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**BIODEGRADABLE WASTE – MAIN PARAMETER IN THE
ANALYSIS OF MECHANICAL-BIOLOGICAL TREATMENT OF
MIXED MUNICIPAL WASTE**

**BIORAZGRADIVI OTPAD – GLAVNI PARAMETAR U VREDNOVANJU SUSTAVA
MEHANIČKO-BIOLOŠKE OBRADJE MIJEŠANOG KOMUNALNOG OTPADA**

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TREATMENT OF MIXED MUNICIPAL WASTE**

**Main requirement (Croatia Accession Treaty based on Landfill
Directive 1999/31/EC)**

- by 31 December 2013, the share of biodegradable municipal waste deposited on landfills shall be reduced to 75% of the total amount (by weight) of biodegradable municipal waste produced in 1997;
- by 31 December 2016, the share of biodegradable municipal waste deposited on landfills shall be reduced to 50% of the total amount (by weight) of biodegradable municipal waste produced in 1997;
- by 31 December 2020, the share of biodegradable municipal waste deposited on landfills shall be reduced to 35% of the total amount (by weight) of biodegradable municipal waste produced in 1997.

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Main achievements

By reducing the amount of biodegradable waste, the following basic waste management objectives are achieved:

- a) Reduction of biodegradable waste disposal to landfills results in reduction of methane and carbon dioxide greenhouse gases emission, indicated as the main factors in potential global warming;
- b) Stimulation of material and energy recovery of biodegradable substances in municipal waste and development of technological solutions providing that;
- c) Reduction of local impact on waters and air due to reduction of gases emission and due to reduction of leachate generation.

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Main parameters in the analysis

- 1. Definition of biodegradable municipal waste
- 2. Quantity of biodegradable municipal waste produced in 1997
- 3. Quantity of biodegradable municipal waste going to landfills

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Definition of biodegradable municipal waste (BMW)

In Landfill Directive (1999/31/EC with amendments 1882/2003 and 1137/2008), the biodegradable waste *"means any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, and paper and paperboard"*.

Definition is not precise as the words "such as" open the door for various interpretations. The consequences of such definition are different criteria in EU countries. In some countries, the textile and wood are also included in definition, some countries accept only half of paper, and some of them accept only kitchen and garden waste.

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Other definitions of biodegradable municipal waste

- In the Republic of Croatia Waste Management Plan, apart from kitchen and garden waste and paper and cardboard, biodegradable municipal waste includes also the total amount of textile, wood, leather and bones;
- In the project LIFE 04 TCY/CRO000028: Guidelines Development for Starting Implementation of Waste Management Plan in the Republic of Croatia (Ekonerg, 2007) biodegradable waste includes kitchen and garden waste, paper and cardboard and also the 50% of textile, wood and leather and bones
- In the IPCC document *"Good Practice Guidelines and Uncertainty Management in National Greenhouse Gases Inventory"* is very appropriate. according to which the biodegradable part of waste is expressed as DOC (*Degradable Organic Carbon*) and defined by the following expression:

$$\text{DOC} = 0.4A + 0.17B + 0.15C + 0.3D$$

where A-share in paper cardboard and textile waste, B-share in garden and similar waste, C-share in food preparation waste and D-share in wood and agriculture waste

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Quantity of biodegradable municipal waste produced in 1997

According to the Project CRO/98/G31: First National Report on Climate Change, Data on Solid Waste in Croatia 1990-1998. (Ekenerg. 2000.) the waste disposed to municipal official landfills in Croatia in 1997 amounts to 755,800 tonnes. When the quantity of waste landfilled on unofficial landfills, the waste that was not collected the quantity of the produced municipal waste in the 1997 amounts to about 1,000,000 tonnes.

If the formula from IPCC document is applied to the waste produced in 1997 where A=31.9%, B+C = 40.8%, D=1.7% and DOC = 19.8% the total annual amount of DOC in produced municipal waste in 1997 was 182,000 tonnes.

The disposal criteria according to requirements of the Croatia Accession Treaty are the following:

- DOC-75% = 136,500 t/g
- DOC-50% = 91,000 t/g
- DOC-35% = 63,700 t/g

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Quantity of BMW going to landfills in 2020

1. The selection at source and in the MBO facilities amount to 50 percent of paper and cardboard, plastics, metal and glass;
2. The selection at source of the biowaste amounts to 11 percent
3. MBO facilities for treatment of mixed municipal waste that remain after the selection at source treatment was supposed;
4. It is supposed that the quantity of produced MW in 2020 amounts to 2,100,000 tonnes, of which 365,800 tonnes should be separated at source;
5. The remaining 1,734,200 tonnes are going to MBO treatment with the DOC content of 313,340 tonnes
6. The outputs from MBO facilities are as follows:
 - paper and cardboard, plastics, metal and glass, 235,620 t/y with DOC=28,560 t/y
 - refuse derived fuel with LHV=22.5 MJ/kg, 371,050 t/y with DOC=96,076 t/y
 - mass and DOC reduction in the biological treatment, 399,146 t/y, with DOC=129,896 t/y
 - Remaining part that goes to the landfills, 728,384 t/y, with DOC = 58,808 t/y.

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Conclusion

1. Requirements of Landfill Directive and Croatian Accession Treaty may be fulfilled by using MBO technology with the landfilling of the remains after biological treatment;
2. The process should be improved with the separation at source a part of paper and cardboard and biowaste;
3. It is recommended that the biodegradable waste balance will be performed by using the degradable organic carbon (DOC) as a control parameter.