ESTIMATION OF MUNICIPAL SOLID WASTE HEATING VALUE IN GREECE IN THE FRAME OF VARIOUS WASTE TREATMENT SCENARIOS

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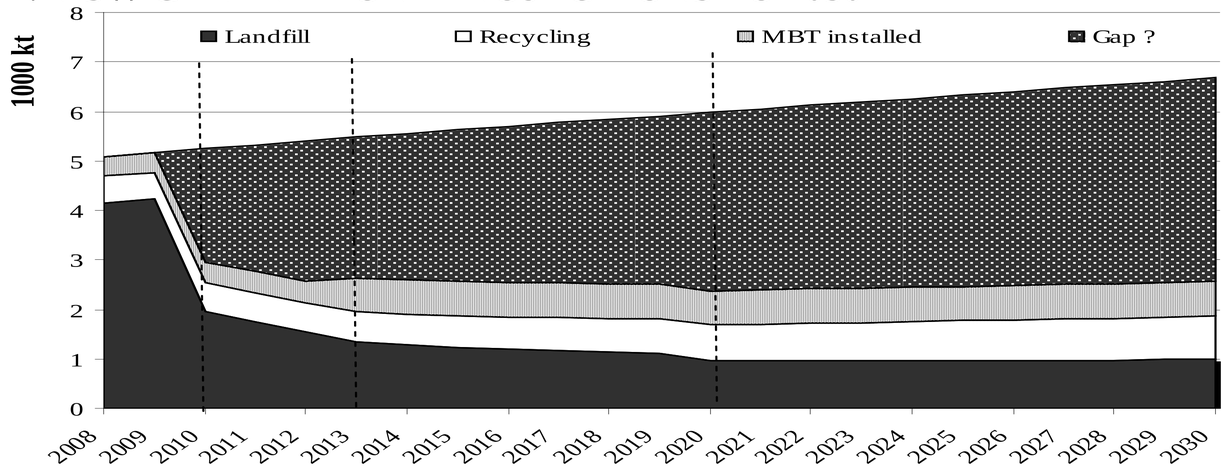
1. INTRODUCTION

Recycling of packaging wastes may be compatible with incineration within integrated waste management systems. In order to estimate and calculate the energy potential of the Municipal Solid Wastes (MSW) a mathematical model was formulated by taking into consideration:

- Existing legislation (1999/31/EC and 2004/12/EC).
- Existing and future waste management plants in Greece.
- Residuals of the aforementioned plants.

Then, the recycling impact and the organic waste diversion in the heating value of the MSW were investigated.

2. MSW GENERATION - PROJECTIONS TO 2030

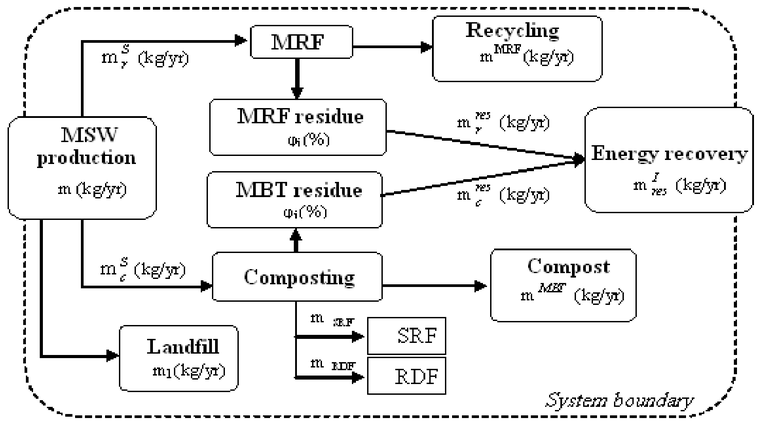


• MSW generation increase: 1.1%/y, currently existing plants.

3. METHODOLOGY

The developed model combines the following attributes:

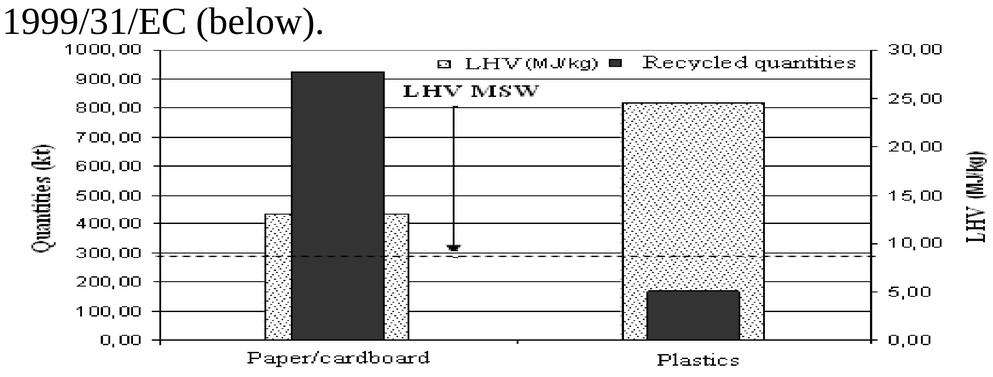
- Separate collection at source, which depends on the mass fraction of each waste material,
- Recycling of packaging materials and paper/cardboard.
- Biodegradable Municipal Waste (BMW) diversion.
- Potential incineration of residuals from Material Recycling Facilities (MRF) and Mechanical Biological Treatment (MBT) plants.
- Sensitivity analysis regarding different diversion rates of each waste fraction.

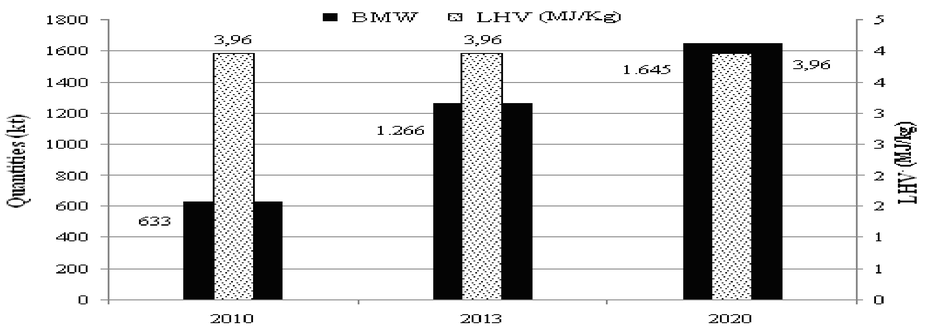


m	MSW mass rate (kg/yr)
m_1	MSW mass rate to landfill (kg/yr)
m^{MRF}	Mass rate of recycled waste (kg/yr)
m^{MBT}	Mass rate of compost (kg/yr)
m^S_c	Mass rate to MBT (kg/yr)
m^S_y	Mass rate to MRF (kg/yr)
m^{res}_y	residual from MRF (kg/yr)
m^{res}_c	residual from MBT (kg/yr)
m^I_{res}	waste mass rate to energy recovery facility (kg/yr)
m_{SRF}	SRF production (kg/yr)
m_{RDF}	RDF production (kg/yr)
φ_i	composition (%)

3. LEGISLATION IMPACT

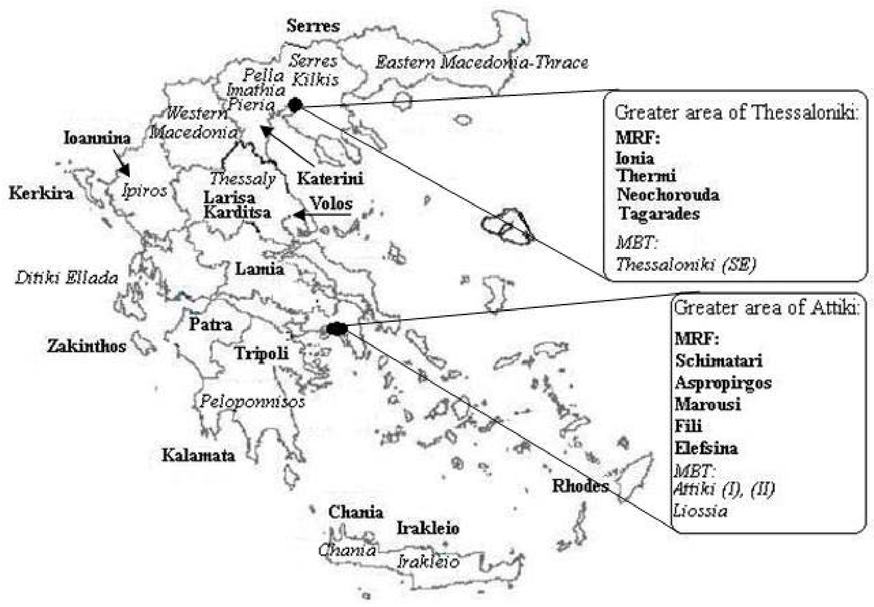
Effects of packaging materials' recycling and BMW diversion on (a) LHV and (b) achieving the targets of 2004/12/EC and 1999/31/EC (below).





4. EXISTING INFRASTRUCTURE

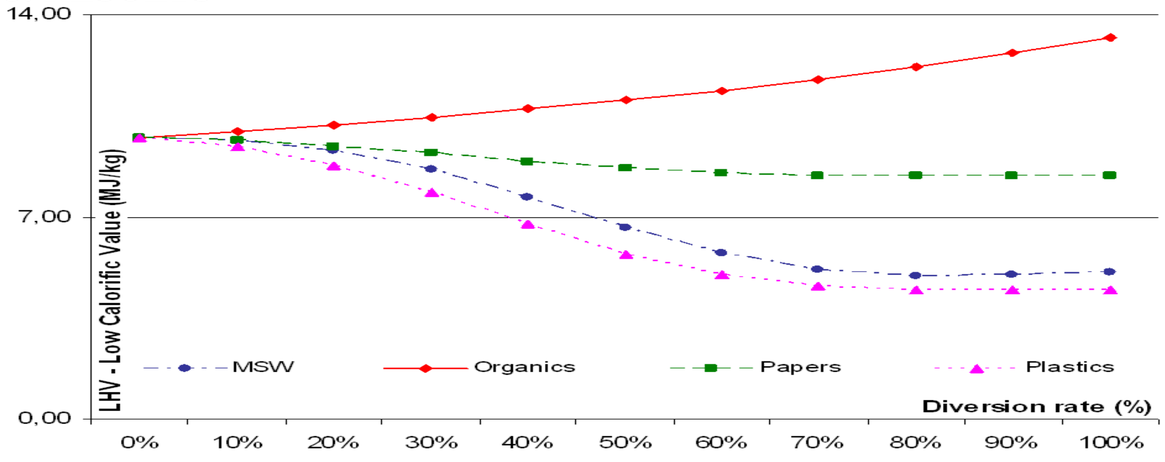
- BMW management: 3 MBT plants operate in Greece. Additionally until the end of 2010, 2 more will start their operation, reaching the total capacity of 766.5 kt of residual MSW in 2010.



MBT	Capacity (kt)	Implementation year	Technology
Liossia	301	2004-2006	
Chania	70	2005	Composting
Peloponnisos	255	1997	
Irakleio	70	2010	Biodrying
Ditiki Ellada	70,5	2009	
To be constructed			
Attiki (I)	495	2010	Composting
Thessaloniki (SE)	120	2010	
Imathia	50	2010	
Serres	90	2010	
Thessaly	80	2010	
Eastern Macedonia-Thrace	60	2010	
Western Macedonia	106	2011	It isn't decided yet
Attiki (II)	660	2013	
Pella	30	2013	
Pieria	30	2013	
Ipiros	55	2013	
Kilkis	35	2020	

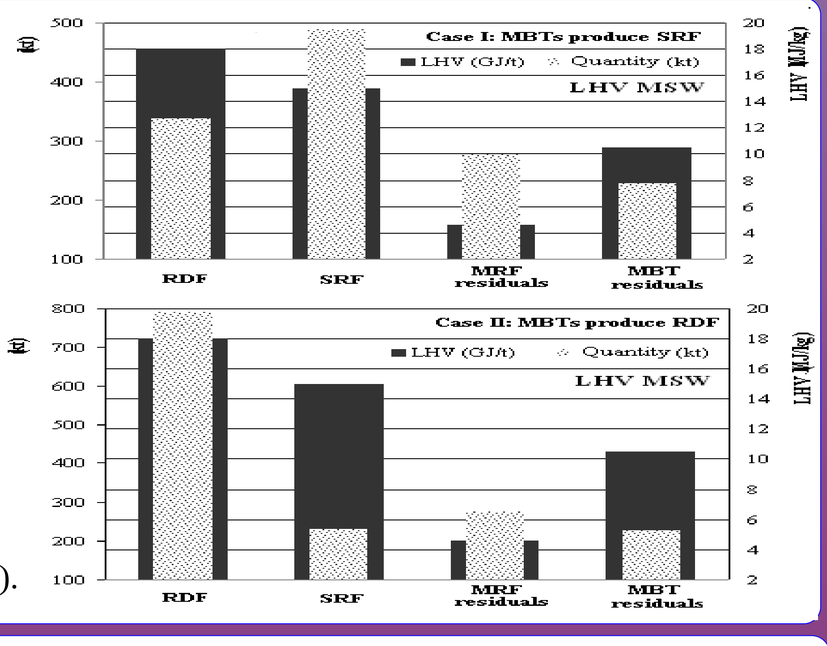
MRF and MBT plants – current status in Greece; in italics are the MBT plants which are planned to be constructed in accordance to table and in bold are the MRF plants. The MBT plants location is referred to each region.

5. RESULTS



➢MBT ~ 15% residuals
➢LHV=10.5 GJ/t
•Residuals composition:
•50% plastics, paper and BMW
•50% inert waste.

➢MRF ~ 30% residuals
➢LHV=4.56 GJ/t
•Residuals composition:
•BMW and inert waste



Paper recycling reduces the LHV of the residual waste but only 14% (even assuming a maximum recycling rate of 100%), whilst plastic packaging's recycling impact in LHV is much more significant (about 60% reduction of the LHV).

6. CONCLUSIONS

The EU Landfill Directive 1999/31/EC calls for the reduction of the biodegradable waste fraction which is sent to landfills. For implementing this Directive, food waste must be diverted from the mixed waste stream, increasing the LHV of the residual waste and as a result increasing its potential use as a supplementary fuel in Waste-to-Energy plants or in existing industries for co-incineration purposes. Recycling of packaging materials has a negative impact on LHV, but this will be compensated with the recovery of food waste and the recycling of the glass and metals. The aforementioned compensation will increase the LHV of residual wastes, thus confirming that WtE and source-separation recycling can go hand-in-hand.