

ANAEROBIC DIGESTION

CASE STUDY FROM MALTA

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Introduction to Wasteserv

“We **manage waste** by maximising the extraction of **good quality recyclable materials** and by generating **renewable energy** as part of our sustainable contribution for the Maltese Islands”

Waste Management practices (1)

- Malta operates mainly a **door-to-door collection** of mixed municipal waste (black bag), separate recyclables (grey/green bag) and bulky refuse.
- Moreover, Malta has brought in 10 transfer sites at the localities and a further 6 civic amenity sites



Waste Management practices (2)

- Facilities operated by Wasteserv include:
 - 1) Malta North MBT
 - 2) Sant Antnin MBT and MRF
 - 3) Gozo Waste transfer station
 - 4) Thermal treatment facility
 - 5) Engineered landfills



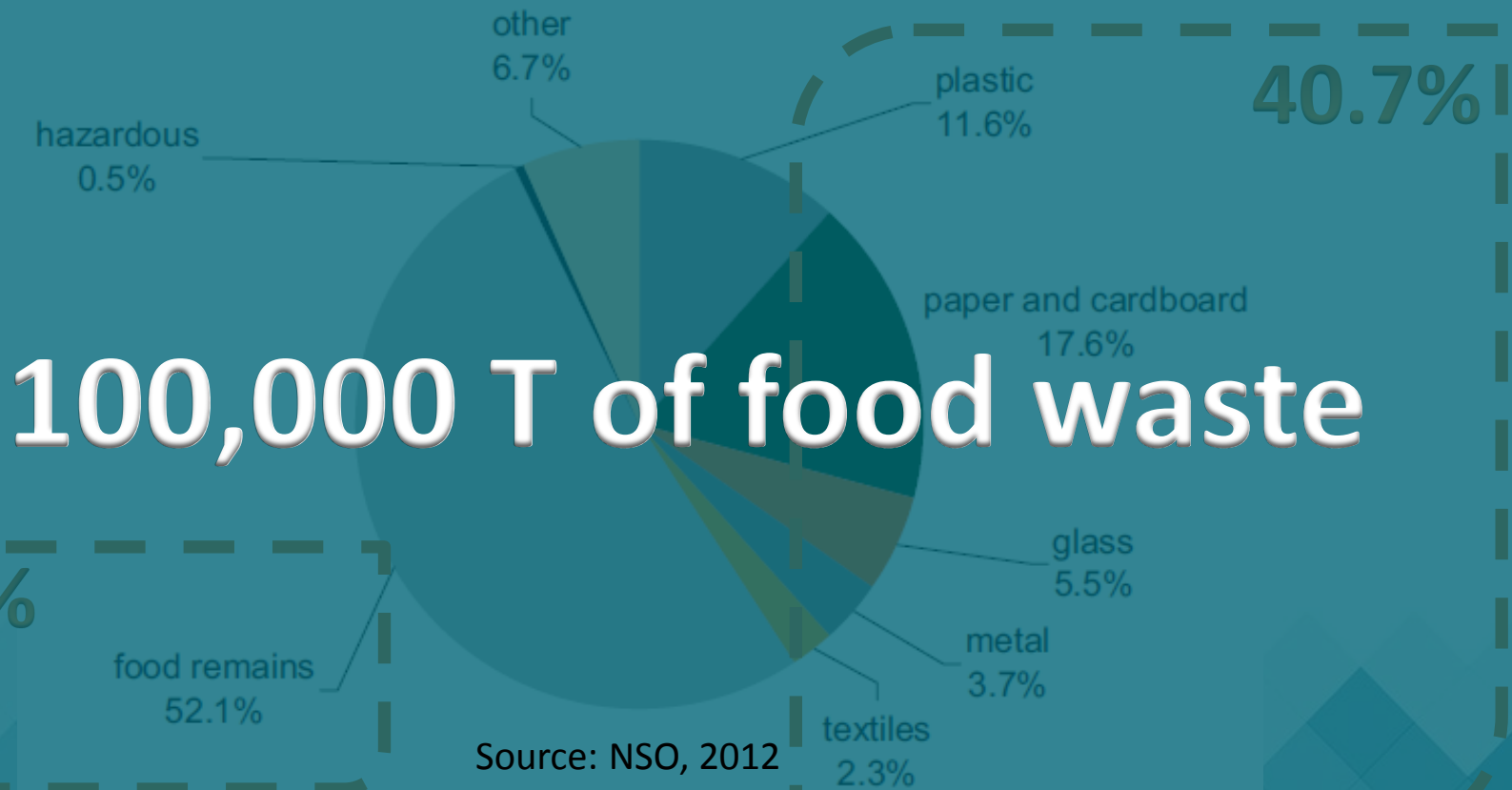
Black bag waste in Malta

2015	Landfilled at Ghallis	Treated at SAWTP
MSW received (T)	152,000	41,000
Total (T)	193,000	

This equates to some **450kgs of black bag waste** per capita per annum



Black bag waste composition



Waste Management and AD

“Anaerobic digestion (AD) is the breakdown of organic material by micro-organisms in the absence of Oxygen. AD produces biogas, a methane-rich gas that can be used as a fuel, and digestate, a source of nutrients that can be used as a fertiliser.”

Source: The official Information Portal on Anaerobic Digestion, 2016

“As a renewable energy technology, is the harnessing of natural biological processes to use available biomass to produce renewable methane...”

Source: Renewable Energy Association, 2015

The Sant Antnin MBT (1)

Parameter	Unit	Value
Capital Expenditure	Million EUR	15.8
Capacity of MBT (Indicative)	T/annum	35,000
Capacity of AD	T/annum	40,000
Digester technology	Multi-stage, wet anaerobic digestion at mesophilic temperatures	
CHP capacity	MW	1.7
Electricity potential	GWh	12.5
2015 waste acceptance (MSW)	T	41,400

The Sant Antnin MBT (2)



The Sant Antnin MBT (3)

- Issues of concern
 - AD plant is underutilised
 - Glass and inert content is high making separation of organics difficult
 - Compost quality low due to no source segregation

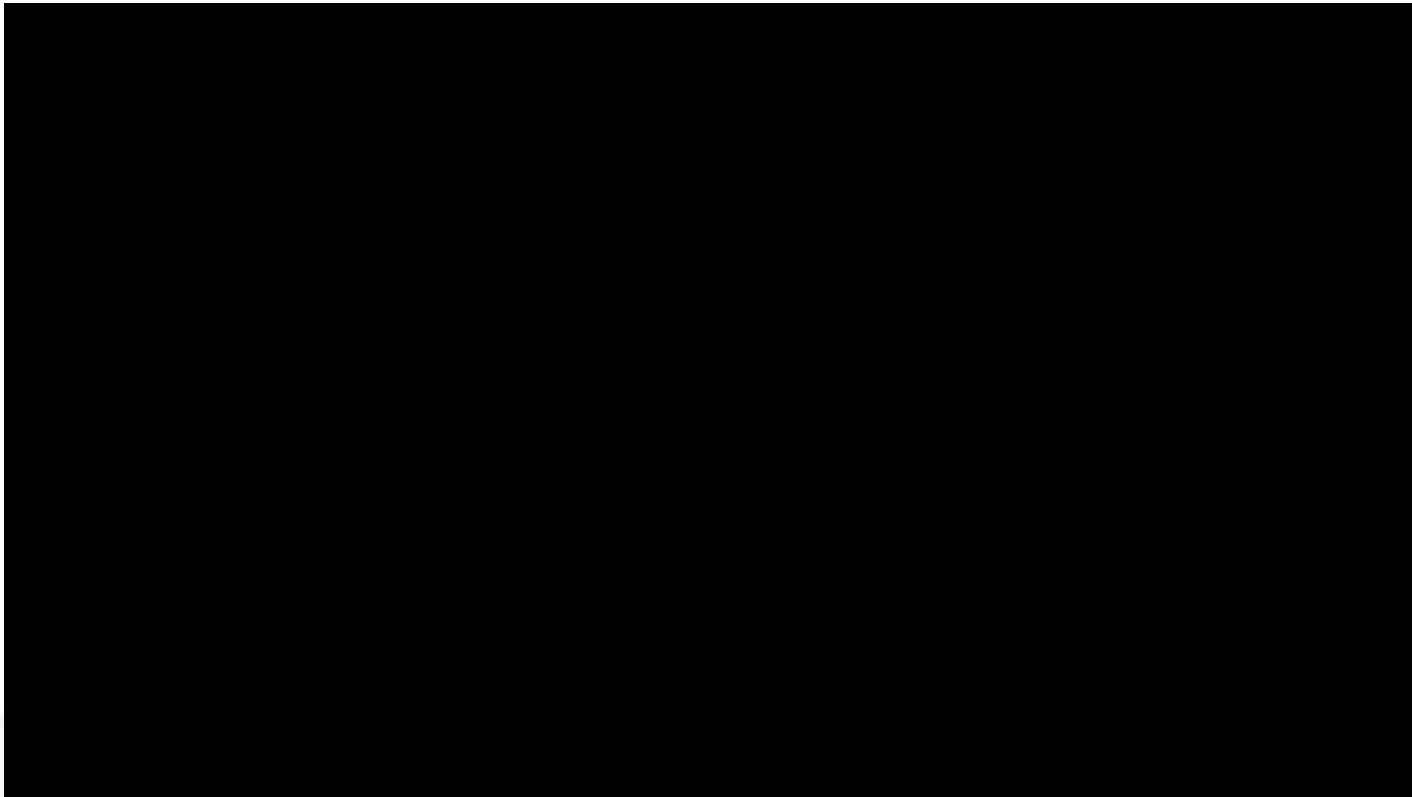
- Improvement plan
 - Source segregation of organic waste

The Malta North MBT (1)

Parameter	Unit	Value
Capital Expenditure	Million EUR	50
Capacity of MBT	T/annum	66,000
Capacity of AD (including manure)	T/annum	80,000
Digester technology	Multi-stage, wet anaerobic digestion at mesophilic temperatures	
CHP capacity	MW	1.8
Electricity potential	GWh	11.0

Plant is undergoing phased hot commissioning

The Malta North MBT (2)



Benefits of AD

- Diversion of organic waste from landfill
 - Reducing the void space required in the landfill
 - Reduction of greenhouse gases
- Renewable energy generation from waste
- Generation of green jobs



Challenges of AD (1)

- Human resources
 - AD is not a mechanical process but a biochemical process which is more difficult to control
 - Multidisciplinary skills and AD competence are required
- Utilisation of the digestate
 - Quality of output suitable to be used in agriculture or only landfilled?

Challenges of AD (2)

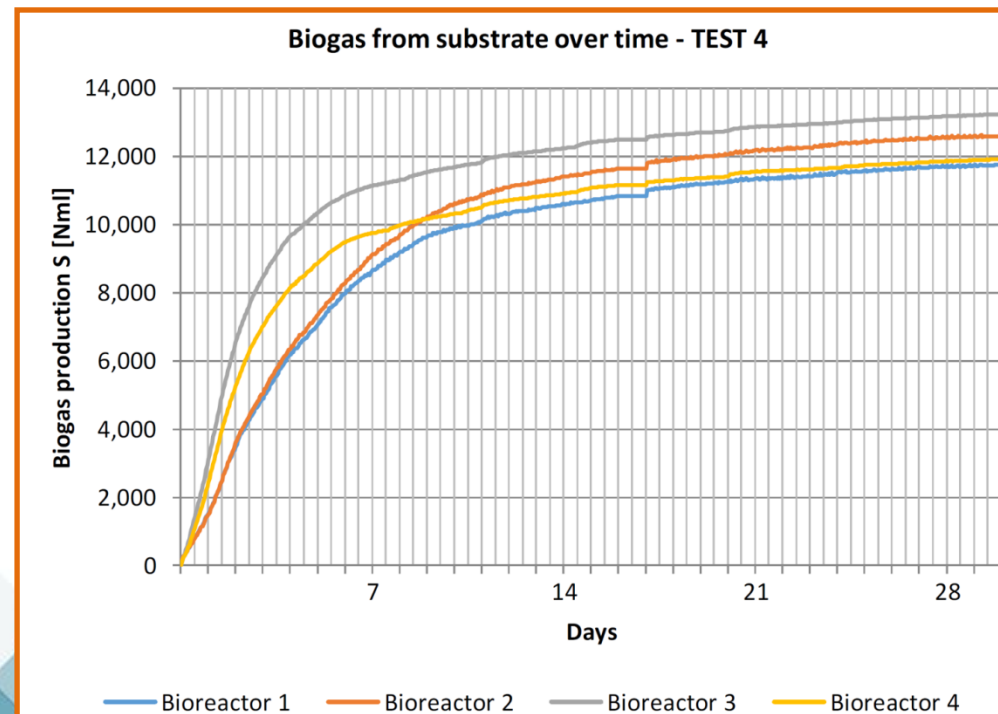
- Cost of AD
 - Landfilling is charged at 20 EUR per tonne – what is the true cost of AD?
 - Low renewable energy feed-in tariff – 0.105 EUR per kWh
 - Limited use of generated heat
- RDF generation
 - Recycling and thermal treatment systems required as part of the waste management system

Bio-methane potential test



Biomethane potential test results

- The average biomethane potential for OFMSW was found to be $374 \pm 49 \text{ CH}_4 \text{ NI/kgVS}$.
- Biogas production had a methane concentration of about 60%.



Renewable energy potential from waste

Parameter	Unit	Value
Total Organic in HSW	T	100,000
Organic matter (VS)	T	23,500
Average biomethane potential	CH ₄ NI/kgVS	374
Energy content	GWh	81
Electrical conversion efficiency	η_{elec}	37%
Total renewable electricity	GWh	30

Way forward

- Treatment of all MSW prior landfilling
- Intensifying efforts for the source segregation of organic waste nationally
- Improve scientific and technical control to extract maximum energy content of OFMSW
- Inclusion of more manure for co-digestion
 - Small scale, on-site AD facilities

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