Energetic and Environmental Aspects for Solid Municipal Waste Treatment Alternatives in Vilnius Region, Lithuania:

Incineration and /or Mechanical Biological Treatment

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Introduction

Republic Lithuanian:

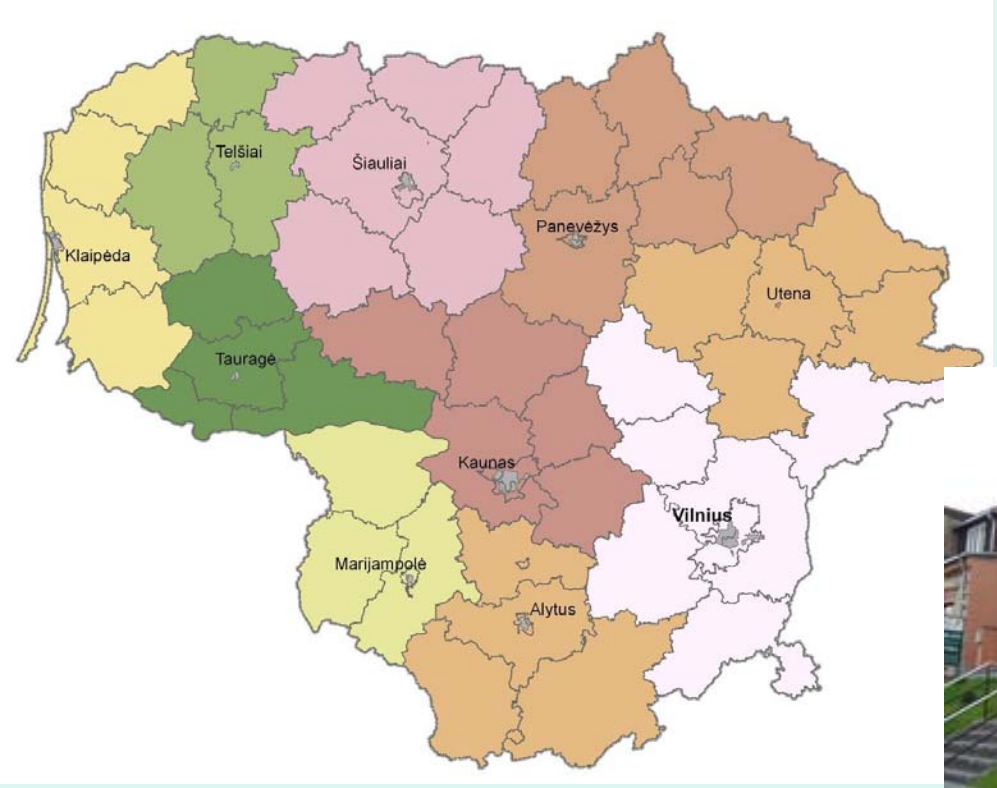
Year of EU entry: 2004
Capital city: Vilnius
Total area: 65 300 km²
Population: ~3,4 million
GDP:
~94 790 €/per capita
Annual municipal waste generation:
~1,25 mln. t/a
(~370 kg/per capita)

Introduction

- ***The implementation of requirements of Council Directives 1999/31/EC (Landfill of Waste) and 2001/77/EC (Promotion of Electricity Produced from Renewable Sources in the Internal Electricity Market) is actual both for Lithuania and for other many new EU members.***

Introduction

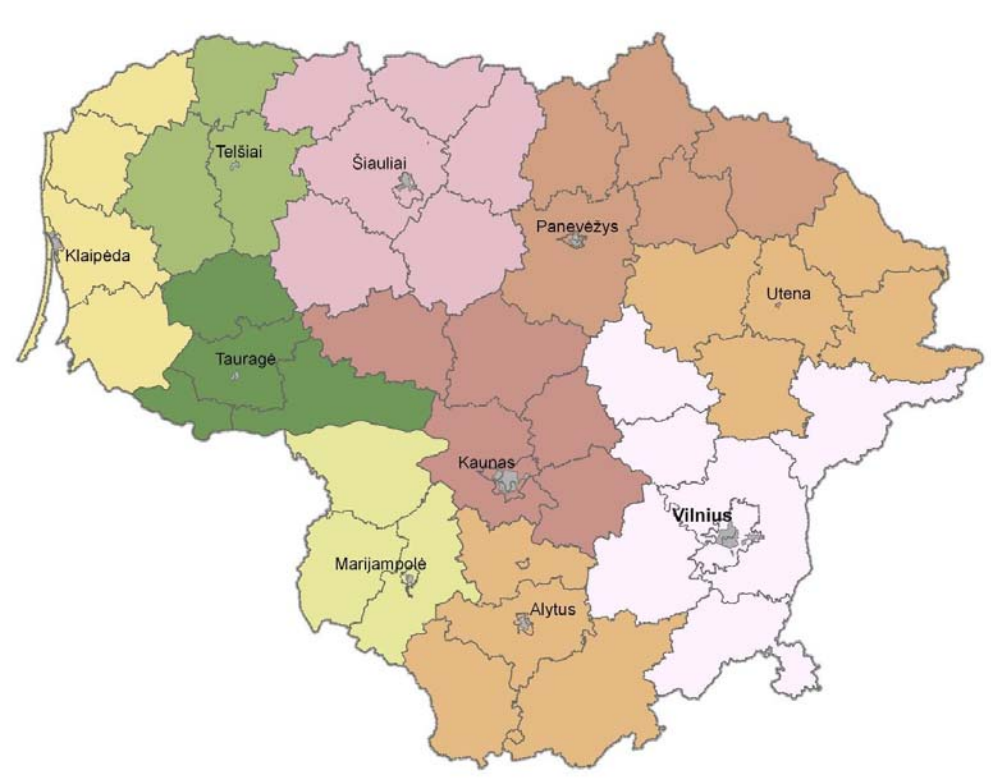
Currently in Lithuania:



-10 waste management regions with regional waste management centers have been established…

Introduction

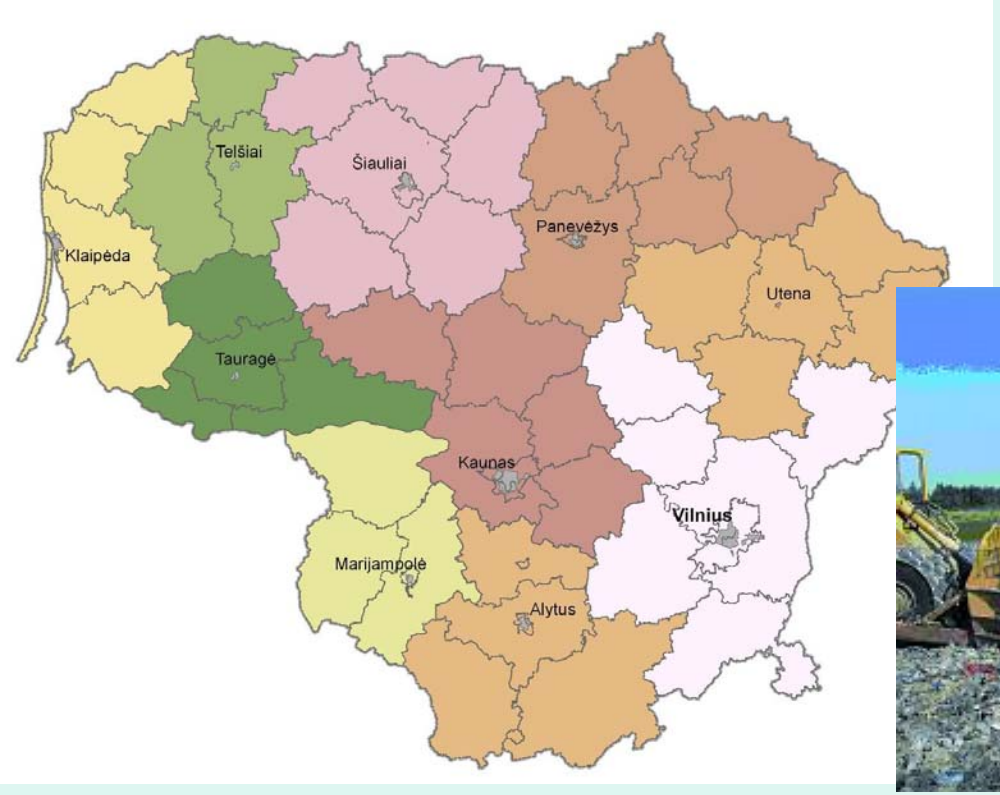
Currently in Lithuania:



- separate collection and recycling is step by step increased…

Introduction

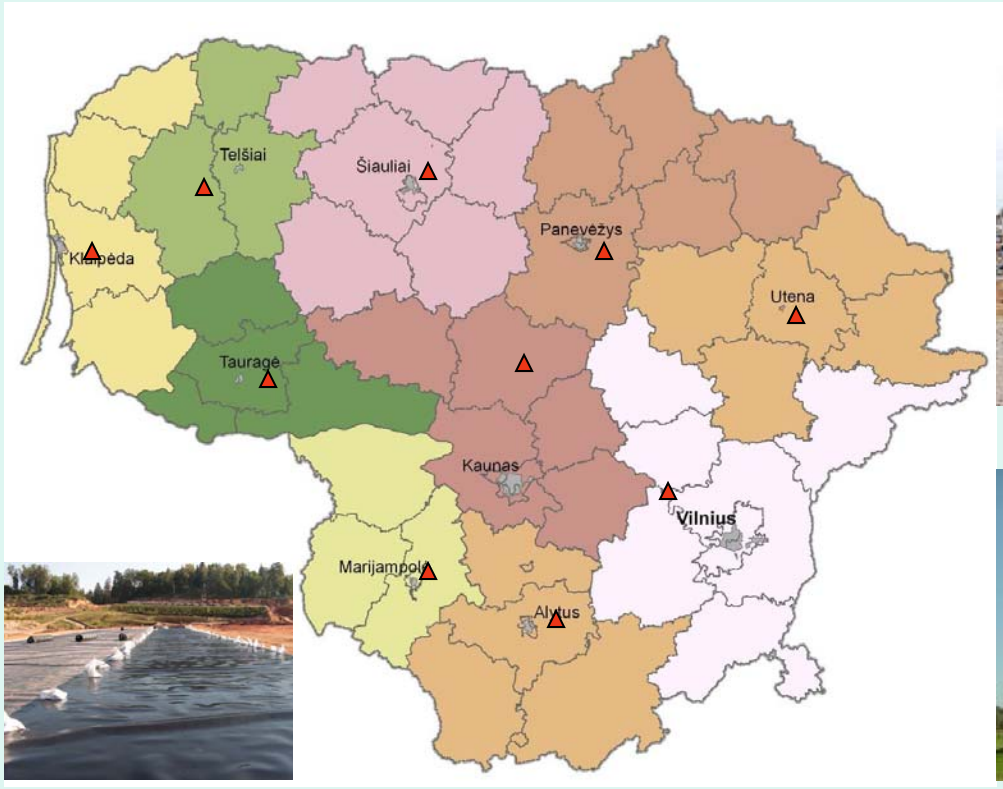
Currently in Lithuania:



- however main MSW disposal method leaves still landfilling

Introduction

Currently in Lithuania:



- otherwise 10 modern regional landfills have been constructed and opened…

Introduction

Currently in Lithuania:

- 10 waste management regions have been established;

- 10 regional landfills have been constructed;

- national feasibility study for development of municipal waste management have been prepared;

- however main MSW disposal method in Lithuania leaves still landfilling.

Based on the conclusions of mentioned study :

- Lithuanian State Strategic Waste Management Plan came into effect;

- the construction of three waste incineration plants are planed.

Introduction

Currently in Lithuania:

nexts improtant studies have been prepared

- national feasibility study for development of municipal waste management;

- feasibility studies for municipal waste incineration in Vilnius, Kaunas and Klaipėda cities;

- feasibility study for energetically use of high-calorific fractions in Lithuanian cement industry (North Lithuania).

Based on the conclusions of mentioned study :

- Lithuanian State Strategic Waste Management Plan came into effect;

- the construction of above mentioned waste incineration facilities are planed.

Introduction

Currently in Lithuania:

However the intend for MSW incineration raised the stonewalling of Vilnius inhabitants...

Introduction

Currently in Lithuania:

…also the opposition of businessmen who plan the development of MSW recycling and mechanical-biological pre - treatment (MBP).

Waste management system priorities

Before taking an objective assessment we may remember a priorities of waste management system:

- prevention;

- re-use;

- recycling;

- another use;

- disposal.

Waste management system priorities

Recycling:

- the use of waste for manufacturing of same or other products with except energy generation

Another use:

- includes also energy generation from waste

Disposal:

- waste to be not suitable for recycling and/or another use are disposed in corresponding facilities including landfilling and incineration without energy generation.

Waste management system priorities

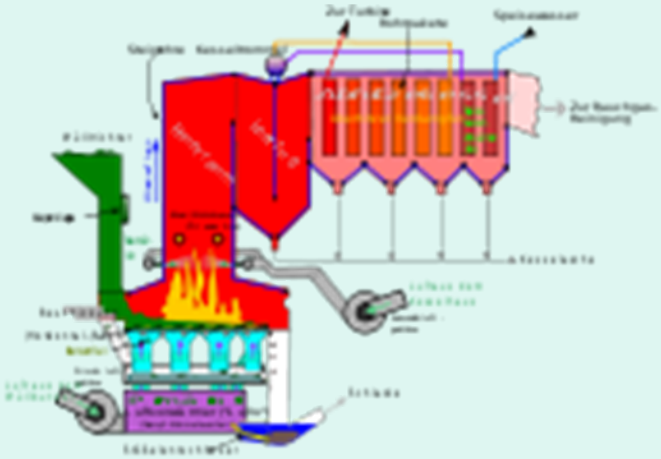
According to some important points Lithuanian State Strategic Waste Management Plan:

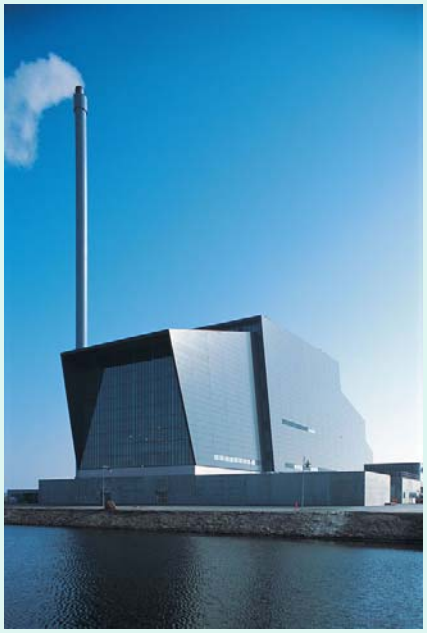
- ***till 2013: no less than 50 % of municipal waste may be recycled or otherwise used;***

- ***landfilled part of municipal biodegradable waste may be:***
  - till 2010: no more than 75% of landfilled in 2000;
  - till 2013: no more than 50% of landfilled in 2000;
  - till 2020: no more than 35% of landfilled in 2000.

Waste management system priorities

We may have in the mind that:

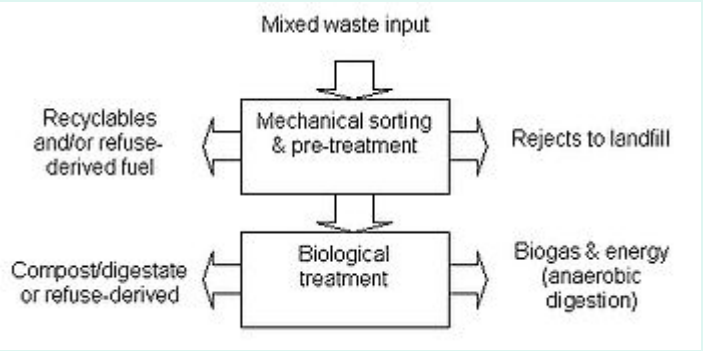




- waste incineration with energy generation is one of kinds for another use of waste, but it isn't waste disposal, only ;

Waste management system priorities

We may have in the mind that:



- mechanical-biological pre-treatment is not recycling, because the treatment residues are also waste, but no products.

Waste management system priorities

We may have also in the mind that:

- both waste incineration and mechanical-biological pre-treatment are waste stabilising process before disposal in landfill.

The prognosis of MSMW generation and content

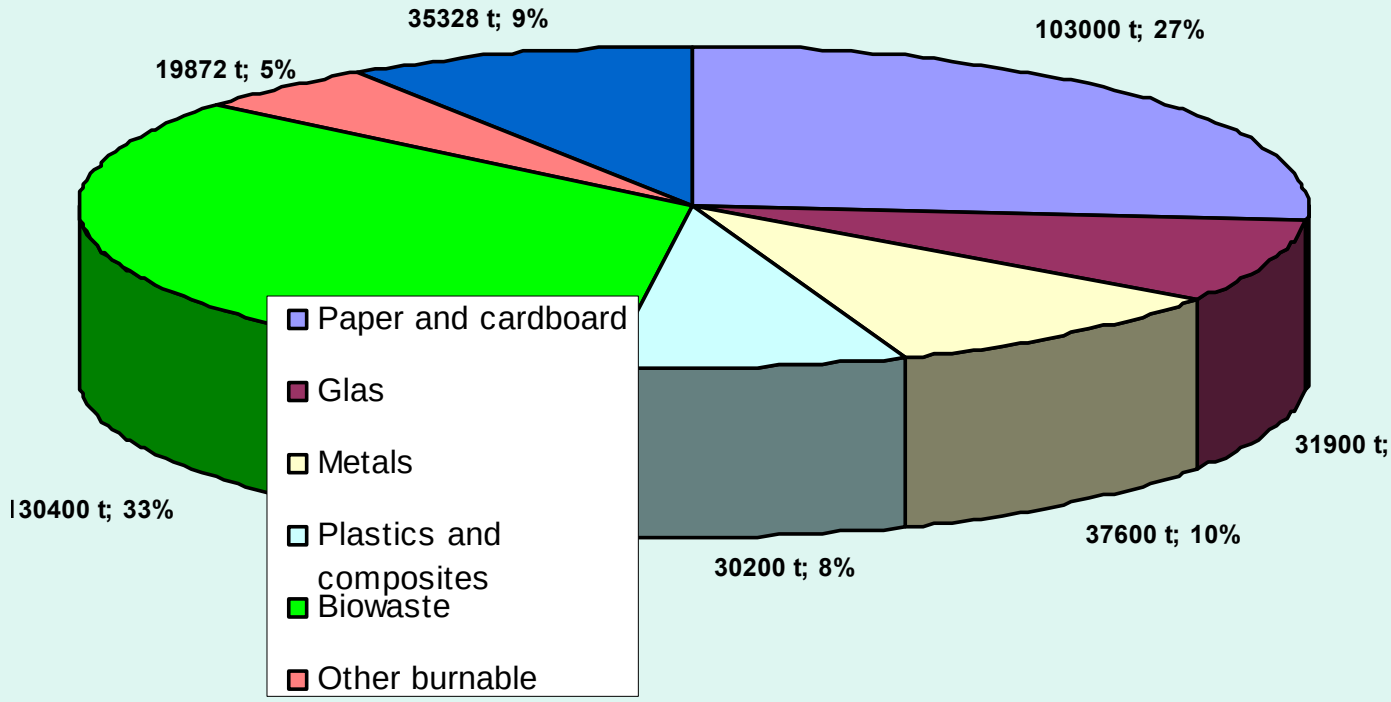
The assessment of MBP and incineration alternatives for Vilnius waste management region had been performed in concordance that according to Lithuanian State Strategic waste management plan and considering the recommendations of EU specialists the separate collection and recycling of municipal waste fractions will be:

- ***biowaste – 22 %***
- ***paper and cardboard - 60 %***
- ***plastics and composites – 25 %***
- ***glass – 60 %***
- ***metals – 50 %***
- ***other combustible waste – 3%***

The prognosis of MSMW generation and content (2)

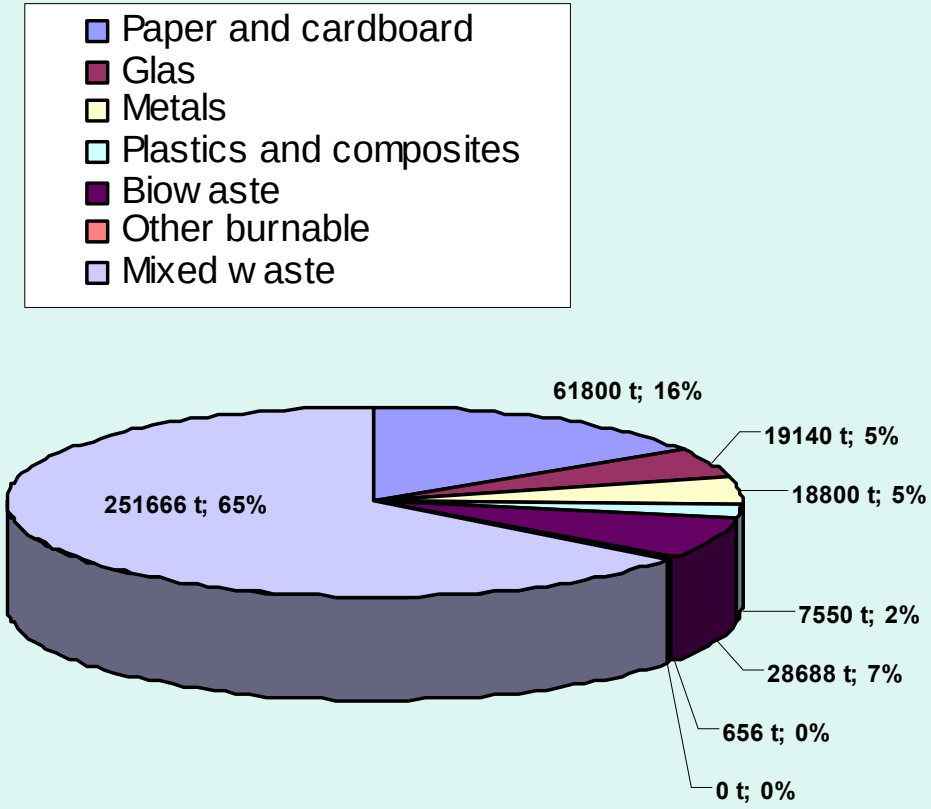
The forecasts of municipal waste generation have been performed by use of prognostic model LCA-IWM

The prognosis of SMW generation and content (3)



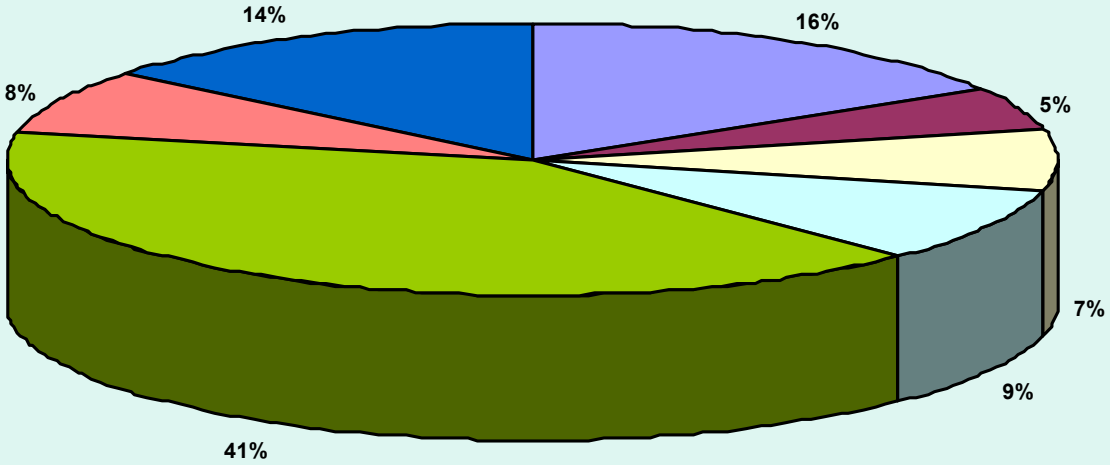
SMW generation forecast for Vilnius region (2013)

The prognosis of SMW generation and content (4)



SMW collection forecast for Vilnius region (2013)

The prognosis of SMW generation and content (5)



Mixed SMW content forecast for Vilnius region (2013)

MSMW management alternatives

0 alternative: MSMW landfilling.

In this case the collected residual MSMW are landfilled.

1 alternative: MSMW mechanical-biological pre-treatment (MBP) and HCF incineration in cement kilns

In this case:

- collected residual MSMW are treated mechanically with particularly metals separation and dividing to high calorific fraction (HCF) and low calorific fraction (LCF);

- separated metals go to recycling;

- LCF is treated biologically and the content of biowaste is significantly reduced;

- HCF is incinerated in cement kilns

- stabilised LCF are landfilled.

MSMW management alternatives (2)

2 alternative: MSMW mechanical-biological pre-treatment (MBP) and HCF incineration in WIP

In this case:

- collected residual MSMW are treated mechanically with particularly metals separation and dividing to high calorific fraction (HCF) and low calorific fraction (LCF);

- separated metals go to recycling;

- LCF is treated biologically and the content of biowaste is significantly reduced;

- HCF is incinerated with energy recovering, the 80% of formed slags is used for construction of ways;

- stabilised LCF and rest slag are landfilled

MSMW management alternatives (3)

3 alternative: MSMW incineration

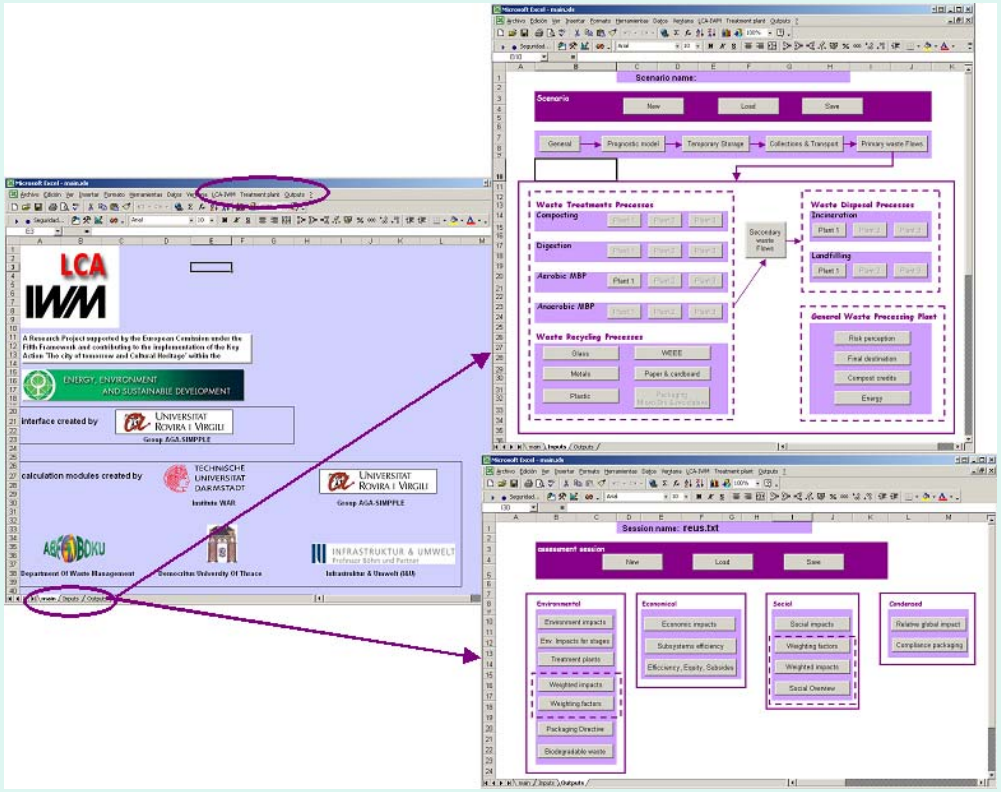
In this case:

- collected residual MSMW are incinerated with energy recovering;

- the metals are separated from formed slag and 80% of slag is used for construction of ways;

- the rest slag is landfilled.

MSMW management alternatives (4)

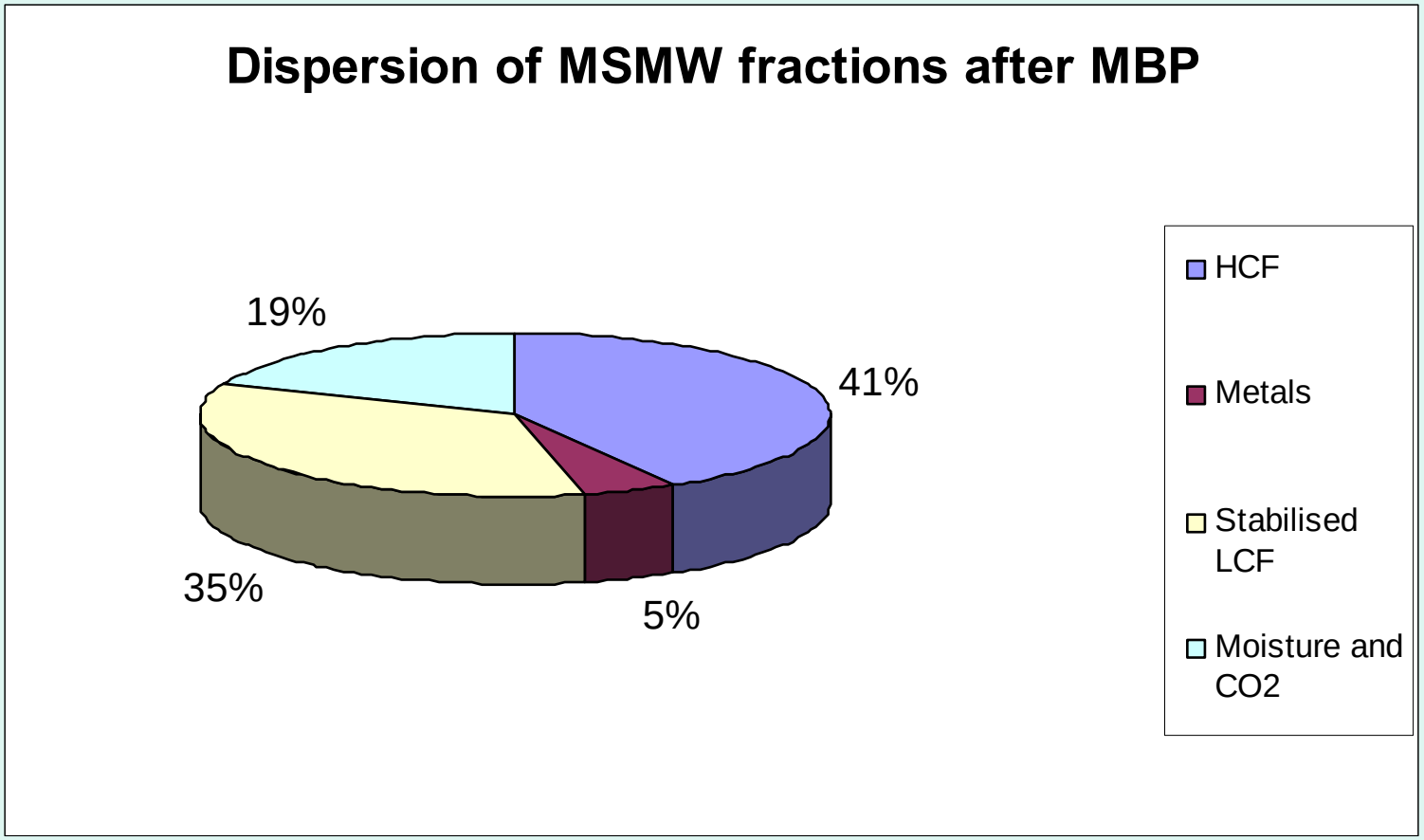


The used assessment tool LCA-IWM evaluate the chemical content, moisture and caloricity of every waste fraction, also the pollutants emissions conditioned by each waste treatment technology.

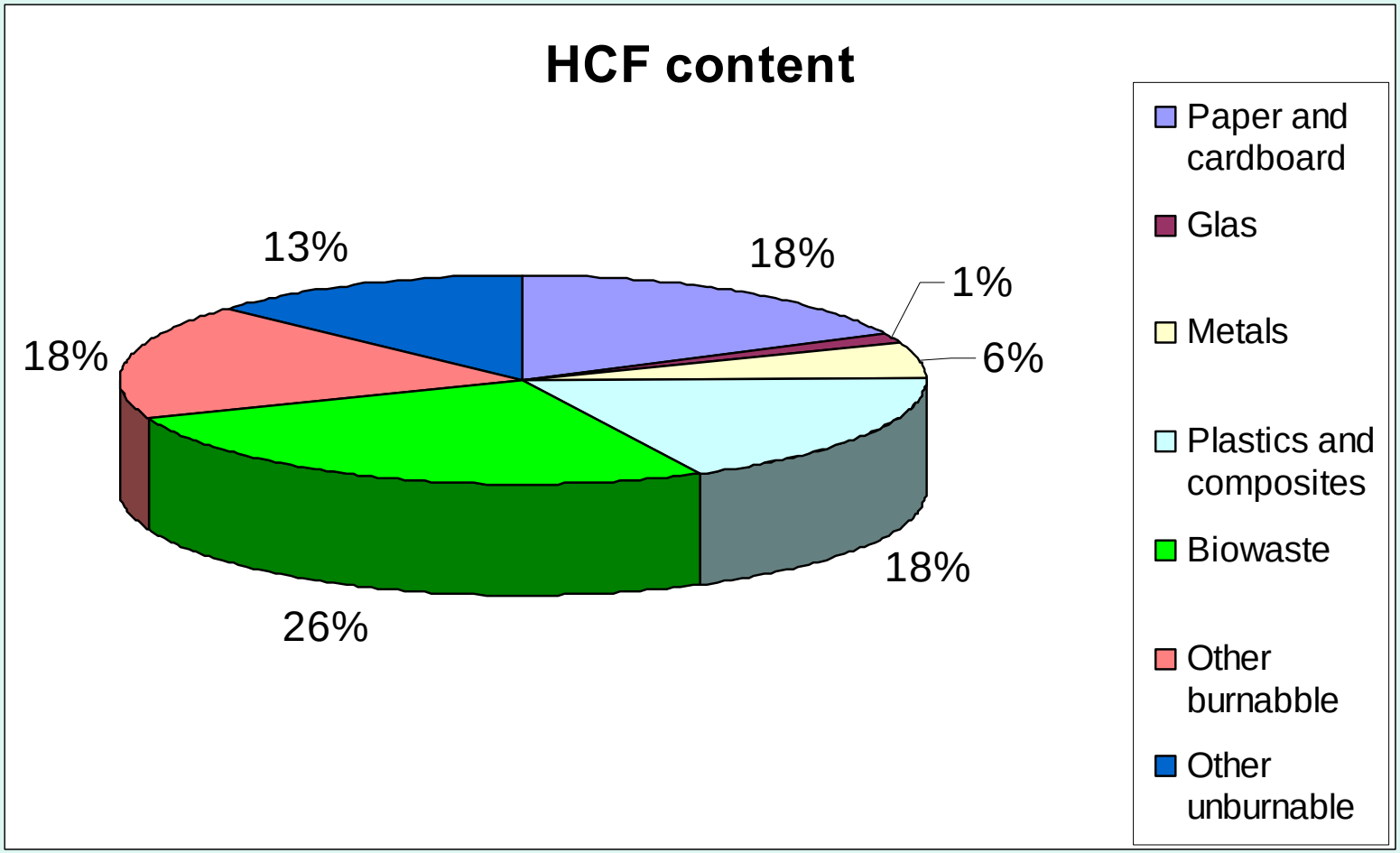
The tool considers that fire grate technology (as best available technology) with effective gas cleaning system is used for waste incineration.

The tool also considers the parts of waste fractions to be divided between HCF and LCF, also the part of biowaste to be destroyed in the biological stage of MBP.

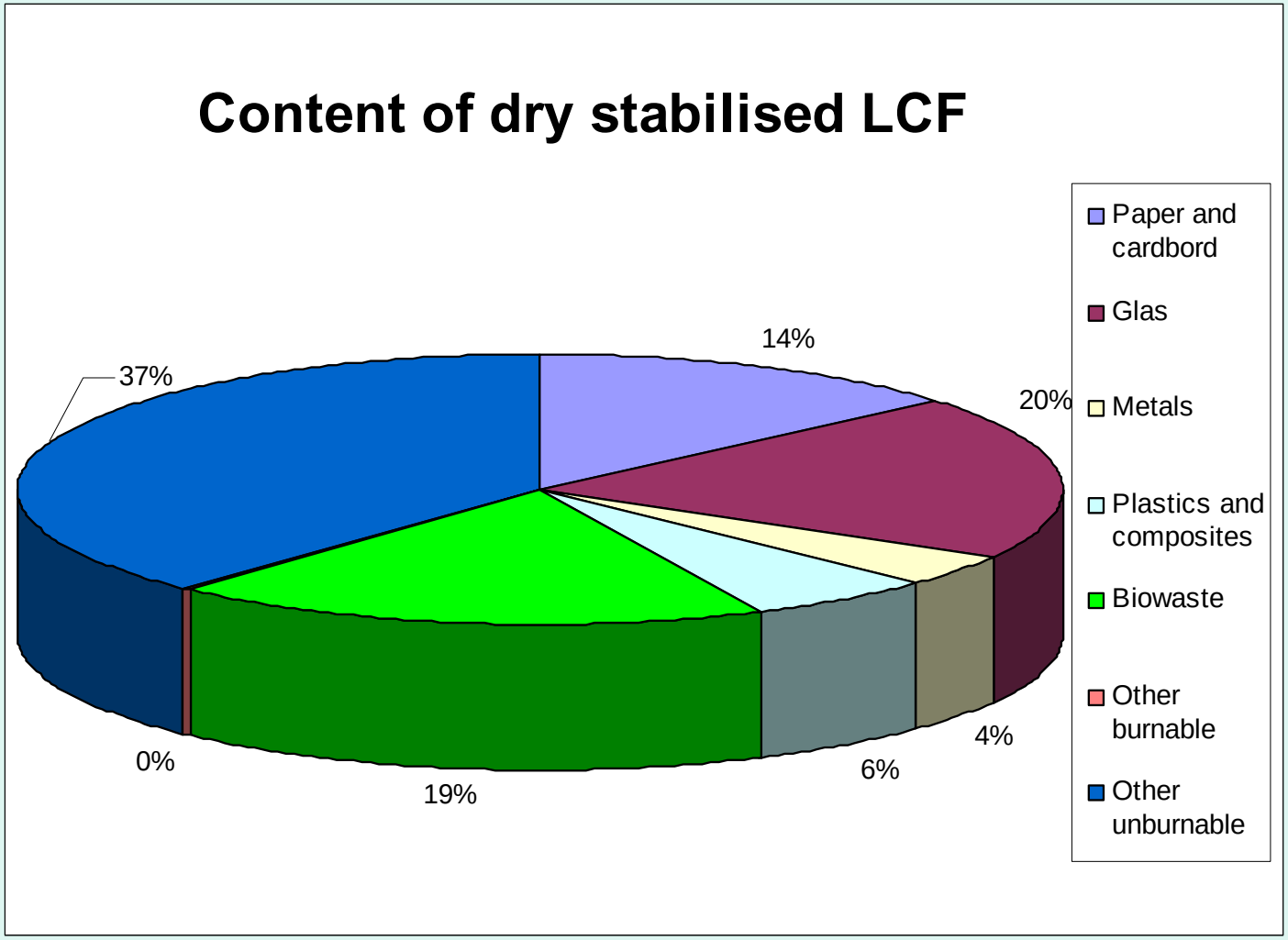
MSMW management alternatives (5)



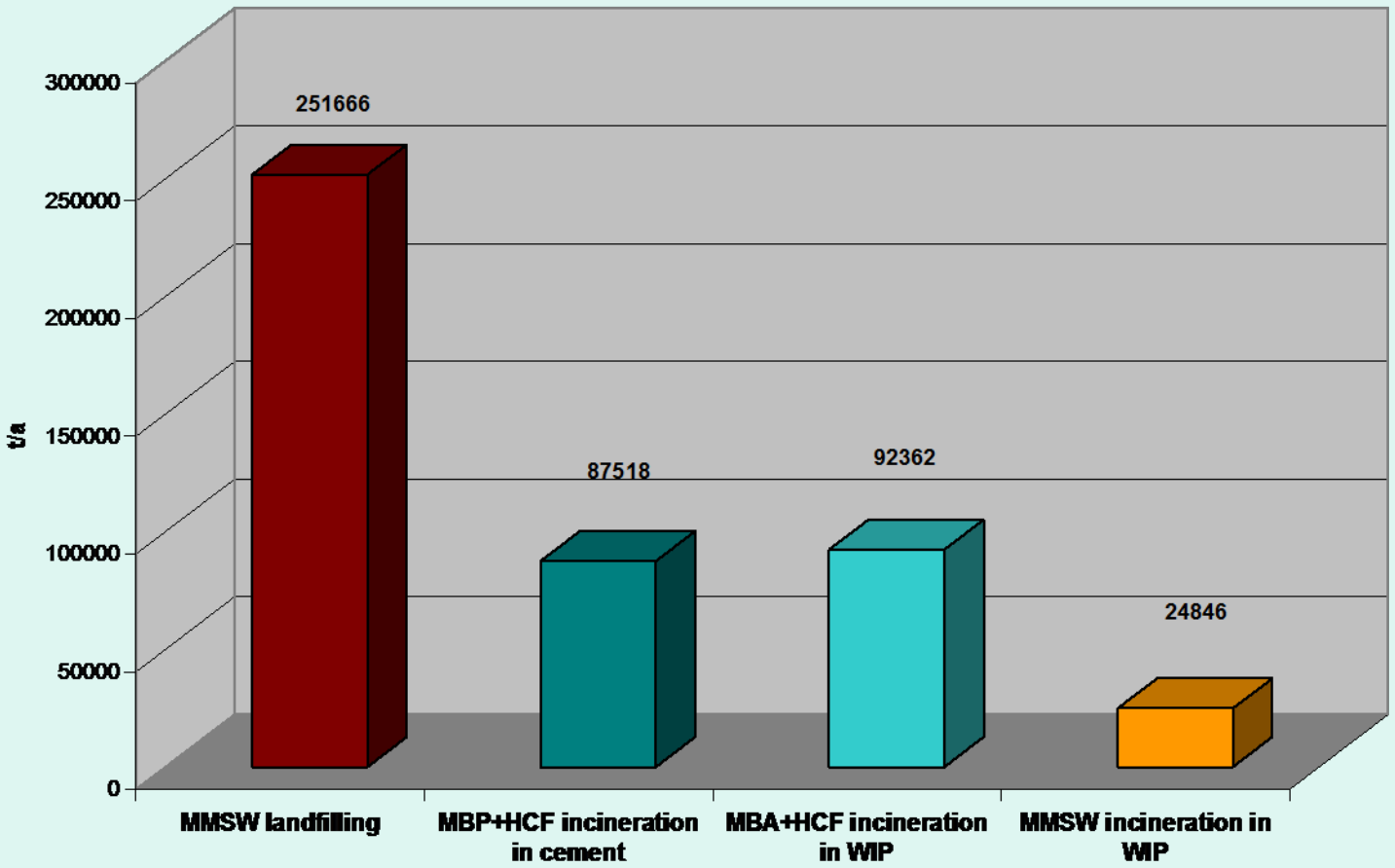
MSMW management alternatives (6)



MSMW management alternatives (7)



Assessment results

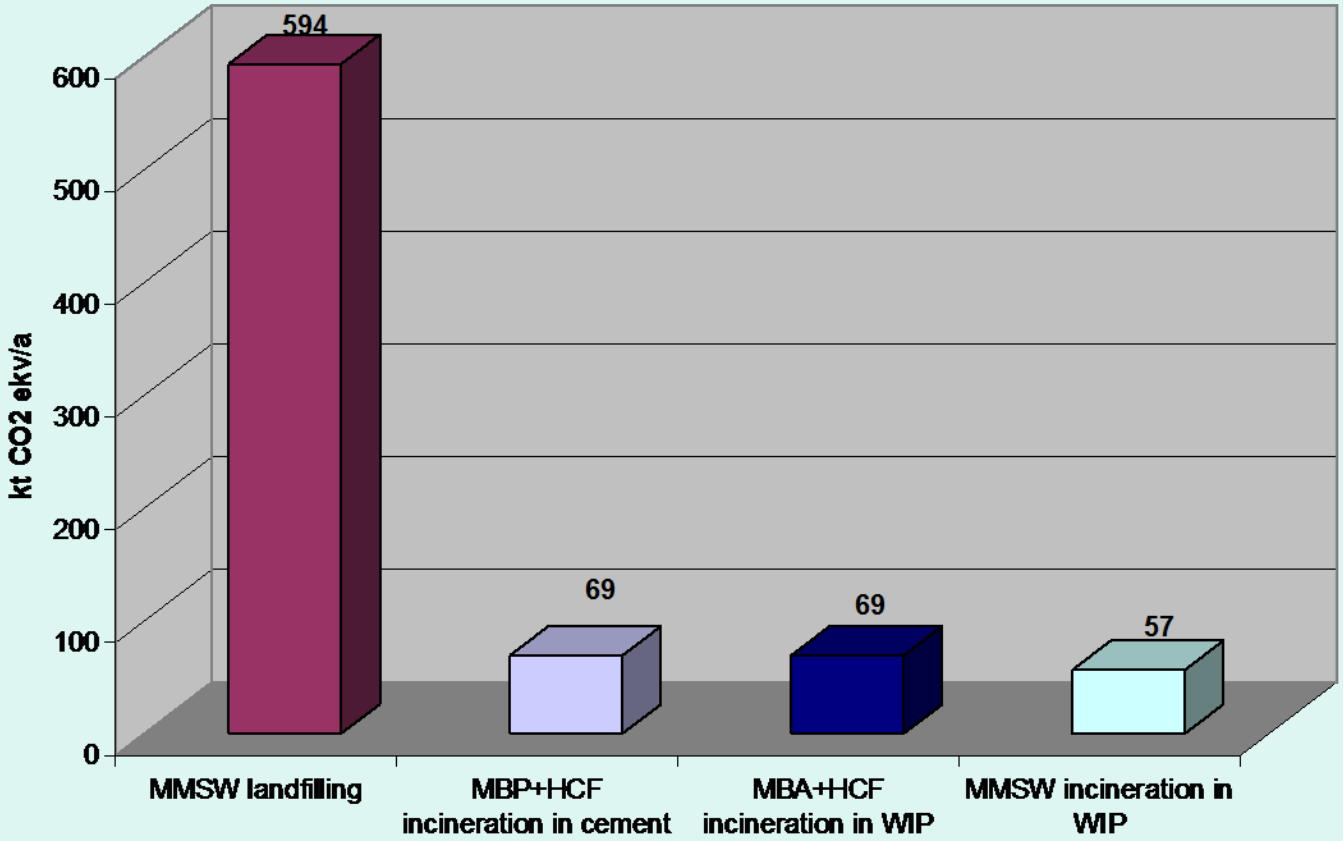


Review the differences of waste and/or waste treatment residues flows to the landfills for every alternative. It is evident that:

- due to MBP and following HCF incineration ~ 3 times;

- due to MSMW incineration - 17 times.

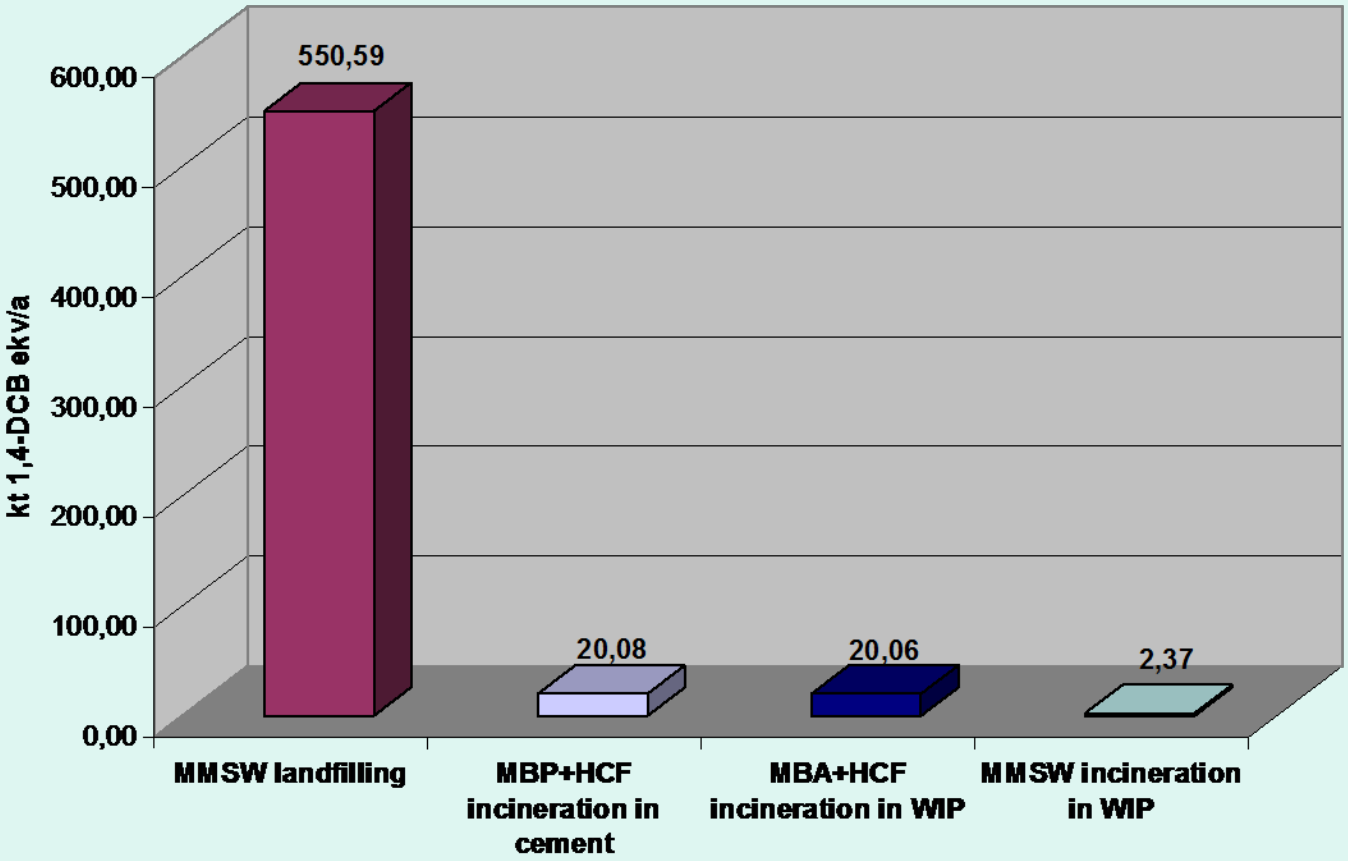
Assessment results (2)



Namely biowaste accessing to the landfill with MSW and/or its treatment residues make mostly environmental impact problems because during anaerobic biowaste digestion the main amount of ***greenhouse gas*** *(methane CH4) is emitted together with landfill gas.*

The emissions during waste incineration are significantly lower.

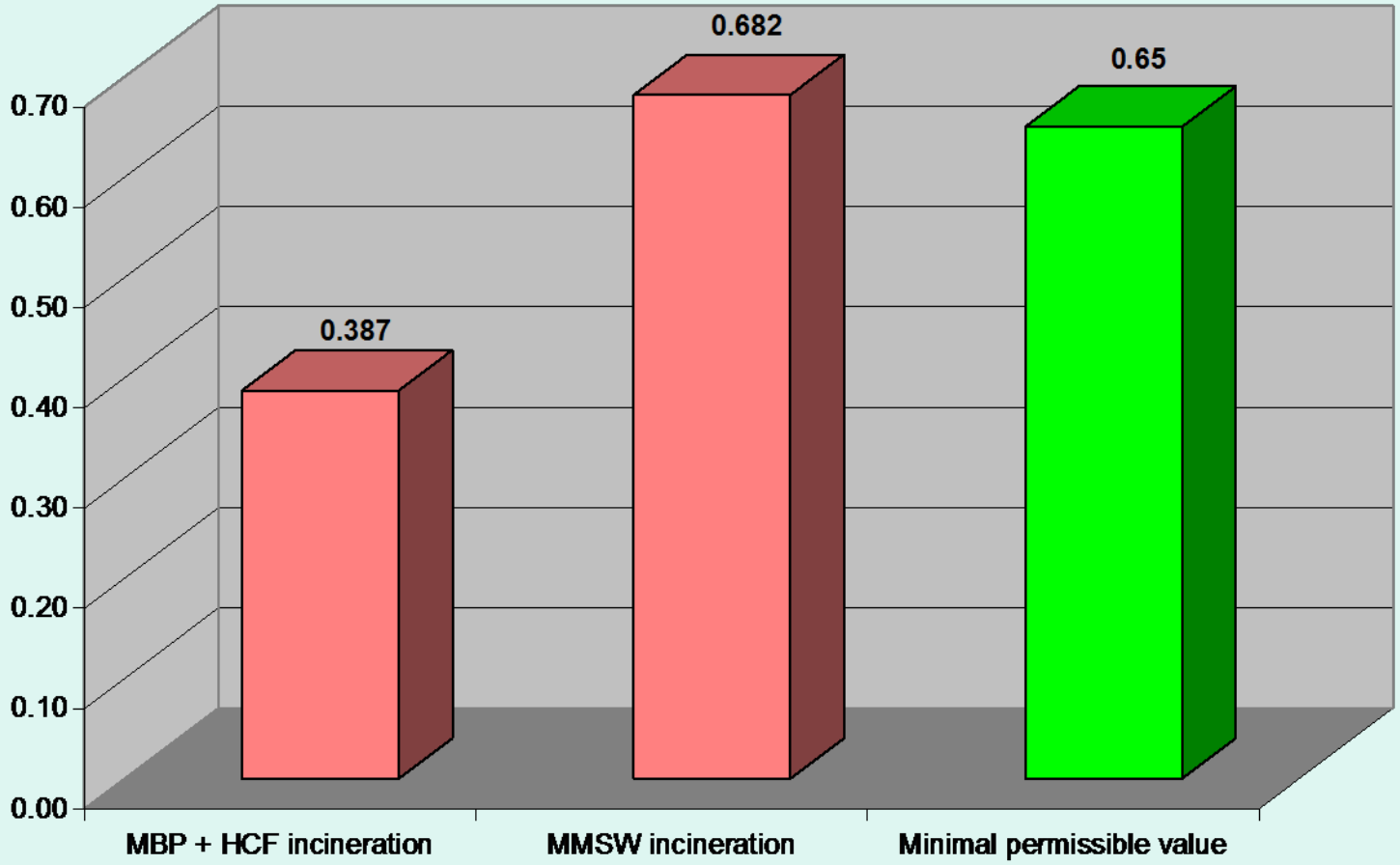
Assessment results (3)



Namely biowaste accessing to the landfill with MSMW and/or its treatment residues make mostly environmental impact problems because during anaerobic biowaste digestion the main amount of ***toxic compounds*** *is emitted together with landfill gas and leachate.*

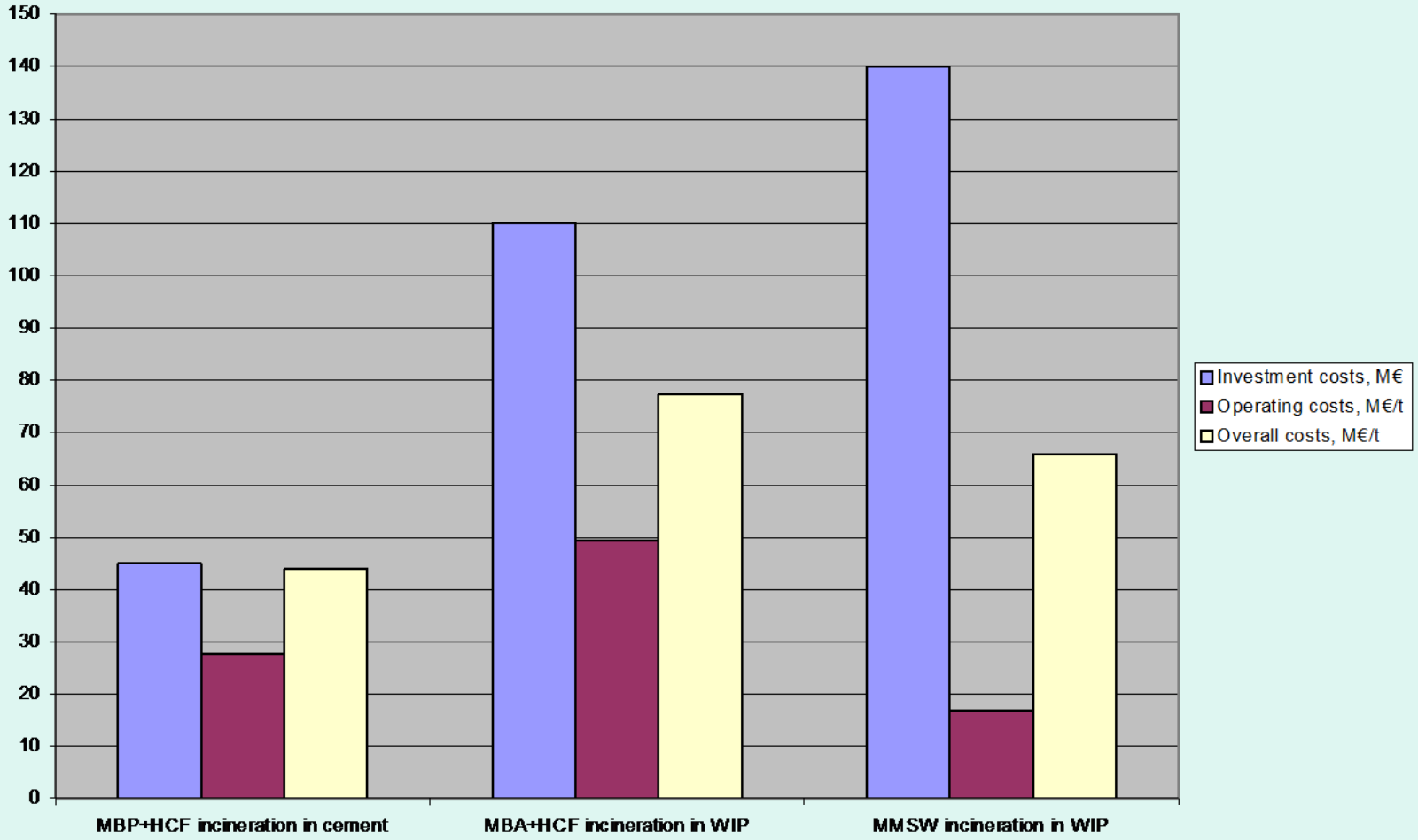
The emissions of these environmental pollutants during waste incineration (considering to gas cleaning efficiency) are significantly lower.

Assessment results (5)



MSMW incineration satisfies the minimal requirements for energy generation from waste according to not yet unforced new EU Waste Directive

Assessment results (5)



Possible investment, operating and overall costs for MSW treatment alternatives (2013, Vilnius waste management region, Lithuania)

Conclusions

The performed assessment show that:

- Due to MBP process for MSMW and subsequent HCF incineration the municipal waste flow to the landfill is reduced 2,8 times, due to MSMW incineration - 17 times;
- Due to MBA process and subsequent HCF incineration for MSMW the biowaste flow to the landfill is reduced 5-6 times, due to MSMW incineration the biowaste flow to the landfill is excluded;
- In comparison with MSMW landfilling the MBP process with subsequent HCF incineration reduce greenhouse gas emissions 7 times, MSMW incineration – 11 times;
- In comparison with MSMW landfilling the MBP process and subsequent HCF incineration reduces the human toxicity 16 times, MSMW incineration - – 232 times.
- Energy efficiency for MBP and subsequent HCF incineration is 38%, MSMW incineration – 68%, whereas according to new EU Waste Directive this efficiency may be not less than 65%.
- In comparison with MBP the economic advantages of MSMW incineration are evident concerning operating costs, however the corresponding investment costs for incineration in WIP are about 3 times higher.

Thank you for your attention ☺

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