State of Municipal Waste Management in EU Member States Depending on the Standard of Living

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The Waste Framework Directive of the European Union (EU) from 2008 is the legal framework for waste legislation of the Member States. Article 4 of the Framework sets a five-step hierarchy with regards to the handling of waste in the order of prevention, preparing for reuse, recycling (recycling including reprocessing of organic substances), other kinds of utilization (e.g. thermal) and disposal. Waste that is not produced is considered as the best waste. The recitals of the Framework Directive explains that the objective of any waste policy should be to minimize the adverse impacts of waste generation and waste management on human health and the environment. Waste policy should aim at reducing the use of resources and promote the practical application of the waste hierarchy. A deviation from the hierarchy, however, is permissible if circumstances such as technical feasibility or economic viability or environmental protection can be justified. [1].

Article 1 defines the objectives. Harmful impacts of the generation and management of waste are to be prevented or reduced. The overall impact of resource use should also be reduced and its efficiency should be improved. After a recovery operation, the waste property is eliminated if a useable product that meets existing needs and is marketable is created (Article 6).

The EU Waste Framework Directive requires that, by 2015, the separate collection of paper, metal, plastic and glass is established in all Member States, and by 2020, recycling rates of 50 percent for paper, metal, plastic and glass need tobe achieved (Article 11). Regarding waste incinerators, the energy efficiency of the system designates its classification as energy recovery or as disposal.

The producer or owner of waste is responsible for the disposal or the recovery of waste. This duty can be met by appointment of a public or a private enterprise. Regarding the costs, the polluter pays principle applies, i.e., the waste producer, the current owner, or the former owner is the one who has to pay the costs. The costs are to be classified so that they reflect the true cost of waste generation and waste management.

With the aim of protecting European Citizens, the Commission of the European Union (EC) oversees the compliance of the EU directives by the Member States concerning matters of the environment. Recently, for example, Poland and Slovakia were taken to the European Court of Justice for their failure to implement the EU directive on recycling of electrical and electronic waste into national law. In the case of Poland, the EC requested the establishment of a fine of 71,610 EUR/d, and in the case of Slovakia a fine of 8,408.40 EUR/d, until an approximation of national law to EU law is carried out.-

Romania has been sued for not duly adopting the packaging directive into national law. In addition, the EU Commission has sued Germany at the European Court for the non-implementation of EU rules concerning the recycling of electronic waste and applied for a penalty of approximately 210,000 EUR/d, which is to be exerted until the relevant law is implemented. The United Kingdom was criticized for not sufficiently having cleaned wastewater in four agglomerations and for not having built the wastewater treatment plant in Gibraltar. Also France was subjected to a trial, because in nineteen different districts (e.g., Bastelica, Braine, Coggia, Chateau Ville Vieille, etc.) sewage treatment did not comply with EU-standards [2].

1. The new waste recycling management package of the EU Commission

The European Commission expects that a full implementation of the existing Waste Framework Directive by 2020 will increase the average recycling rate (material recovery plus biological treatment) of municipal waste in the Member States from the current level of 38 percent to 50 percent.

The EC, however, intended to go further. On July 02, 2014 the EC brought forth a draft directive, including accompanying notes, to verify the recycling aspects and other objectives of the EU Framework Directive 2008/98/EC, of the Landfill Directive 1999/31/EC and of the Packaging Directive 94/62/EC, and to present a new waste recycling management package in 2015 with the goal of using good waste management by individuals, households, the business world and governments to develop the EU into a resource efficient recycling society, and thereby save money. [2] It expected that, for example, a reduction in food waste would give every household an annual savings of up to 500 EUR, or that an increase in municipal waste recycling ratio by the EU Member States to 70 percent would create about half a million new jobs. In addition, it would result in a reduction in CO_2 emissions between 146 and 244 megatons per year, which would contribute 19 percent to 31 percent of the achievement of climate targets for 2020.

The main elements of the waste recycling package of the EC are summarized below [2], [6]:

- By 2030, 70 percent of municipal waste is to be recycled or to be treated for reuse.
- By 2030, 80 percent of used packaging must be recycled or treated for reuse.

- Starting in 2025, recyclable materials such as plastics, paper, metals, glass and organic waste may no longer be landfilled, which corresponds to a maximum landfill rate of 25 percent.
- By 2025, the production of food waste is to fall by 30 percent.
- The product responsibility is to expand.
- To avoid possible problems in the Member States, an early warning system must be established.

Early in 2015 it became clear that the European Commission would put the project on ice, as several members had raised objections to it and a favorable majority in the European Parliament was not in sight. Meanwhile, the package has been withdrawn.

2. Waste generation and treatment in the European Union

According to Eurostat, the EU statistics agency, in 2010, economic and household activities (in the EU-27) generated a total of 2.57 billion tons of waste. Of these, 94.5 million tons (3.7 percent) were classified as hazardous waste. In the construction sector, around 855 million tons of waste (33 percent) was generated, while the amount of waste from the mining and extraction came to 727 million tons (28.3 percent). The manufacturing sector produced 280 million tons (10.9 percent), and households generated 221 million tons (8.6 percent). The contribution of agricultural waste was relatively low, thanks to the use of liquid and solid manure as a soil amendment or as fertilizer [7].

Regarding the Eurostat data, it should be noted that data collection occurs indirectly. It is carried out by the Member States through the respective national authorities and therefore the survey method and the strategy of collection varies from country to country. Eurostat validates the data together with the respective Member State, and then all data must be approved by the Member State [4].

In Table 1, the Eurostat data for 2013 on the specific municipal waste generation and waste treatment in the EU are given. At first glance it is noticeable that the production of municipal waste per inhabitant (i) and year (a) varies greatly, between 272 kg and 747 kg. Richer countries generate more waste than the poorer ones. Denmark produces with 747 kg/i.a specifically the most waste, followed by Luxembourg (653 kg/i.a), Cyprus (624 kg/i.a), Germany (617 kg/i.a), Ireland (586 kg/i.a), Austria (578 kg/i.a), Malta (570 kg/i.a), France (530 kg/i.a), the Netherlands (526 kg/i.a), and Greece (506 kg/i.a), while the other countries remain below the amount of 500 kg/i.a.

Strong differences also prevail between the amounts of waste that is landfilled, biologically recycled or burned. On average, in the 28 EU Member States, 31.3 percent of municipal waste is landfilled, 27.7 percent is recycled, 26.0 percent is thermally treated and 15.0 percent is fermented or composted.

In Germany only 1 kg/i.a, or 0.2 percent of municipal waste is landfilled. In second place is Sweden with 3 kg/i.a or 0.6 percent, and in third place Belgium with 4 kg/i.a, which constitutes 0.9 percent of the treated municipal waste. Also in Holland

(8 kg/i.a or 1.5 percent), Denmark (12 kg/i.a, or 1.6 percent) and Austria (23 kg/E.a, or 4.2 percent) the method of landfilling, entirely in line with the objectives of EC, plays a far subordinate role.

Table 1: Generation and treatment of municipal waste in the European Union (2013)

Country	Production	Treatment	Disposal/ Landfilling	Combustion	Material Recycling	Composting/ Anerob. Fermentation
	kg/i.a					
EU 28	481	470	147	122	130	71
Belgium	439	441	4	195	151	91
Bulgaria	432	428	298	7	108	15
Czech Republic	307	307	173	60	65	9
Denmark	747	747	12	404	207	123
Germany	617	617	1	218	290	108
Estonia	293	253	40	163	36	15
Ireland	586	531	223	93	180	34
Greece	506	506	409	0	79	19
Spain	449	449	270	44	88	46
France	530	530	150	180	110	89
Croatia	404	393	332	0	54	7
Italy	491	474	181	99	122	72
Cyprus	624	624	491	0	77	57
Latvia	312	312	259	0	33	20
Lithuania	433	421	270	31	88	32
Luxemburg	653	653	114	226	182	131
Hungary	378	378	244	34	81	19
Malta	570	526	464	2	32	29
Netherlands	526	526	8	256	126	137
Austria	578	550	23	202	133	192
Poland	297	249	157	20	39	32
Portugal	440	440	222	104	57	57
Romania	272	220	213	0	8	1
Slovenia	414	287	109	2	157	20
Slovakia	304	278	213	32	10	22
Finland	493	493	124	209	94	67
Sweden	458	458	3	228	153	74
United Kingdom	482	476	165	102	133	77

Source: Eurostat, waste generation and treatment of municipal waste, Tables, Graphs and Maps Interface, April 2015

As expected, the top five countries mentioned above are also recycling the most municipal waste. In Germany, 47 percent of municipal waste goes to material recycling, 35 percent to thermal treatment and 18 percent to biological treatment. In Sweden, half of municipal waste is incinerated, 33 percent recycled and 16 percent composted or fermented. The corresponding values for the other Member States are as follows: Belgium 44 percent, 34 percent and 21 percent; Netherlands 49 percent, 24 percent and 26 percent; Denmark 54 percent, 28 percent and 17 percent; Austria 37 percent, 24 percent and 35 percent.

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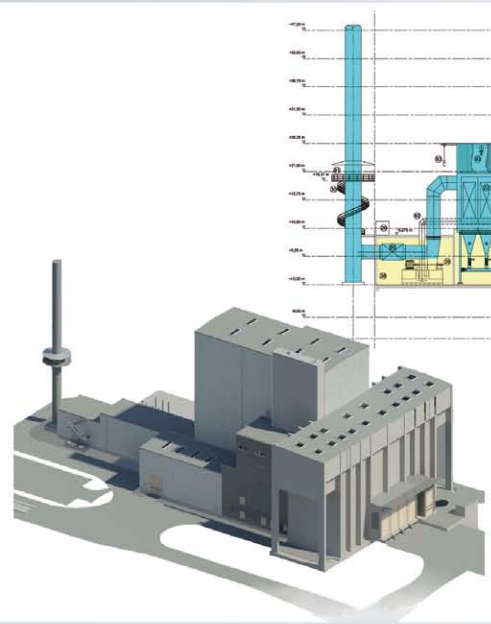

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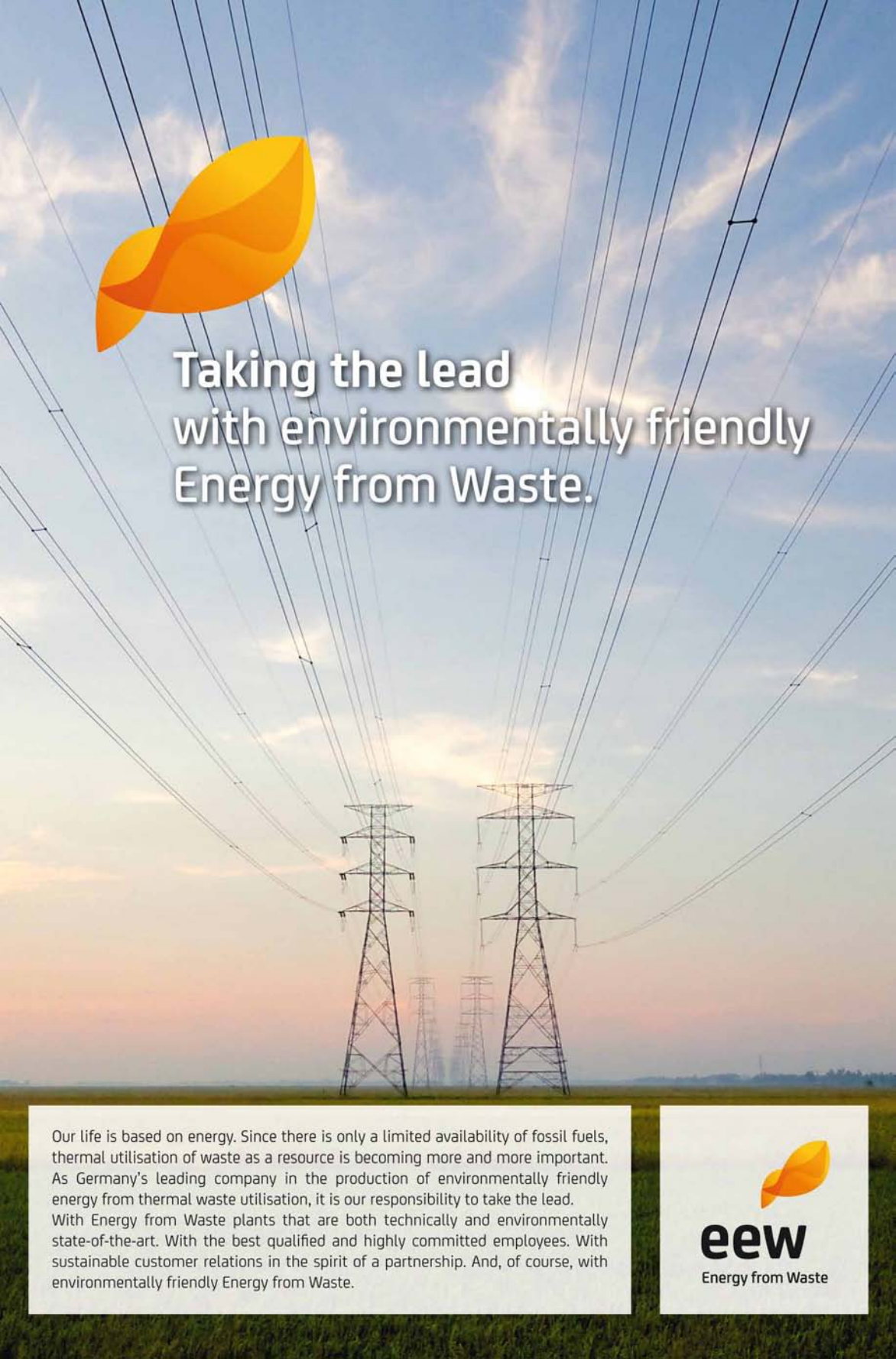

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The laggards are Romania with 4.1 percent (9 kg/i.a) and Malta with 12 percent (63 kg/i.a) of treated waste (combustion, mechanical recycling and composting or fermentation). They are followed by Croatia, with16 percent (61 kg/i.a), Latvia with 17 percent (53 kg/i.a); Greece with 19 percent (98 kg/i.a); Cyprus with 22 percent (134 kg/i.a); and Slovakia with 23 percent (64 kg/i.a).

In the midfield are Bulgaria (30 percent or 130 kg/i.a); Hungary (35 percent or 134 kg/i.a), Lithuania (36 percent or 151 kg/i.a); Poland (37 percent or 91 kg/i.a) and Spain (40 percent or 178 kg/i.a).

3. Gross domestic product and waste recycling rate

The review of the portions of municipal waste recycled in the EU countries given in Chapter 2 suggests that the better a country achieves waste management objectives set by the EU-Framework Directive, the higher its life standard, measured with the instrument of gross domestic product (GDP). Richer countries recycle more than poorer ones.

Table 2 contains both the gross domestic product of the EU countries in 2013 at current market prices according to the Eurostat data, and the overall rate of non-landfilled but recycled waste amounts [5].

It can be stated that the average value of specific GDP of all EU countries in 2013 was around 26,600, - EUR per inhabitant. Above this level are Luxembourg (83,100), Sweden (45,500), Denmark (45,100), Netherlands (38,300), Austria (38,100), Ireland (38,000), Finland (37,100), Belgium (35,600), Germany (34,200), France (32,100), UK (31,500), Italy (26,700). Under this level are Spain (22,500), Cyprus (21,000), Malta (17,900), Slovenia (17,500), Greece (16,500), Portugal (16,400) , Czech Republic (15,000), Estonia (14,200), Slovakia (13,600), Lithuania (11,800), Latvia (11,600), Poland (10,300), Croatia (10,200), Hungary (10,200), Romania (7,200), and Bulgaria (5,600).

Figure 1 shows the total municipal waste-treatment rates (sum of thermal, mechanical and biological treatment) in the EU countries depending on the gross domestic product at market prices. Figure 2 illustrates the dependence of the rate of material recycling and biological recycling of municipal waste from the level of gross domestic product in the EU Member States.

The results for Luxembourg in figure 1, with a population of just under 600,000, fall a bit out of line. This is due to the country's specific GDP conditioned by the significant number of cross-border workers from Belgium, France and Germany with 83,100 EUR/i.a, which is more than three times higher than the EU average. Otherwise, the correlation between the numbers for the specific GDP and the ratio of the total for recycling (thermal, material recycling and biological) of municipal waste is quite unambiguous (Figure 3). The level of 50 percent is attained (with the exception of Estonia and Portugal) only at specific GDP-values higher than 20,000 EUR/i.a. The drift of Estonia and Portugal can be explained by the relatively strong weight of municipal waste combustion (Estonia 64 percent; Portugal 24 percent) in these two countries.

Table 2: Gross domestic product (GDP), specific amount of material recycling and biological recycling of municipal waste, and the ratio of combusted, and material recycled plus biological recycled waste in the EU countries (2013)

Country	Gross Domestic Product	Ratio of combustion and material recycling plus biological recycling	Amount of material recycling and biological recycling of municipal waste
	EUR/i.a	%	kg/i.a
EU 28	26,660	68	201
Belgium	35,600	99	242
Bulgaria	5,600	30	123
Czech Republic	15,000	43	74
Denmark	45,100	99	330
Germany	34,200	100	398
Estonia	14,200	85	51
Ireland	38,000	58	214
Greece	16,500	19	98
Spain	22,500	40	134
France	32,100	72	199
Croatia	10,200	16	61
Italy	26,700	61	194
Cyprus	21,000	22	134
Latvia	11,600	17	53
Lithuania	11,800	36	120
Luxemburg	83,100	83	313
Hungary	10,200	35	115
Malta	17,900	12	61
Netherlands	38,300	99	263
Austria	38,100	96	325
Poland	10,300	37	71
Portugal	16,400	50	114
Romania	7,200	4,1	9
Slovenia	17,500	43	177
Slovakia	13,600	23	32
Finland	37,100	75	161
Sweden	45,500	99	227
United Kingdom	31,500	66	210

Sources:

Eurostat, waste generation and treatment of municipal waste, Tables, Graphs and Maps Interface, April 2015

Gross Domestic Product at Current Market Prices in Euros per capita from 2003 to 2014

Figure 2 and Figure 4 illustrate further the dependency of the achievement of the EU objectives, in terms of material recycling plus biological recycling of municipal waste, from the country's prosperity. The average value of the 28 EU Member States of 201 kg/i.a is reached only beyond a gross domestic product of 30,000 EUR/i.a. Thus clarifies the reason why the thrust of the European Commission with the new waste

recycling package, in which specifications such as ensuring a recycling rate of 70 percent by 2030, or a reduction of the landfill rate by 2025 to a maximum of 25 percent were specified, could not succeed in early 2015 since around 60 percent of the EU Member States have specific GDPs less than 30,000 EUR.

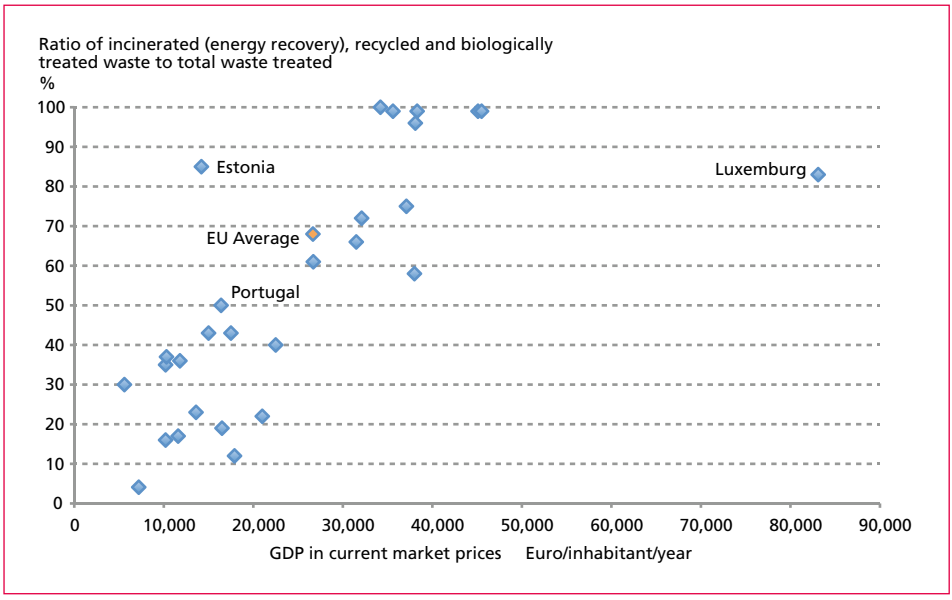

Figure 1: Achieving the objectives of the EU Waste Framework Directive compared to GDP (2013)

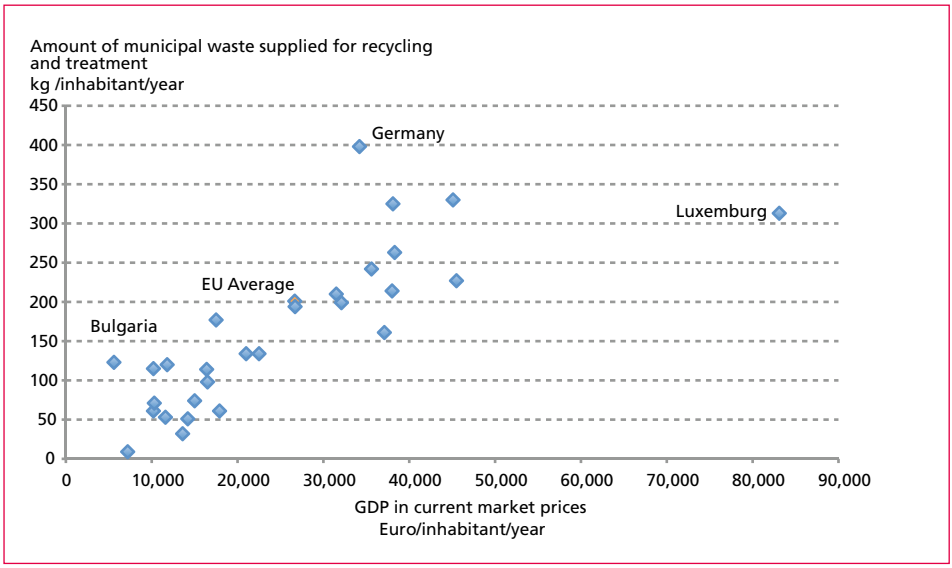

Figure 2: Dependence of the material and biological municipal waste recycling amounts on GDP in the EU (2013)

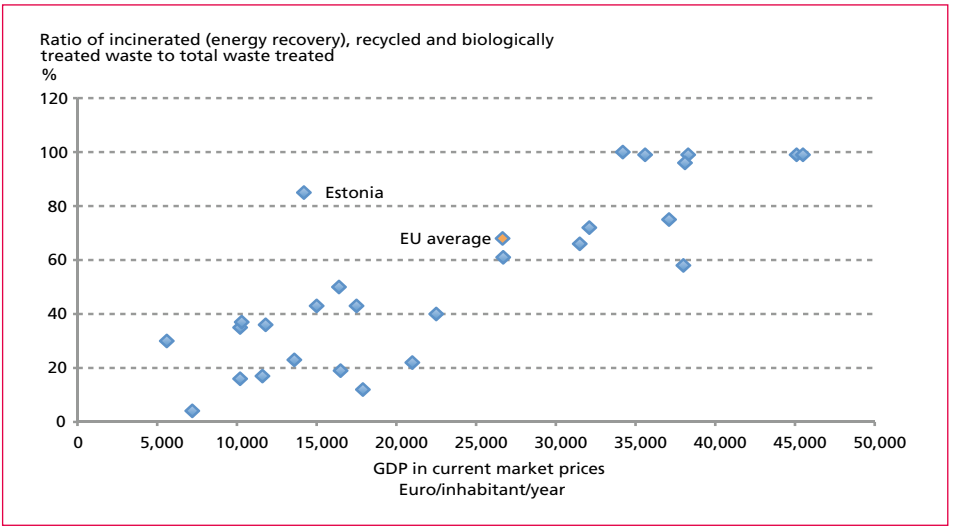

Figure 3: Achieving the objectives of the EU Waste Framework Directive compared to GDP (2013), without Luxemburg

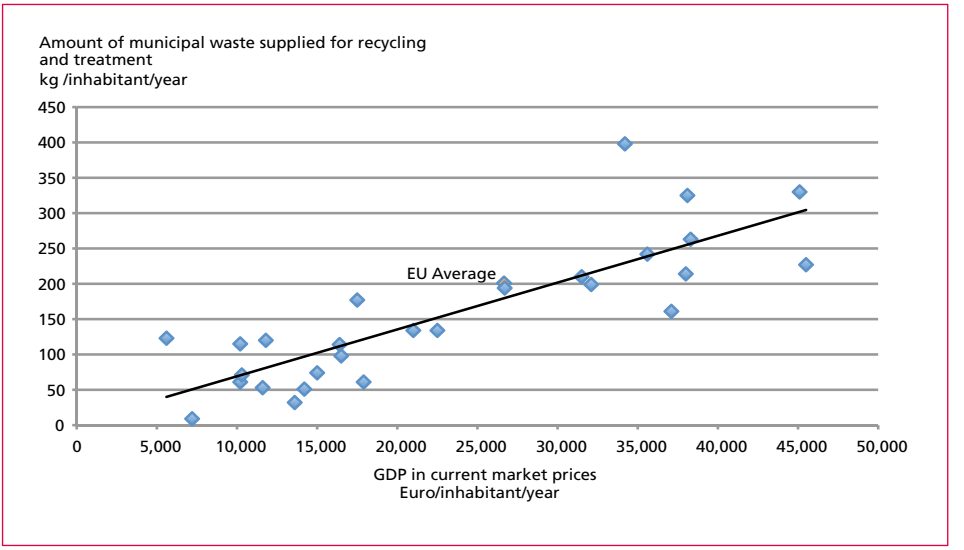

Figure 4: Dependence of the material and biological municipal waste recycling amounts on GDP in the EU (2013), without Luxemburg

4. Closing remarks

Over the seven years of its existence, the EU's Waste Framework Directive made significant inroads towards the establishment of a circular economy in the Member States. Here, however, considerable differences still exist between the countries, which can be

explained mainly by the different standards of living. In countries with a gross domestic product less than 20,000 Euros per inhabitant per year, the rate of material, biological and thermal recycling of municipal waste is below 50 percent.

The average recycling rate of municipal waste in the 28 EU-Member States regarding material recycling plus biological recycling sums up to 201 kg per inhabitant and per year. Only richer countries with a gross domestic product of 30,000 EUR or more achieve this average or exceed it. It can be expected that with growing prosperity, poorer Member States will be able to meet the EU-waste management standards better in the future than today.

5. References

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