



## **WASTE MANAGEMENT LAW BY EXAMPLE OF A SMALL EUROPEAN COMMUNE**

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### ***Abstract***

The aim of this article was to present the rules governing the waste management system (WMS) and identify the changes emerging as a result of new regulations being introduced by example of Wołomin commune. European, Polish and Czech regulations clearly indicate the value of the hierarchy of waste management (WM). A response to the amended law was the modification of the WMS in communes, including the Wołomin commune.

Based on performed analysis and discussions, it can be stated that the municipal waste management system (MWMS) in the commune of Wołomin meets the requirements imposed by the legislator, works efficiently and positively influences the condition of the natural environment. In addition, the information obtained has been generalized and compared with the situation in the Czech Republic (CR).

**Keywords:** waste reduction activities, law, waste collection

## **INTRODUCTION**

Due to a rapid increase of technological development and human population since the Industrial Revolution, the amount of waste produced has continued to grow (Adamcová and Vaverková 2016, Adamcová et al. 2017, Nabavi-Pelesarai et al. 2017). Among the most crucial challenges and problems that

the 21st century environmental engineering faces are optimal use and treatment of waste generated by industries and as a result of common activities (Gworek et al. 2016, Hůrka and Malinowski 2014, Koda et al. 2013, Koda et al. 2017). Furthermore, issues of solid waste management (WM) are expected to become a major environmental problem in the near future for cities worldwide (Saeed et al. 2009, Vaverková and Adamcová 2014, Vaverková and Adamcová 2015, Koda et al. 2017, Vaverková et al. 2017). For instance, the World Bank (2012) expects the volume of waste globally generated in urban contexts to increase from the 2009 annual figure of 1.3 billion tons to 2.2 billion tons in 2025 (Chifari et al. 2017). The waste accumulation in the environment has raised the public awareness because of the problems caused by the amount of waste being disposed of into the environment (Matsakas et al. 2017) and it obliges local governments to sort the waste. This issue applies specifically to every day waste, production of which is very high. In the European Union (EU), the amount of municipal waste generated per person in 2013 amounted to 481 kg. In recent years, thanks to an increasing ecological awareness, the majority of municipalities in developed countries have implemented various forms of programs and schemes to promote waste reduction activities (Chifari et al. 2017). WMS, existing for years, were often modified in order to achieve its most beneficial form. The changes in Polish and Czech legislation law were the result of the need of adjusting the law to EU standards.

Through gradual introduction of the changes and many amendments to Polish legislation law, the WMS transformed into a separate economy branch focused on protection of the environment. Recent updates, included in the Waste Act of 14th December 2012 and the law of 1st July 2011 on the changes of the act on maintaining cleanliness and order in communes and other bills, revolutionized the whole system modifying the participation of local governments in the process of WM. In the new system the commune has to take over the responsibility for the MSW and its disposal. The system will introduce a fee (for the commune) for providing services of collecting and disposal of waste. The commune should organize waste collection by selecting the company providing the services by means of public tender (Malinowski 2011).

The WM, according to the laws presently in force, is a step towards the idea of Sustainable Development (SD). Each of the Polish communes independently decides on the shape of the system and the way it functions. However, only co-operation between the communes, local authorities, communities and companies in this matter will make it possible to achieve the best outcome and to leave the natural environment intact.

The aim of this article is to introduce the WM rules and identify the changes by the example of Wołomin commune. The article presents main directives creating the WMS in reference to the analysis of the law regulations on the

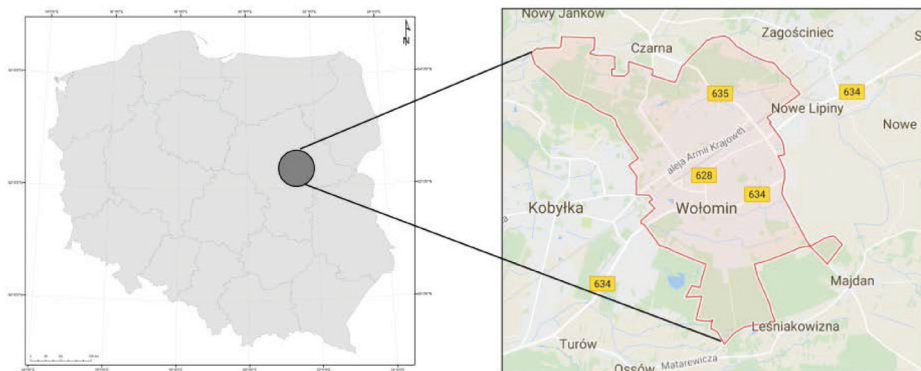
European, national and local level. It also presents the functioning of new laws based on the condition of the waste management in an elementary local government unit such as Wołomin commune.

### **AIM AND SCOPE OF THE STUDY**

In this study two research approaches have been used: a documents examination method with the main analyzed document being the Report of Wołomin commune's Mayor on the performance of tasks regarding the MWM. This analysis made it possible to verify the condition of the WM in the commune and the progress of the new law regulations being introduced into the commune's system. The authors inspected European, national and local laws which allowed to establish law frames regulating the functioning of local governments. The second method used was a monographic method based on the analysis of the MSWMS and the operations undertaken in this field in Wołomin commune by the Municipal Department of Sanitation.

### **DESCRIPTION OF THE COMMUNE**

The Wołomin commune is an urban-rural commune that is situated in the center of Mazovia region (52°20'N 21°15'E), in the outskirts of the Warsaw metropolitan area (Figure 1). The commune occupies the territory of 61.6 km<sup>2</sup> and its capital is the city of Wołomin that lies in the west of the region. In the north, east and south the city neighbors with a rural area which consists of 15 village councils: Helenów, Cięciwa, Czarna, Zagościniec, Lipinki, Duczki, Lipiny Stare, Lipiny Nowe, Grabie Stare, Grabie Nowe, Mostówka, Majdan, Leśnikowizna, Ossów and Turów. According to the Central Statistical Office's data, in 2015 there were 51,762 inhabitants in Wołomin commune which amounts to 22.0% of the county's population. The wholesale and retail trade and repairs comprises 31% of the commune's economy sectors; 13.4% is constructions, 10.1% is manufacturing and 7.5% is professional, technical and scientific activity. The largest part of the commune's area is occupied by utilized agricultural area (55%), which consists of arable land (44% of utilized agricultural area of the commune), hayfields (15% of utilized agricultural area of the commune) and grazing's (12%). Orchards form the smallest part of the utilized agricultural area of the commune – 1%. Woods and forest area are only 12% of the overall commune's area, which is very little compared to the average woodlands and forests area of the Wołomin county (27.7%) and the average woodlands and forests area of the country (30.5%).



**Figure 1.** The research area

## **RESULTS**

### **The characteristics of the municipal waste in the Wołomin commune**

The main sources of the MSW in the commune include households and infrastructural objects such as: mercantile and service buildings, craft and production enterprises in the social area, markets, green areas, parks, streets, city squares, graveyards, cultural-educational centers, health and social care centers, public administration buildings and other institutions equipped with an office and social area. In Wołomin commune the MSW was collected and separated into: paper, glass, plastics and metal. What is more, bulky waste such as furniture, used electronics, construction and demolition waste, used tires, batteries and accumulators, out-of-date medication, biodegradable waste, organic wastes (also stocked in composters by property owners) was gathered. The medications were stored in pharmacies. The batteries and used strip lights were collected in the shops they were bought at and collecting points i.e. schools, kindergartens (batteries) and institutions.

According to data contained in annual reports on MSWM from 2014, 48.844,88 Mg of MSW, containers (group 15), construction and demolition waste (group 17), used tires and group 19 waste were collected in Wołomin county. 34.739,22 Mg of mixed MSW was gathered. Due to waste sorting 14.105,66 Mg of waste was collected which amounts to 28.9% of all waste gathered in the county area. The amount of the waste collected, together with their codes, is presented in Table 1.

**Table 1.** The amount and type of municipal waste collected in Wołomin county in 2014.

<b>Code</b>	<b>Type of municipal waste</b>	<b>Weight of municipal waste [Mg]</b>
15 01 01	Cardboard and paper packaging	70.20
15 01 02	Plastic packaging	1013.37
15 01 04	Steel packaging	38.66
15 01 06	Mixed packaging	873.88
15 01 07	Glass packaging	2034.40
16 01 03	Used tires	104.90
16 06 05	Other batteries and accumulators	0.40
17 01 01	Concrete rubble and demolition waste	1044.50
17 01 07	Mixed concrete rubble, crushed brick, ceramic materials other than 17 01 06	997.20
17 02 02	Glass	0.70
17 09 04	Mixed construction and demolition waste other than 17 09 01, 17 09 02 and 17 09 03	1.70
19 12 12	Other mechanical treatment waste other than 19 12 11	4217.80
20 01 02	Glass	808.10
20 01 10	Clothes	11.30
20 01 21*	Fluorescent lights and other waste containing mercury	0.46
20 01 23*	Appliances containing freons	8.80
20 01 26*	Oils and grease other than mentioned in 20 01 25	0.02
20 01 33*	Batteries and accumulators together with batteries and accumulators mentioned in 16 06 01, 16 06 02 or 16 06 03 and unsorted batteries and accumulators containing these batteries	0.83
20 01 34*	Batteries and accumulators other than mentioned in 20 01 33	0.4
20 01 35*	Used electronic and electric devices other than mentioned in 20 01 21 and 20 01 23 containing hazardous waste	27.80
20 01 36	Used electronic and electric devices other than mentioned in 20 01 21 and 20 01 23	70.30
20 01 39	Plastics	898.60
20 02 01	Biodegradable waste	501.20
20 02 03	Green non-biodegradable waste	247.20
20 03 01	Mixed municipal waste	24029.52
20 03 07	Bulky waste	666.79

\* Hazardous waste (according to European Waste Catalogue and Hazardous Waste List)

**Table 2.** The amount of MSW collected in Wołomin commune in years 2014-2016

Year	2014	2015	2016
Mixed municipal waste [Mg]	10.676,2	4.913,2	3.078,64
Sorted municipal waste [Mg]	2.016,3	2.017,2	870.63
Biodegradable waste [Mg]	386.10	570.1	257.30
Bulky waste [Mg]	170.30	141.6	129.54

Table 2 is based on data acquired at Municipal and Communal Office of Wołomin. It can be clearly seen that unsorted MSW dominates over any other sort of waste. An overwhelming part of it (86.5%) was collected in urban areas and the rest (13.5%) in rural areas. In 2014 almost 38.3% of all MSW resulted from mechanical waste treatment. What is crucial is that the actual mass of MSW generated in the commune may contrast with the data included in the reports on waste collecting. It is caused by individual actions of the inhabitants who want to „get rid of” the waste. The mentioned actions are: neutralizing and recycling of the waste by the residents by themselves (i.e. composting biodegradable waste, re-using the containers), illegal landfill sites, selling the waste to recycling centers.

### **The rules of municipal waste management in Wołomin commune**

Starting 1st July 2013 a new WMS has been introduced. The reason for this change was, among others, an amendment of an act on maintaining cleanliness and order in communes dated back to 13th September 1996. Before the modification of the law property owners were obliged to forward the MSW produced on their property (based on a contract) to institutions with a licence to collect the waste which was usually transported to a landfill site without any recycling. Since the new law has been introduced the level of involvement of the commune has increased. The commune of Wołomin held a tender and signed a contract with a waste collection company collecting the household waste. The company responsible for waste collection in Wołomin is now Municipal Department of Sanitation (MDS). The company was created in 1992 and it owns a landfill site, a sorting department and a compost facility. According to the new system, the inhabitants no longer conclude individual contracts for the collection of waste directly with the companies operating on this market. Moreover, they can decide on how their waste should be collected – mixed or separately collected. The property owners are required to choose how they want their waste to be collected and pay for the service.

The rules of maintaining cleanliness and order in Wołomin commune allow unsorted MSW to be collected. They also compel the residents to sort furniture

and bulky waste, tires, organic waste, construction and demolition waste and hazardous waste (such as used batteries and accumulators or out-of-date medication).

The local council who created the rules included therein also information on the frequency of collecting the waste: (1) MSW: single family dwellings – once in two weeks; multi-family buildings – every day (except Sundays and holiday), (2) sorted waste: single family dwellings – once in a month (directly from the property owner); multi-family buildings – every day (except Sundays and holiday) with a possibility for the residents to deliver the waste to recycling centers by themselves.

The level of recycling, a preparation for reusing the MSW fractions such as paper, metals, plastics and glass in the commune of Wołomin has reached recovery rates required by law. The results acquired are higher than those specified by the Minister of Environment in Regulation of the Minister of Environment of 29 May 2012 on levels of recycling, preparation for re-use and recovery by other methods of certain fraction of municipal waste (Regulation of the Minister of Environment of 14 December 2016 on levels of recycling, preparation for re-use and recovery of some fractions of municipal waste by other methods, Journey of Law 2016, item 2167).

### **Recycling and neutralizing**

The commune recycled the MSW sorted by means of: sorting the waste in sorting departments and collecting the waste separately at the place it was generated. The following recycling processes were used: R1 – using the waste as a fuel or a different means of generating the energy; R5 – recycling or regenerating of other non-organic materials; R12 – replacement of the waste in order to submit it to any of the operations listed in R1 to R12; R13 – storage of waste to be subjected to any of the operations listed in R1 to R12 (excluding temporary storage at the time of collection at the place where the waste is generated). The waste was also disposal with the use of two operations: D1 – landfilling of inert waste and D5 – landfilling of hazardous waste or non-hazardous waste.

### **Installations and waste treatment facilities**

There are three installations in the commune to which the MSW collected from the residents is transferred. The installations are: a sorting department, a compost facility and a landfill site. A sorting department has been used by the MDS since 1998. It recycles several types of recyclable materials: plastics, glass (sorted by colors), waste paper, aluminum cans and scrap.

The waste is sorted by hand. Waste fractions acquired by means of sorting are pressed and mixed waste is shipped to a landfill site. The performance of the object reaches 2 Mg·h<sup>-1</sup>. As technology improves, productivity increases. In 1998, 116.801 Mg of raw materials were recovered, whereas in 2007 the mass



increased to 1968.79 Mg. A composting facility is owned by the MDS. It is located in Stare Lipiny. It is a field windrow composting facility, with a surface area of approximately 1200 m<sup>2</sup>. The facility is designated to recycle separately collected biodegradable waste. The most frequently recycled materials there are agricultural waste, flora debris (branches, leaves) and sludge from biological wastewater treatment plants. Composting in this facility consists of partial humification and biomineralization of biomass, which was piled on the surface of the plate in the form of a windrow. The efficiency of the facility is 5000 Mg annually and the gathered organic material is used for regeneration of the landfill site.

The landfill site is located in Stare Lipiny, around 3 km east from the center of Wołomin. The owner of the site is Wołomin commune and its manager is the MDS. The total capacity of the object is 880.000 m<sup>3</sup>, 790.000 m<sup>3</sup> of which is filled. The site has seals in the form of a natural geological barrier (natural clay with a thickness of 0.5-1 m and filtration rate  $k < 10^{-9} \text{ m s}^{-1}$ ) and an artificial barrier – a bentomat with a density of 5,000 g·m<sup>-2</sup> and synthetic insulation (Geomembrane PEHD 4 mm). The waste is stored in layers about 2 m thick: 1.9 m – waste layer and 0.1 m – insulation material (sand, earth). The landfill equipment consists of a piezometers network, which enables monitoring of groundwater and drainage of landfill leachate. This drainage system consists of a 0.5 m thick drainage layer and interceptors made of PEHD (100-200 mm in diameter). The leachate is collected in tanks and then passed to the municipal sewage treatment plant or sprayed on the surface of the landfill. There is no biogas drainage system in the landfill.

## DISCUSSION

MSW generation and treatment represents an important socioeconomic issue for Europa, Poland and the CR. Poland and the CR are EU-countries located in the Eastern part of Europe. Although these two countries differ in size, population and economic situation, it is interesting to compare their waste management policies based on positive experiences. The CR with an area of 78.870 km<sup>2</sup> is a country much smaller than Poland (312.679 km<sup>2</sup>) but there is a significant difference concerning the population – 10.55 mln in the CR (133 inhabitants/km<sup>2</sup>) and 38.4 mln in Poland (123 inhabitants/km<sup>2</sup>) (2015). The WM market in Poland has undergone a significant change over the past few years, largely as a result of the country's effort to reach the standards of WM of Western Europe's more developed countries. Transposition of EU directives has accelerated the pace of modernization of existing plants as well as compelled the companies to engage in further investments, especially in the reduction of landfilled waste (Gawor and Saarela 2016).



MSW generation in the CR remains below a certain level compared to the EU average (310 kg/y/inhabitant compared to around 475 kg/y/inhabitant on average) (The Czech Ministry of Environment). The same situation can be observed in Poland. In 2014, Poland generated 272 kg/y/inhabitant of municipal waste; this is significantly below the EU average. In the CR the recycling of MSW accounts for 25% being below the EU average (44%) this score also shows that the CR, while having a steady increase in recycling rate, must invest further in recycling in the next coming years in order to reach the 2020 recycling target. Compared to the CR, Poland achieved better recycling results and 32 % of municipal waste is recycled (recycling material and composting). However, this was also below the EU average (44%) in 2014. Poland must therefore invest strongly in recycling in the coming years in order to reach the 2020 recycling target.

The main treatment option for MSW in the CR is still landfilling. It amounts to 56% and it is twice as much as the EU average of 28%. This result is very similar to the Polish one. Although Poland is taking steps to improve its waste treatment, a large part of the country's municipal waste is still being disposed of in landfills. Poland landfilled 53% of its MSW in 2014, which is also significantly above the EU average (28%). Thermal treatment in the CR is over 20% of all waste disposal methods, whereas in Poland it is only 9-11%. However, the number of incineration plants is still being increased in the Polish WMS.

Illegal landfilling and dumping waste in forests is a pressing problem despite Poland's ongoing efforts to clean up the dumping sites. According to a recent report by the Supreme Audit Office – 'Implementing of the new WMS in the communes' this is mainly due to insufficient control over organizations dealing with WM and a lack of sites for treatment and disposal of specific waste (e.g. electronic waste, municipal bulky waste). The municipalities are mainly responsible for enforcing waste legislation and addressing these shortcomings, and their involvement needs to be increased. The CR faces difficulties with disposal of biodegradable waste. Currently, a number of flaws in the WM policy makes it difficult for the CR to reach EU targets: a high share of biodegradable waste goes to landfills. Waste treatment does not completely adhere to the waste management hierarchy; there is a no harmonized national waste data base and insufficient reporting structures.

The National WM Plan 2015-2024 was adopted on 22<sup>nd</sup> December 2014 by the Czech Government (together with the National Waste Prevention Programme). The Regional WM Plans were being gradually adopted by June 2016. The plans include policy measures, which should help the CR achieve its recycling targets; there are however concerns regarding planned capacity for residual waste treatment, in particular waste to energy conversion. The problems mentioned above are tightly connected to the community. MSW requires

extraordinary actions taken by the members of society. Legal regulations have no meaning if they are not respected.

## CONCLUSIONS

The article presents data on WM in Poland by example of a selected commune. A correctly functioning WMS is a crucial part of everyday life. The aim of this article was to present the rules governing the WMS and identify the changes emerging as a result of new regulations being introduced by example of Wołomin commune. The performed analysis of regulations proved that a hierarchy of WM is fundamental. Every action being taken should be aimed at preventing new waste being created, reused or recycled. European, Polish and Czech regulations clearly indicate the value of the hierarchy of WM. The document containing guidelines for WM in the commune is the amendment of the Law on the maintenance of cleanliness and order in communes dating back to 1st July 2011. The major change introduced by this amendment was to increase the competence of the municipality throughout the system. The municipality took over “waste ownership”, meaning it was obliged to collect and dispose of municipal property from property owners. The amendment was also intended to promote selective waste collection. Communes have been exempted from creating WM Plans.

A response to the amended law was the modification of the WMS in communes, including the Wołomin commune. The MDS, which has technical facilities for effective WM, has been responsible for WM under the supervision of the municipality. Presently, every citizen has the opportunity to donate MSW in a selective manner. The changed regulations positively influenced the level of proficiency of WMS in the commune of Wołomin. Based on performed analysis and discussions, it can be stated that the MSWMS in the commune of Wołomin meets the requirements imposed by the legislator; works efficiently and positively influences the condition of the natural environment. In addition, the information obtained has been generalized and compared with the situation in the Czech Republic. Both countries have similar problems with new regulations and MSWMS.

## ACKNOWLEDGMENT

This study was supported by the IGA – Internal Grant Agency Faculty of AgriSciences MENDELU No. IP 2017/021.

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Received: 21.07.2017

Accepted: 21.08.2017