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Legal and organisational solutions of the municipal waste management in chosen countries of UE

Introduction

Municipal waste were produced as result man activity and unsuitable their management may be cause risk for environmental resources and the same for people. Due to diverse waste composition, included bio-waste, paper, glass, metal, plastic and hazardous waste, their utilization is very difficult and requires substantial legislative and organizational action. In the European Union waste management is regulated by Waste Directive 2008/98/ WE\(^1\). This legal act in the Article 3 defined the waste as any substance or object which the holder discards or intends or is required to discard. Moreover, the mean municipal waste produced in households, excluding vehicles withdrawn from use, together with waste from other waste producers, also not containing hazardous waste is similar in character and composition to household waste. Management of these waste contains the collection, transport, recovery and disposal of waste, including the supervision of such operations and the after-care of disposal sites, and including actions taken as a dealer or broker. The general aim of EU waste management policies is to reduce the environmental and health impacts of waste and to improve the EU’s resource efficiency. The long-term aim of these policies is to reduce the amount of waste generated and when waste generation is unavoidable to promote it as a resource and achieve higher levels of recycling and the safe disposal of waste. Therefore in the UE obliged the strategy on the prevention and recycling of waste. This strategy sets out guidelines and describes measures aimed at reducing the pressure on the environment caused by waste production and management. The main thrust of the strategy is on amending the legislation to improve implementation, and on preventing waste and promoting

effective recycling. The general aim is so creating legal instruments and organiza-
tional solutions promoting a “society of the recycling” which aspires to minimizing its
waste and utilizing waste as raw material. This principle was a basic guideline for
many EU countries. The objective of this article is analysis of legal regulations and
organizational solutions of municipal waste management in chosen countries in the
European Union such as Germany, Spain, Italy and Poland.

The general principles of waste management in the EU

ments and sets the basic waste management definitions for the EU. The additional legal acts in this frame are Decision 2000/532/EC establishing a list of wastes\(^5\) and Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste\(^6\). Decision 2000/532/EC establishes the classi-
fication system for wastes, including a distinction between hazardous and non-
hazardous wastes. It is closely linked to the list of the main characteristics which render waste hazardous contained in Annex III to the Waste Framework Directive above. However, Regulation (EC) No 1013/2006 specifies under which conditions waste can be shipped between countries.

The general principle of the Waste Directive 2008/98/WE is the environmental
protection and human health before the unsuitable waste management. In this aim
Member States shall take the necessary measures to ensure that waste management
is carried out without endangering human health, without harming the environment, in particular:

(a) without risk to water, air, soil, plants or animals;
(b) without causing a nuisance through noise or odours; and
(c) without adversely affecting the countryside or places of special interest.

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\(^2\) OJ L 114/9, 27.04.2006.
\(^6\) OJ L 190, 12.7.2006.
The waste management must be carried regards the hierarchy of dealing with waste includes the following actions: prevention, preparing for re-use, recycling, other recovery e.g. energy recovery, and disposal. Waste prevention is a key factor in any waste management strategy. If we can reduce the amount of waste generated in the first place and reduce its hazardousness by reducing the presence of dangerous substances in products, then disposing of it will automatically become simpler. Waste prevention is closely linked with improving manufacturing methods and influencing consumers to demand greener products and less packaging. Prevention means measures taken before a substance, material or product has become waste, that reduce: (a) the quantity of waste, including through the re-use of products or the extension of the life span of products; (b) the adverse impacts of the generated waste on the environment and human health; or (c) the content of harmful substances in materials and products. Moreover, preparing for re-use includes checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other preprocessing. If waste cannot be waste production prevented, as many of the materials as possible should be recovered, preferably by recycling. Recycling means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes also the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations. The organic recycling is carried by biological decomposition of organic materials by microorganisms under controlled, aerobic, conditions to a relatively stable humus-like material called compost. In the anaerobic conditions is created methane. The European Commission has defined several specific «waste streams» for priority attention, the aim being to reduce their overall environmental impact. This includes packaging waste, end-of-life vehicles, batteries, electrical and electronic waste. EU directives now require Member States to introduce legislation on waste collection, reuse, recycling and disposal of these waste streams. Several EU countries are already managing to recycle over 50% of packaging waste.

However, recovery is operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy. Disposal contain any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy. The basic methods of disposal are accumulation of waste on disposal sites and waste burning. Directive obliged EU countries to achieve appropriate levels of recovery, preparation for re-use and recycling, and to implement methods to limit biodegradable municipal waste volume in landfills.
Germany

Germany is a Federal Republic consisting of sixteen Federal States (Bundesländer). Responsibility for waste management and environmental protection is included in the national Government, the Federal States and local authorities. The National Ministry of Environment sets priorities, participates in the enactment of laws, oversees strategic planning, information and public relations and defines requirements for waste facilities. Germany’s Waste Management Act (KrWG) entered into force on 1 June 2012. The KrWG, which was enacted as Article 1 of the law titled “Gesetz zur Neuordnung des Kreislaufwirtschafts- und Abfallrechts”, supersedes the law titled Kreislaufwirtschafts- und Abfallgesetz (KrW-/AbfG) and transposes Directive 2008/98/EC into German law. The Waste Management Act (KrWG) is intended to tighten resource, climate and environmental protection regulations. It transposes the five-stage waste hierarchy of “prevention – preparing for reuse – recycling – other recovery – disposal” laid down in the European Waste Framework Directive into national law. Recycling now has priority over other types of recovery, for example energy recovery. Each Federal State adopts its own waste management act containing supplementary regulations to the national law, e.g. concerning regional waste management concepts and rules on requirements for disposal. Germany was the first country in the EU to introduce producer responsibility with a packaging waste regulation in 1991. According to this principle, which is a core tenet of German waste legislation, the producer of a product is generally responsible for the product when it becomes waste. However, this principle has been implemented only for some product types such as packaging, waste electric and electronic equipment, vehicles, solvents, waste oil and batteries. For waste generated by households, the Recycling Management and Waste Act assigns responsibility to the local public waste disposal authorities. Their responsibility covers collecting and transporting waste, measures to promote waste prevention and recovery, and planning, constructing and operating waste disposal facilities. Municipalities have more practical tasks such as providing sites for waste collection.

The basic organizational resolutions in Germany is improving MSW management system. This country has for over 20 years had a strategy for diverting MSW away from landfills and increasing recycling. The most important initiatives taken in order to increase MSW recycling have been:

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– a long tradition for developing waste strategies on the national level, and developing waste management plans in the federal states and in the municipalities;
– introduction of producer responsibility for packaging waste already in 1991;
– in 1999, the German government committed itself to completely recover all municipal waste by 2020, so that landfilling of municipal waste and waste treatment residues would no longer be necessary; recovering waste incineration residues and further developing of treatment technologies such as sorting and MBT;
– a ban on landfilling un-pretreated MSW by defining requirements to the organic content of MSW direct landfilled (maximum 5% carbon content) or maximum 18% if the waste has been pre-treated; the first initiatives in relation to this ban were taken in 1993, followed up in 2001 and 2002 and fully implemented in 2005;
– focus on separate collection and recycling of secondary raw materials (paper and biowaste), pre-treatment of mixed household waste in mechanical-biological treatment plants and dedicated incineration with energy recovery of mixed household waste.\(^9\)

In Germany waste management system packaging waste, biowaste and waste paper are collecting separately. In this way beside 2001 Germany already recycled about 48% of municipal waste, whereas approximately 25% was landfilled and 22% was incinerated. Germany was among the first European countries to introduce policies to limit landfilling in already in 1990. It is a general requirement of the EU Landfill Directive that all Member States have to reduce the amount of biodegradable municipal waste landfilled (BMW).\(^10\) Municipal waste after 1 June 2005 and max 5% carbon content in waste direct landfilled. These waste has been mechanically/biologically pre-treated, and max 18% carbon content and very low content of biodegradable organic carbon in waste landfilled measured with degradation tests. With the implementation of the above mentioned initiatives of landfilled BMW and according to the Landfill Directive, Germany had already fulfilled the 75% requirement in 2006, the 50% requirement in 2009 and the 35% requirement in 2013. If avoided emissions are higher than direct emissions, one could conclude that it would be better for the environment to generate and recycle more waste. That is of course not the case. The reason is that the model only focuses on waste management and not the full production chain and its consequences in a life cycle perspective. There-


fore, the increasing consumption of goods (and resulting generation of more municipal solid waste) is more harmful for the environment, if all life-cycle stages of materials were taken into account\textsuperscript{12}.

**Spain**

The next country which implemented the regulations of the Waste European Directive (2008/98/EC) in the law 22/2011 on waste and contaminated soils\textsuperscript{13} is Spain. The principles of the waste management in Spanish law is determined mainly in Article 7, which regard protection of the human health and the environment before waste. The competent authorities will adopt the necessary measures to assure that the management of the residues should realize without putting in danger the human health and without damaging to the environment and, especially:

- they will generate risks neither for the water, the air or the soil, nor for the fauna and the flora;
- they will not cause inconveniences for the noise or the smells; and
- they will commit an outrage adversely neither against landscapes nor to places of special interest legally protected.

The measures adopted will have to be coherent with the strategies of fight against the climate change. Additionally, the competent administrations, in the development of the policies and of the legislation of prevention and waste management, will apply to obtain the best environmental global result, the hierarchy of residues for the following order of priority: prevention; preparation for the reutilization; recycling; another type of valuation, included the energetic valuation; and elimination (Article 8). Nevertheless, if to obtain the best environmental global result in certain waste streams was necessary to separate of the above mentioned hierarchy, a different order of priorities will be able to adopt previous justification for an approach of life cycle on the impacts of the generation and management of these residues, having in consideration the general principle of precaution and sustainability in the area of the environmental protection, technical and economic viability, protection of the resources. The main objectives of this act is separately collection of waste (metal, paper, plastic and glass) before 2015, recycling domestic waste, recycling construction waste promoting recycling, reusing and collection of waste before 2020 and container deposit refund system. There are realized on three levels:


\textsuperscript{13} Num. 181 Sec. I. Pág. 85650 13046, Ley 22/2011, de 28 de Julio.
– national level as the Ministry of Agriculture, Food and Environment is responsible for the national plans;
– regional level by the autonomous regions are responsible for doing strategic waste management plans for each specific region;
– local level by the municipal authorities are responsible for the management of the urban waste (domestic, industry and commerce, offices and services), including separate collection and transportation of waste.

In Spain functioning the Management of Municipal Solid Waste (MSW) System. This system is considered a set of operations that it is realized from the wastes generated in homes and services to the last step of the treatment. There are three steps included: collection, transportation and treatment. The collection consists on the compilation of the MSW to carry out the transfer to the floors of treatments. Basically, there are two types of collections such as non-selective and selective collections. In the first cause, the wastes are deposited and mixed in the containers, without any type of distinguish. This was usual for many years ago. In the second case, the selective collection is done distinguishing the wastes depending on the class and depositing on the belonging container. In this way, there are containers for the paper, bottle, glass or organic materials. This kind of activity has a clear impact above the traffic circulation. Everything must be set up properly because it’s a source of bother for the neighbourhood: noise, bad smell, pollution, etc. The treatment it’s the most important step. If wastes are distinguished, in case of paper or glass, they will go directly to the floor of recycling. If they aren’t, in case of bottles or cans, they must be separated according to their nature. The process is the same for the organic wastes. Once they are distinguished treatment must be realized. Taking care of their nature and the condition, there are 3 options: recycling, energetic valuation and controlled spill. There are 3 management systems such as ECO-EMBES – treats all the packaging materials, ECOVIDRIO – manages only the glass and SIGR – manages the rests of the medicine. These management systems are nonprofit association entities, that are maintained thanks to the supports that the associated companies give. The quantity depends on the type of wastes generated. Besides, they regularly make awareness and instructive campaigns for the purpose of making citizens separate all type of wastes

In Spain, recycling levels was increased from 21% in 2001 to 33% in 2010. Despite this progress, an extraordinary effort is still required if Spain is to meet the 50% target of the Waste Framework Directive by 2020. This country still maintains very high rates of landfilling, surpassing 50% of MSW generated in 2010. Nevertheless, Spain has been successful in meeting the targets set by EU Landfill Directive of BMW diversion from landfills in 2006 and 2009. The first and second National Municipal Solid Waste Management Plans (for the periods 2000–2006 and 2008–2015

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respectively) have been instrumental in the development of MSW recycling by introducing several initiatives, from separate collection of recyclables to upgrading recycling facilities. The Landfill tax which was adopted by the most highly populated regions of Spain contributed to the diversion of MSW from landfills and the valorisation of material resources through recycling\textsuperscript{15}.

**Italy**

The most important legal act of waste management in Italy is Legislative Decree 152/2006\textsuperscript{16} which implemented regulations of the Framework Waste Directive 2008/98/EC. It shaped the national waste management system defining the responsibilities of the actors involved, introduced targets about separate collection of municipal waste, established the National Packaging Consortium and provided for the progressive replacement of the old waste tax with a new waste tariff. The most important innovations shaped by the Decree and its amendments are the following:

- the separate collection of municipal waste, the Decree set three new targets to be achieved at ATO level: 35% by 2006; 45% by 2008, and 65% by 2012; and
- the waste tariff introduced by legislative Decree 22/97 was substituted by a new one; new waste tariff shall be proportional to waste quantity and quality produced per floor area unit, in relation to uses and different typologies of activities.

In Italy obliged regional differences of MSW (the Management of Municipal Solid Waste) recycling from 2001 to 2010. The rate of separate collection of municipal waste (or MSW total recycling SC) in Italian Regions from 2006 to 2010 and the actual national separate collection targets, introduced by Legislative Decree 152/2006 (ISPRRA 2012). The level of separate collection is increasing in all the Italian regions, but Italy as a whole, with 35% of MSW separate collection in 2010, equal to 11.4 million tonnes, is still far from achieving the national separate collection targets, introduced by Legislative Decree 152/2006 (the 2008 target was 45%)\textsuperscript{17}.

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Italy has traditionally landfilled most of its MSW, even if the landfill rates have constantly decreased between 2001 and 2010, a reduction from 67% to 48% related to MSW generated (and from 19.7 to 15.4 million tonnes in absolute terms)\textsuperscript{18}. In general, it can be underlined that regions that are able to couple high separate collection rates with an adequate capacity for MSW processing under different waste treatment options and a market for recycled materials usually show lower landfill levels. The regulations of the EU Landfill Directive (1999/31/EC) was transposed by Legislative Decree 36/2003\textsuperscript{19}, Member States shall reduce the amount of biodegradable municipal waste (BMW) landfilled to 75% of the total amount of BMW generated in 1995 by 2006; to 50% by 2009; and to 35% by 2016. In this frame in this country functioning Optimal Management Areas (ATO) Programm, which was based on two core reasons: the lack of reliable data on the quantity of biodegradable municipal waste landfilled in 1995 and the need to implement improved monitoring at the local level. The Decree 36/2003 targets to be reached the following levels of landfill of biodegradable municipal waste reduction to below 173 kg/year before 27 March 2008, 115 kg/year before 27 March 2011 and to 81 kg/year before 27 March 2018. The same Decree also introduced a landfill ban for waste with a calorific value exceeding 13 megajoules per tonne with effect from the beginning of 2007. This deadline was then shifted to the end of 2008\textsuperscript{20}.

**Poland**

Polish legislative and organizational changes in municipal waste management were introduced in the waste Act of 14th December 2012\textsuperscript{21}, which implemented the regulations of directive 2008/98/EC. This defined methods to be used for environmental protection, preventing and reducing negative environmental impact and ensuring inhabitants’ life and health. Changes were introduced primarily to put order into municipal waste management, by limiting its volume and improving the efficiency of waste recovery and neutralization methods. The municipal waste management is regulated in the legal act of 1996\textsuperscript{22} in the range of maintenance of cleanliness and order by communes, which provides that selective collection of municipal waste must attain the appropriate level of individual waste fraction recovery determined by


\textsuperscript{19} Legislative Decree no. 36/03 of 13 January 2003, transposition of directive 1999/31/EC Ministerial Decree of 3 August 2005 (repealing ministerial decree of 13th march 2003) which establishes criteria and procedures for the acceptance of waste at landfills, according to decision 2003/33/EC.


\textsuperscript{21} Act of 2012 on waste, OJ 2013, pos. 21 with changes.

\textsuperscript{22} Act of 1996 on the maintenance the tidiness and order in communes, OJ 2010, No. 185, pos. 1243 with changes.
the EU, and that organic waste stored on landfills is reduced. According to Act of 1996 it was planned reach municipal waste recycling levels by 31\textsuperscript{st} December 2020; such that paper, metals, plastics and glass account for at least 50\% of total waste volume. Moreover, they are obliged to limit landfill biodegradable municipal waste volume by 16 July 2020 to no more than 35\% of total municipal waste.

In Poland functioning the comprehensive municipal waste processing systems in RIPOK installations. These installations should provide waste processing by thermally transforming prepared waste for recovery or disposal processes. Mixed municipal waste is mechanically and biologically processed, and fractions suitable for complete or part recycling are separated from this waste. In addition, selectively collected green waste and other bio-waste is processed by composting. These installations also guarantee disposal of municipal waste from mechanical-biologically mixed processing. In addition, they undertake to comply with Article 35 of Poland’s waste Act, which requires that municipal waste remnants in the installation must not increase within the next fifteen years; so all their mechanical and biological waste processing must remain equal to waste accumulation during that period\textsuperscript{23}.

In 2009, the proportion of deposited waste was 76\%, with 15\% recycled and 8\% composted\textsuperscript{24}. The increase in municipal waste volume collected selectively and subjected to recycling between 2008 and 2011, together with the individual waste fractions. In the studied years, the assembled company’s municipal waste selective volume rose 69\% to 302,000 tonnes. This included paper, glass, plastics, metals and bio-waste fractions. Increases of 12–16\% plastics and 18–21\% bio-waste were recorded\textsuperscript{25}.

**Municipal waste management in 2012 in EU**

As results of described legal and organizational solutions in EU after the implementation regulations of Directive 2008/98/EC, the EU countries reached suitable levels of waste recovery and limitation of landfills. Moreover, the development of waste is different in described countries. Among total mass of waste generated by all economic activities and households, 8\% was municipal waste. In 2012, the total these waste generation was found for the following countries: Germany (36 472 tonnes), Italy (29 613 tonnes), Spain (21 224 tonnes) and Poland (9 324 tonnes). The total waste generated by households may also be expressed in relation to population size in the particular countries. The average amount of waste generated in EU in 2012 was equivalent to almost five tonnes (4 982 kg) per inhabitant.


In the range of waste treatment, generally in EU in 2012, 36.4% of the waste was sent to recovery operations other than energy recovery and backfilling, for simplification this is called recycling in this article. 9.3% of the waste treated is backfilled. Backfilling is the use of waste in excavated areas for the purpose of slope reclamation or safety or for engineering purposes in landscaping. Significant differences could be observed among the EU Member States concerning the use they made of the various treatment methods. For instance, some countries had very high recovery (other than energy recovery) rates (e.g. Italy, Belgium, Poland and Germany), while others favoured waste disposal (e.g. Bulgaria, Romania, Greece and Malta). Table 1 shows that the proportion of waste sent to recovery in analyzed EU countries in 2012 recorded from 75.73% in Italy to 43.29% in Germany, while landfill was from 17.69% in Italy to 44.48% in Spain (Table 1).\(^{26}\)

<table>
<thead>
<tr>
<th>Countries</th>
<th>Recycling</th>
<th>Landfill</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>tonnes</td>
<td>%</td>
<td>tonnes</td>
</tr>
<tr>
<td>Germany</td>
<td>152 807</td>
<td>43.29</td>
<td>63 750</td>
</tr>
<tr>
<td>Spain</td>
<td>48 745</td>
<td>44.93</td>
<td>48 259</td>
</tr>
<tr>
<td>Italy</td>
<td>98 809</td>
<td>75.73</td>
<td>23 084</td>
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<tr>
<td>Poland</td>
<td>80 941</td>
<td>50.36</td>
<td>40 757</td>
</tr>
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</table>

Moreover, energy recovery is the future recovery of waste especially mixing municipal waste, because these waste have the high caloric value. Among analyzed countries the highest proportion of waste utilization by energy recovery was noted in Germany (9.61% – 33 953 tonnes), the next was Spain (3.01% – 3269 tonnes), Poland (2.20% – 3567 tonnes) and Italy (1.98% – 2593 tonnes). Similarly, the highest proportion of waste sent to backfilling also was found for Germany at 25.91% – 91 469 tonnes, and in Poland almost 22% and in Spain (7.5%).

Analyzed the development of waste treatment in 2004–2012 in EU, the quantity of waste treated by disposal in 2012 was slightly (0.4%) lower than it had been in 2004. The quantity of waste recovered (excluding energy recovery) grew from 890 million tonnes in 2004 to 1 053 million tonnes in 2012, and increased by 18.3%. As a result, the share of recovery in total waste treatment rose from 42.1% in 2004 to 45.7% by 2012. Waste incineration (including energy recovery) saw an overall increase between 2004 and 2012 of 27.4%.

Conclusions

Substantial changes took place in EU countries’ municipal waste management after the Waste Directive 2008/98/EC came into force. The following priority objectives for waste policy in the EU should be requirement: reduction the amount of waste generated; to maximizing recycling and re-use; limitation incineration to non-recyclable materials; phasing out landfilling to non-recyclable and non-recoverable waste. The analysis of the implemented legislative and organizational changes, especially the establishment of our comprehensive system, signaled significant improvement in municipal waste organization and management. All countries improved the waste management by introduction Management of Municipal Solid Waste System and suitable comprehensive technology to complex waste recovery and disposal. For example in Spain functioning ECOEMBES and ECOVIDRIO systems, in Poland RIPOK, Italy ATO. As results of these legal and organizational solutions caused increase in recycled and decrease in waste deposited in landfills. Moreover, the future of waste management especially mixing municipal waste is their energy recovery because these waste have high caloric value. In this range waste recovery method Germany has the highest proportion almost 10%. The second waste treatment apart recycling is utilization by backfilling to reclamation or safety or for engineering purposes in landscaping. Some UE countries in high percentage recovering waste by this method e.g. Germany and Poland above 20%.

Literatura


**Streszczenie**

*Prawne i organizacyjne zasady gospodarki odpadami komunalnymi w wybranych krajach UE*

Słowa kluczowe: Ramowa Dyrektysa Odpadowa, regulacje prawne, system gospodarki odpadami.

Podstawowe zasady gospodarki odpadami komunalnymi w krajach UE zostały uregulowane w Ramowej Dyrektywie Odpadowej 2008/98/EC, zgodnie z którą należy dążyć do wzrostu masy odpadów poddawanych odzyskowi i ograniczyć ich składowanie. Wiele krajów członkowskich implementowało te przepisy w swoim ustawodawstwie poprzez wdrożenie kompleksowych systemów gospodarowania odpadami komunalnymi i zastosowanie odpowiednich technologii ich odzysku i unieszkodliwiania (np. w Hiszpanii systemy ECOEMBES i ECOVIDRIO, w Polsce – RIPOK, a we Włoszech – ATO). Przyczyniło się to do wzrostu masy odpadów poddanych recyklingowi i zmniejszenia ich ilości kierowanych na składowiska odpadów. Ponadto zmieszane odpady komunalne są przetwarzane – odzyskuje się z nich energię oraz stosuje się do rekultywacji gruntów.