



Aalto University
School of Engineering

Waste Management and Recycling

Excursion to HSY Waste Management Center 29.9.2015

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Extended Producer Responsibility

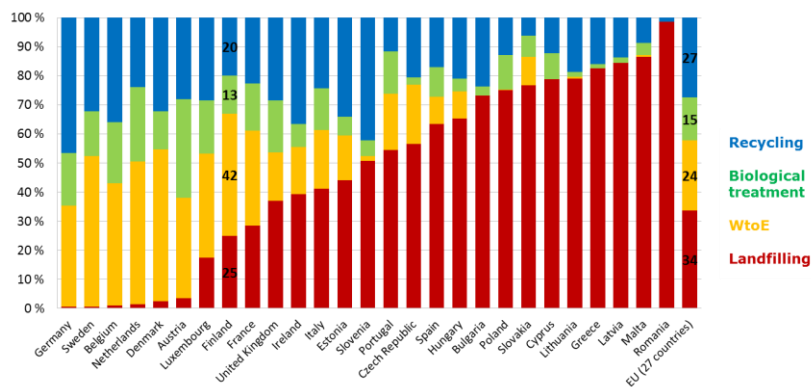
According to EU Directive on Waste and Waste Act (646/2011, FIN):

- In order to strengthen the prevention, re-use, recycling and other recovery of waste Producer (or importer) of following products:
 - Tyres of motor vehicles
 - Passenger cars and vans
 - Electrical and electronic equipments
 - Batteries and accumulators
 - Newspapers and Magazines
 - Packages (plastic, glass, metal cardboard)
- Shall organise the waste management of mentioned products
 - **In practise cover the costs of the waste management**

Helsinki Regional Environmental Services Authority, HSY

- HSY is responsible for waste and water management of four Helsinki Metropolitan area cities
- Turnover over 340 million euros
- Number of employees: 730
- HSY Waste Management:
 - Provides waste management services for over 1 million inhabitants of Metropolitan area
 - Owns and operates the largest landfill site in Nordic Countries
 - Turnover: 100 million euros
 - Number of employees: 130
 - Amount of waste received annually: 500 000 tons
 - MSW app. 260 000 tons

50 % recycling objective until 2016



Steps toward high utilization rate of MSW 1/2

In Metropolitan area landfilling of source separated municipal solid waste was the primary treatment method until spring 2014

Source separation of biowaste started in 1993

- Commission of the first composting plant of 30 000 tons/a in 1998, tunnel composting
- Commission of second composting plant of 50 000 tons in 2006, tunnel composting
- Commission of anaerobic digestion plant in 2015, dry method
- **Source separation regulations for cardboard, glass, metal and paper**
- **Collection points for glass, metal, cardboard, paper and clothes**
- **Sorting stations for waste unsuitable for household or curbside collection (big size wastes, furniture, construction demolition waste and garden waste)**

Steps toward high utilization rate of MSW 2/2

- **New Waste to Energy plant in use since spring 2014**

Location: City of Vantaa

Capacity: 340 000 tons/year (2-lines)

Fuel: Source separated municipal solid waste (mainly household waste or waste equal to household waste)

- Average HV 10,5 MJ/kg -> 930 GWh/a (116,6 MW)
- Plus natural gas of 650 GWh/a (91,8 MW)
- Electricity production 620 GWh/a (31 + 49=80,5 MW)
- Heat production 870 GWh/a (119,3 MW)
- *Heat can be utilized in district heat production through the year*

Plant substitutes one coal fired unit of Vantaa Energy Ltd

- Reduction of the use of coal in energy production app 30%
- Reduction of CO₂ emission in energy production app. 20%

Technology: Grate fired combined WtoE and gas turbine process

Steam values: 90 bar/400 C° and 88 bar/515 C°

Total Energy efficiency 95 %

Metropolitan Area Waste Management System

Reuse

- Recycling centres
- Flea markets

Containers of hazardous waste (approx. 70 units)



- Medicines to pharmacies

Sorti-stations

- Kivikko
- Konala
- Ämmässuo
- Ruskeasanta (in 2015)
- K-nummi (in 2018)
- Munkinmäki waste station



Source separation



Local recycling points (approx. 120 units)



- Glass
- Paper
- Cardboard
- Metal
- Textiles

Collecting trucks



Dr Petri Kouvo, HSY Waste Management 16.9.2015

Långmossebergen-Waste to Energy plant



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Bottom ash and fly ash treatment

Bottom ash is coarse unburned portion of MSW that includes:

- Stones, concrete, other minerals (glass)
 - Metals: ferrous metals, stainless steel, copper, brass, zink
 - And mineralized materials
- Ash is collected from boiler section and from ESP (electrostatic precipitator) or other dust removal device (air pollution control system)
 - *Ash is highly contaminated with heavy metal and is treated as hazardous waste*

Bottom ash and fly ash treatment



Bottom ash and fly ash treatment

- **Step 1. Ferrous (magnetic) and nonferrous metals (eddy current) are separated from bottom ash**
- **Rest of the bottom ash is fractionated to suitable fraction sizes**
- **Mineral fractions can be used in landfill landscaping and other constructions (roads etc)**
- Fly ash is mixed with water and stabilizing agents (cement) and deposited at hazardous waste landfill area

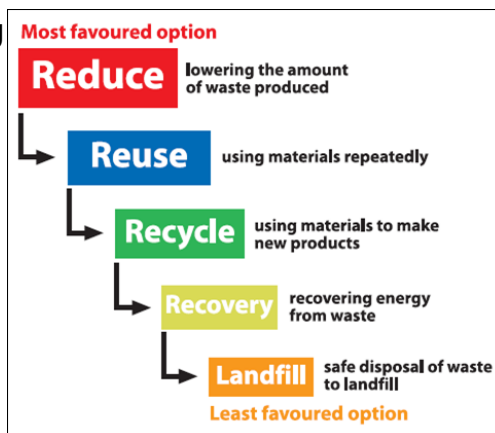
Sorting Stations

- Purpose of the Sorting stations is to provide easy way for households and small enterprises to get their wastes for recycling and other utilization
- First Sorting stations opened in year 2000 and currently there is five stations operating in metropolitan area
 - Number of customers annually is over 350 000
 - Number of employees 2-3 in shift
 - Open from 7.00 am to 9.00 pm
 - Allowed vehicles:
 - personal cars with trailer
 - Vans and vans with trailer
 - No trucks



Waste Hierarchy means General obligation to comply with order of priority

- Order of priority is a binding option but
 - Priority order may change if better overall result is achieved
 - Example: recycling of packaging waste versus energy utilization



Exercise: Waste management plan

Goal of the exercise:

To plan waste management system for a City (the City) of 1,0 million inhabitants and reach to recycling rate of 50 % for household waste

Group 1, Authorities:

- Reparation and decisions of the local waste regulations
 - Source separation regulations
- Decision on transport system
- Waste fees

Group 2, Municipality's transport department

- Planning of the waste collection and transportation system

Group 3, Waste treatment services

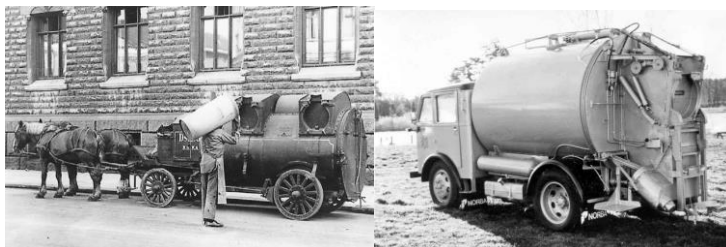
- Planning of the treatment of the waste collected and transported by transport department

Group 2: Collection and Transportation of Waste 1/2

- Based on decisions made by municipal waste authority the municipal waste management organization provides the waste collection and transportation services of municipal solid waste for households
- In this exercise waste is collected from city area of 1 million inhabitants
 - 30 000 inhabitants lives in one family houses and
 - 700 000 in houses of more than 20 apartments
 - Annually 200 000 tons of MSW need to be collected
 - Capacity of one waste truck is 7,5 tons
 - Capacity of 600 l waste bin is 35 kilos
 - Capacity of 240 l waste bin is 22 kilos
 - One person produces 360 kilos of MSW per year

Group 2: Collection and Transportation of Waste 2/2

- One waste truck operates 10 hours every week days
 - **Step one:** Think what are all the other parameters you need to know to be able to order and organize the collection of the mixed waste?



1920. CO2 benchmark, but capacity low. 1937. Compaction reduces transportation needs