuring that the whole WM system is included in the analysis;
- makes clear where the system boundaries are;
- shows where the materials actually end up, including leaks and losses;
- facilitates understanding linkages between formal and informal activities;
- allows for comparison of costs and efficiencies between different operations and for the whole system;
- shows the degree of parallelism (competing options for materials to move along the recovery chains) in the system".

IV. Best Practices

Performing step-by-step these Best Practices will provide policy-makers, administrators and practitioners with the tools to begin designing an effective SWM system.

An effective SWM eliminates in a few years the practice of open air burning of uncollected waste or of material such as plastics and electronic waste which, even if burned to recover precious recyclables materials, generate highly hazardous substances.

BEST PRACTICES

for all the cases in which
open air burning of waste
cannot yet be eliminated

Best practice: Protect indoor-air quality

Household wastes should **NEVER** be burned in indoor residential combustion devices such as stoves, fireplaces or furnaces.

THE WHO HAS OFTEN RAISED THE ALARM ON INDOOR POLLUTION IMPACTS ON HEALTH:

Indoor air pollution – generated largely by inefficient and poorly ventilated stoves burning biomass fuels such as wood, crop waste and dung, or coal – is responsible for the premature deaths of an estimated 3.8 million people.

Among these 3.8 million deaths:

- 27% are due to pneumonia
- 18% from stroke
- 27% from ischaemic heart disease
- 20% from chronic obstructive pulmonary disease (COPD)
- 8% from lung cancer.

More than half of these deaths occur among children under five years of age. In developing countries with high mortality rates overall, indoor air pollution ranks fourth in terms of the risk factors that contribute to disease and death.

https://www.who.int/heli/risks/indoorair/indoorair/en/

Best practice: Protect indoor-air quality

GUIDELINES FOR INDOOR AIR QUALITY: HOUSEHOLD FUEL COMBUSTION

To ensure healthy air in and around the home, *WHO's Guidelines for indoor air quality: household fuel combustion* provide health-based recommendations on the types of fuels and technologies to protect health as well as strategies for the effective dissemination and adoption of such home energy technologies.

https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health

Best practice with respect to the materials burned

BEP include:

- ✓ Avoid including non-combustible materials, such as glass and bulk metals, wet waste and materials of low combustibility
- ✓ Avoid waste containing high chlorine and/or bromine content, such as halogenated plastics such as PVC
- ✓ Avoid materials containing catalytic metals such as copper, iron, chromium and aluminum, even in small amounts
- ✓ Materials to be burned should be dry, homogeneous or well blended and of low density (e.g., non-compacted waste).
- ✓ Avoid potentially explosive items (e.g., aerosol cans, partially full containers of flammable liquids) and hazardous materials should be removed.

Best practice with respect to the burning process:

BEP include:

- ✓Supply sufficient air
- ✓Maintain steady burning or rate of mass loss
- ✓Minimize smouldering, possibly with direct extinguishment, because this is the phase of burning associated with the largest production of persistent organic pollutants
- ✓Limit burning to small, actively turned, well-ventilated fires, rather than fires in large poorly ventilated dumps or containers.

Best practice: Ban of burning activities at dumpsites

- **Banning** of open burning of waste is already implemented in the regulations of countries the SADC region but can be **enforced** more rigorously.

This policy can be implemented at moderate costs and – if enforced effectively- can bring substantial reductions of uPOPs formation with benefits to health and environment.

Municipalities have an important role in enforcement of the ban of any open burning activity, including supporting the activities and training of waste pickers.

Best practice: Improved non-sanitary landfills management

- Waste pickers' activities need to be regulated by municipalities, and they need to be trained carefully.
- The practice of open air burning of waste-by-waste pickers can be eliminated or reduced by concentrating the activities of waste pickers in a dedicated restricted area of the dumpsite, where sorting can be made easier and more profitable and there is therefore no need to burn.
- Waste pickers can be organized, registered, trained and given an identification card and Personal Protective Equipment for a safer sorting of recyclables.
- Access to the landfill should be restricted by fencing and regular enforcement
- Trucks should be instructed to offload the waste in that area only, where waste pickers can be able to easily sort the recyclables.

Once waste pickers have recovered the recyclables, what remains can be moved to its final place.

- Daily coverage of waste with soil is recommended to reduce odors, vermin and spontaneous ignition.

Spontaneous fires fighting

Types of fires at non-sanitary landfills: surface fires and deep-seated fires (smoldering).

Surface fires typically occur in dumpsites where waste is not properly covered with inert matter.

When the bulk of waste is not covered, air intrusion provides the oxygen required for increased biological decomposition of organic material. This creates substantial heat and can cause waste to spontaneously ignite.

In deeper layers, where conditions for the anaerobic process of organic material take place, methane gas is generated, that moves to the surface, where it can generate spontaneous fires.

Methane can also generate **deep seated fires**, up to 5-6 meters deep. Compacting of the waste can reduce such fires. The use of water as extinguisher needs large quantities and results in production of leachate. Other extinguishers like CO2 and flame retardants, are more effective but more expensive and generally not available in the SADC region.

Spontaneous fires fighting

- Aeration of the mass of the bulk waste in a landfill has also been successfully used as a landfill management technique.
- Measures to extinguish spontaneous fires should be taken by municipalities as soon as smoke is detected, to avoid the extension of the fire to wider areas of dumpsite and the establishment of deep-seated fires difficult to extinguish.

Best practice: Measures to reduce exposure to uPOPs in after-burning situations in the SADC region

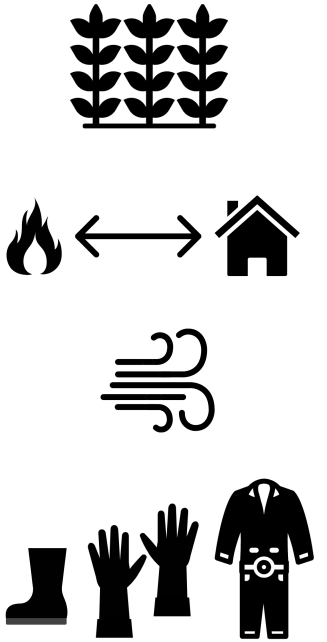
- Surveillance /enforcement: the ban of burning activities at non-sanitary landfills, and its associated enforcement, remains the major measure to be implemented to reduce after burning situations
- Extinguish smoldering and deep-seated fires as soon as detected
- Ban the use of ash as fertilizer and raise awareness of farmers and garden owners on risks and alternatives;
- Safely dispose of ash from medical waste incinerators.
- Ensure 100% collection coverage to the districts where backyard/ barrel/street burning is detected.

If lack of finance does not allow it, improve the efficiency of the ongoing collection services and organize Collection Centers for recyclables.

Best practice: Health and safety considerations

Steps should be taken to reduce exposure to toxic substances.

- Most human exposure comes through the food chain. Thus, burning sites should be located away from crops and animals' production.
- It is also good practice to locate combustion sites remote from the population or at the very least downwind of residential areas.
- Personnel tending the fires should position themselves upwind from any burning waste and be clear of the burning waste.
- Protective clothing such as gloves, boots and overalls, together with smoke



Thank you for your attention!

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