



GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET



MODULE 8

Waste to energy concepts (e.g. biowaste recovery and disposal options)

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



unitar

United Nations Institute for Training and Research

TABLE OF CONTENTS

What is biowaste?.....	3
Why is the segregated collection of the organic fraction important to build an effective SWM system?	3
What is the difference between composting and anaerobic digestion technologies?	4
What is mechanical biological pre-treatment (mbt) of residual waste?	4
How do composting and anaerobic digestion compare?	5

What is biowaste?

Biowaste from municipal waste usually includes:

- food and kitchen waste from households, restaurants, caterers, and local retailers
- branches, grass and other plants portions from private gardens and public parks

The percentage of biowaste in municipal waste determines the most appropriate treatment for the recovery of compost and energy: a high percentage favors composting and anaerobic digestion.

Biowaste from municipal waste can be integrated with similar waste from other sources – agriculture, restaurants, – to facilitate the scaling up of dedicated plants.

Why is the segregated collection of the organic fraction important to build an effective SWM system?

The chain for the recovery of biowaste from municipal waste, and other sources of similar waste, begins with the separated collection of the biowaste fraction. The separation maintains these fractions clean, and it ensure that the compost obtained is of good quality, adequate for use in agriculture.

After biowaste is collected separately, it can be sent to a composting plant or to an anaerobic digester.

These techniques allow the recovery of compost and energy (only anaerobic digestion).

To effectively recover compost and energy from biowaste, policymakers should:

- Understand how an integrated SWM system works.
- The function in the overall SWM system of the chain for the recovery from the organic fraction.
- Know the organizational choices (such as segregated collection and logistic) and plants that can step-by-step build an effective biowaste recovery.

What is the difference between composting and anaerobic digestion technologies?

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 formed that can replace manufactured fertilizers and/or peat, reduce the need for pesticides, improve soil structure, and reduce the need for irrigation.

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 (called 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.

Both composting plants and anaerobic digester can be designed at very different scale: from home-composting to large scale plants (even 100.000 t/year).

What is mechanical biological pre-treatment (MBT) of residual waste?

The mechanical and biological pre-treatment of residual waste (the undifferentiated waste remaining after the segregated collection of dry recyclables and of biowaste is carried out) is a completely different technique from composting or anaerobic digestion performed on segregated biowaste.

MBT addresses only the management of the residual waste; and it pre-treat it before a final treatment is performed or pre-treated waste is sent to landfill.

MBT is performed with two different goals:

1. in high income Countries to prepare the residual waste for energy recovery: it homogenizes the outcoming waste and it increases its calorific value, to favour to thermal treatment or co-incineration.

After pre-only a portion (about 40%) of the outcoming waste is ready for thermal treatment and energy recovery; thus, this technique still requires HIGH VOLUME FOR LANDFILLING.

2. In low- and medium-income Countries: it prepares the waste for landfilling by partially biostabilising the organic fractions.

How do composting and anaerobic digestion compare?

COMPOSTING	ANAEROBIC DIGESTION
	It recovers an ENERGY source – biogas - which is considered renewable
	Biogas can be upgraded to biomethane to provide fuel for transport
It gives a compost of high quality (if from segregated biowaste)	The digestate gives a compost of high quality (if from segregated biowaste)
The operation of the plant always results in carbon emissions (from energy use,...)	It results in a net energy saving thus, it contributes to reducing the carbon emissions of a SWM system.
The cost is relatively low	It requires a significant investment
It requires skilled personnel	It requires highly skilled personnel



GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET



unitar

United Nations Institute for Training and Research