

Henryk Pilecki*

SELECTIVE GATHERING AND COLLECTION OF COMMUNAL WASTE AS THE TASK OF A COMMUNE

Summary

Most duties connected with waste management are the responsibility of communes which are also responsible for ensuring appropriate conditions for selective collection and gathering of communal waste.

This obligation is fulfilled by most Polish communes, but the quantity of selectively collected waste does not exceed 6% of all collected community waste.

Selective collection is a very important form of waste management, because it allows to recycle and limit the weight of waste dedicated for storage – such effects are needed urgently.

The author suggests a way to increase the quantity of selectively collected waste: carefully segregate waste in places where it is created, selectively collect it and gather in such form. All activities resulting in mixing waste should be eliminated.

1. Introduction

The problem of solid waste generated by households and similar waste created outside them, that is communal waste¹, has become an important issue in everyday life and an essential direction of social life organization, especially in urban environment. In the communal management, collection of waste is as important as provision of electricity, water, gas or sewage collection; taking into account their widespread generation, large amounts and necessity of collection. The scope and consequences of the waste phenomenon called for the legal regulation and organization of the whole waste management. Its numerous facets (logistics of gathering, removal and final elimination, possibility of recycling some materials, resources and energy, etc.), are dominated by the environment context.

* mgr, Ph.D. student of Cracow University of Economics..

1 The term defined in Article 3, section 3, point 4 of the Act of 27th April 2001 on Waste (Journal of Law 2001, No 62, position 628, with subsequent changes).

The aim of the communal waste management is to reduce the amount of waste with biodegradable features in order to reduce the total amount of waste subject to landfill.

Before this challenging task, communes took up a number of actions aiming at reducing the total mass of waste subject to landfill^[2]. They concerned isolation of nonbiodegradable elements of waste.

The aim of this article is to present the instrument of communal waste management, which is selective collection, which lowers the amount of waste for landfill.

The subject of our analysis are the techniques and ways of selecting from communal waste those elements which do not have to be deposited on the dumping ground in order to neutralize them.

The subject of our analysis are mostly producers of communal waste, together with real estate administrators and communal services dealing with waste management in the commune, as well as commune administration.

The evaluation of the phenomena presented in the article was based on: bibliography, own experience related to employment at institutions dealing with waste management or connected with evaluations of waste management.

2. The obligations of communes as regards waste management

The generation of waste creates particular needs and consequently – in organized social life – obligations which must be fulfilled to meet those needs.

The chief principle related to waste generation is to dispose of it immediately in the place where it is created^[3]. Other principles are:

- reasonable price of waste disposal,
- troublefree method of waste disposal;
- short period of time in which waste exists.

In this paper I limited the review of obligations only to obligations of communes, not of all participants of the waste management process^[4].

Commune obligations as regards waste management (defined in a direct way) are defined by the following legal acts:

2 Statutory obligations of communes to reduce the mass of biodegradable communal waste intended for landfill (according to the Act of 27th April 2001 on Waste, Article 16a, point 4), include the requirement to reduce the quantity of this type of communal waste to not more than 35% of the total weight of communal biodegradable waste compared to the mass of this waste generated in 1995. The deadline for this obligation is 31st December 2020.

3 This is an incredible phenomenon: we all accept the fact that waste is generated, but we do not accept its existence.

4 The term waste management (and also participants of the process) is defined by the Act of 27th April 2001 on Waste in Article 3, section 3, point 1), which, according to J. Famiciec (*Kształtowanie cen na rynku usług gospodarki odpadami*, lecture, seminar materials Forum Dyrektorów Spółek Komunalnych, September 2008 r.): „(...) considerably restricts the proper understanding of this term”.

1. The Act of 8th March 1990 on Commune SelfGovernment (Journal of Law 1990, No 16, position 95 with amendments^[5]),
2. The Act of 13th September 1996 on Maintaining Cleanliness and Order in Communes (Journal of Law, 1996, position 622 with amendments),
3. The Act of 27th April 2001 on Waste (Journal of Law 2001, No 62, position 628 with amendments).

The abovelisted legal acts are not the only source determining the commune's tasks. Several tasks also result from norms concerning selfgovernment finance, as the foundation of performing public tasks by territorial selfgovernment^[6] is possession of property. The abovelisted legal acts determine direct obligations of communes, therefore they provide us with a clear and complete compendium related to waste management.

The Act on Commune SelfGovernment imposes the duty to satisfy collective needs of the community, among which maintaining cleanliness and order, as well as sanitary utilities, dumping grounds and neutralizing communal waste are mentioned (Article 7, section 1, point 3).

The Act on Maintaining Cleanliness and Order in Communes obliges the commune council to enact the regulation concerning maintenance of cleanliness and order in the area of the commune (article 4, section1). These regulations should precisely determine the principles of maintaining cleanliness and order in the area of commune, concerning (in case of communal waste):

- requirements related to maintaining cleanliness and order in the area of real estate, covering selective collection of communal waste, including generated by individual households dangerous waste, largesize waste, used electronic and electric appliances, used batteries and waste from renovation work (Article 4, section 2, point 1, subpoint a);
- type and minimal capacity of containers intended for collection of communal waste on the premises of real estate and on public roads, conditions of locating these containers and their proper sanitary, orderly and technical state (Article 4., section 2, point 2);
- frequency and method of disposing of communal waste and liquid waste from the real estate and areas of public use (Article 4, section. 2, point 3);
- maximum level of biodegradable communal waste allowed for landfill in dumping grounds (Article 4, section 2, point 4);

5 The current name is in accordance with article 10 of the Act of 29th December 1998 on Changing some Acts in Relation to Implementation of State System Reform, Journal of Law No 116, position 1126, originally the Act on Territorial SelfGovernment.

6 Harańczyk A., Samorząd terytorialny. Organizacja i gospodarka, Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, Kraków 2010

- their requirements resulting from communal plan of waste management (Article 4, section 2, point 5).

The Act on Waste, on the other hand, defines the commune tasks concerning communal waste management, listing them all in one article as a catalogue. These tasks are (Article 16a):

- 1) covering all commune inhabitants with an organized system of collection of all kinds of communal waste,
- 2) providing conditions in which the system of selective collection and disposal of communal waste could operate so as to allow:
 - a) limiting landfill of biodegradable communal waste,
 - b) isolating dangerous waste from communal waste,
 - c) achieving recycling levels of packaging waste,
- 3) providing construction, maintenance and exploitation of own or managed jointly with other communes installations for recycling and neutralizing communal waste or providing conditions for construction, maintenance and exploitation of installations and appliances for recycling and neutralizing communal waste by entrepreneurs,
- 4) providing conditions for limiting the mass of biodegradable communal waste intended for landfill:
 - a) till 31st December 2010 – to not more than 75% of total weight of biodegradable communal waste,
 - b) till 31st December 2013 – to not more than 50% of total weight of biodegradable communal waste,
 - c) till 31st December 2020 – to not more than 35% of total weight of biodegradable communal waste in relation to the mass of this waste generated in 1995,
- 5) initiating and facilitating creation of collection points for used electric and electrical appliances, indicating locations in which such actions should be organized and taking up information and education activities in this area.

Moreover, the Act of 27th April 2001 on Waste obliges communes to develop plans of waste management (Article 14, sections 1 and 3), their updating at least once in four years (Article 14, section 14) and preparing reports on realization of the plan of waste management covering the period of two calendar years (ibid, section 12b).

The initiative for changes in legislature, expressed in the 2010 parliamentary project of the act on maintaining cleanliness and order in communes (paper No 1169) and the 2009 government project of the act on waste (paper No 2002) raises some worries about the future shape and clarity of division of obligations and about the polarity of motives expressed by participants of the waste management market. In developed discussion, generally the intention to

cover all property owners with a fee for waste disposal (as an effective means to stop the practice of dumping waste) is praised, while the intention to prevent demonopolization and to burden commune selfgovernment with the right to own communal waste is criticized.

In the current legal state, the major principles of waste management are defined by the Act of 27th April 2001 on Waste. According to Article 5 of this Act, these are:

1. preventing waste generation or limiting the amount of waste and its negative influence on the environment during and after their use;
2. providing recovery in accordance with principles of environment protection if generation of waste could not be prevented;
3. providing neutralization of waste in accordance with principles of environment protection if generation of waste could not be prevented or if it could not be recycled.

The above principles are some sort of ecological standards.

The realization of public objectives in waste management area is not possible without cooperation of all process participants who strive at achieving the same goals. To make this cooperation possible, it is necessary to create and implement some standards of conduct. When standards are developed, we have to implement them in the form and extent allowing satisfactory level of goal achievement.

3. Recycling of communal waste

Recycling so far has been conducted in three basic forms:

- a) through selective gathering,
- b) through directing the flow of gathered mixed communal waste to segregation installations^[7],
- c) through using both abovementioned forms simultaneously.

Recycling through selective gathering consists in such arrangement of waste collection points so that they are composed of a set of containers for particular types of materials. These are usually separate containers for plastic, paper, glass and mixed material. Sometimes the set is extended to comprise the container for metals or for used batteries, sometimes for biodegradable waste. In suburbs or villages containers (usually with 110 dm³ capacity are replaced with stands with bags with capacity of 50 – 80 dm³). In collection points located in housing districts, near blocks of flats, the container for mixed waste is much larger (capacity of 1,100 dm³ or 3 m³). Mixed waste is sent to landfill while selectively gathered waste for recycling.

7 J. Nędzusiak (*Segregacja zmieszanych odpadów komunalnych jako forma ich odzysku*, *Recykling*, 2006, No 11) identifies segregation of mixed waste with recycling, which should be considered the right opinion.

The second form, namely the recycling through directing the flow of gathered mixed communal waste to segregation installations, consists in gathering mixed waste and then segregating it using industrial methods. In a simplified version, such industrial sorting plant is an installation consisting of a set of sieves dividing waste into factions differing in sizes, foil catchers, electromagnet for catching steel elements, and then a set of conveyor belts with posts for manual segregation of waste. As a result of the segregation process, waste for recycling or landfill is picked.

The use of both mentioned forms consists in selective gathering of waste, including mixed waste. Mixed waste is subjected to industrial segregation through processing it in the segregation installation. Selectively gathered waste is also sorted out again in the segregation installation in order to isolate waste which may contain pollution (both in selective gathering or as a result of primary segregation).

Apart from the abovementioned forms of recycling, there are some others, such as: homogeneous collection of only one type of material (for example foil and plastic packages or glass packages), etc. This form usually does not apply to communal administrative areas but to individual properties, for example it is used near large department stores or has a form of public points of waste collection in the area of the commune. It also happens that waste is gathered selectively, but its collection is not selective^[8]. This is a particularly reprehensible way of management. Particular forms of recycling are accompanied by different organizational elements, such as differentiation of prices for waste collection (mixed waste is more expensive, sorted out waste is cheaper or even collected free of charge).

There are also communes which are devoid of any form of segregation or recycling actions. There were 931 such communes in 2005 in Poland, though in 2009 there were only 147 of them, compared with 2331 communes with selective gathering of communal waste in 2009 (the total number of communes in Poland is 2478)^[9]. The changes in the number of communes using selective system of waste gathering in Poland in the analyzed period are presented in Table 1.

8 In selective gathering, there are many streams of waste (differentiated by types: plastics, paper, fabrics, glass, etc., and mixed waste), while during the collection the number of streams is restricted to two: selectively gathered waste (together as one stream) and mixed waste.

9 According to Różańska B., Sobczyk M., *Infrastruktura Komunalna w 2009 r.*, Główny Urząd Statystyczny, Warszawa 2010. [in:] <http://www.stat.gov.pl> – table 33: Selective gathering of communal waste in communes, line 1, column 2.

Table 1. Structure of communes in Poland in 2005-2009 which used selective gathering of waste

No.	Year	Number of communes with no segregation	Number of communes with selective segregation of waste	Percentage share of communes without selective gathering of waste
1.	2.	3.	4.	5.
1.	2005	931	1,547	38
2.	2006	558	1,920	23
3.	2007	312	2,166	13
4.	2008	188	2,290	8
5.	2009	147	2,331	6

Source: own elaboration on the basis of Infrastruktura Komunalna 2005 (and further years till 2009), Główny Urząd Statystyczny, Warszawa, 2006 – 2010.

The combination of pairs of quoted figures concerning particular years provides a pretty satisfactory picture. A clearly visible trend of equalizing the number of communes with selective waste gathering with the total number of communes in Poland is particularly positive.

A look at the achieved effects (that is the level of obtained recycling) ruins this satisfaction and may even cause some serious worries. Statistical data explaining this attitude can be found in Table 2.

Table 2. The amount of recycled waste in Poland in 2005-2009

No	Year	Communal waste					Amount of recycled waste from:			
		Total		Mixed		Selectively gathered	mixed waste		selectively gathered waste	
		Amount [t]	Amount [t]	Total share [%]	Amount [t]	Total share [%]	Amount [t]	Total share [%]	Amount [t]	Total share [%]
		3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	2005	9 352 117.3	9 056 807.4	96.8	295 309.9	3.2	71 298.8	0.8	295 309.9	3.2
2.	2006	9 876 586.5	9 473 192.9	95.9	403 393.6	4.1	144 300.0	1.5	403 393.6	4.1
3.	2007	10 082 600.0	9 569 600.0	94.9	513 000.0	5.1	153 000.0	1.5	513 000.0	5.1
4.	2008	10 036 405.0	9 353 923.2	93.2	682 481.8	6.8	335 510.8	3.3	682 481.8	6.8
5.	2009	10 053 499.0	9 264 600.0	92.2	788 871.5	7.8	795 802.2	7.9	788 871.5	7.8
6.	average	9 880 241.6	9 343 624.7	94.6	536 611.4	5.4	299 982.4	3.0	536 611.4	5.4

Source: own elaboration on the basis of Infrastruktura Komunalna 2005 (and further years, until 2009), Główny Urząd Statystyczny, Warszawa, 2006 – 2010.

For around 10 million tons of communal waste collected in the period of 2005-2009, only from 295,309.9 tons to 788,871.5 tons were gathered selectively. This accounts for 3.2% to 7.8% (average rate was 5.4% in this period).

In the EU countries before 1999, in years 1994-1998, the figure was ten times higher and ranged from 53% (Austria) to 96% (Great Britain)^[10].

The future objectives related to selective collection of waste are determined in the Directive 2008/98/CE of the European Parliament and of the Council on Waste, which was given the status of a framework directive on waste^[11].

The basic norm established by Directive 2008/98/CE is obligation to selective collection of waste until 2015 at least as regards: paper, metal, plastic and glass, and obligation to recycle by 2020 at least 50% of the weight of household waste, such as: paper, metal, plastic, glass.

The comparison of these obligations (and their deadlines) with currently achieved effects of selective collection of communal waste defines the scope of necessary action in Poland.

4. Selective gathering in place of generation and selective collection of waste as the basic ecological standard

The information in Table 1 shows that recovery from selectively gathered waste is much more effective than recovery from mixed waste. This statement is convincingly illustrated by the proportion of the recovery degree (pr) from selectively gathered waste and mixed waste:

$$pr = \frac{so_s}{so_z} = \frac{100\%}{3\%} = 33,3 \quad (1)$$

where:

$so_s = 100\%$ degree of recovery from selectively gathered waste

$so_z = \text{average } 3\%$ degree of recovery from mixed waste.

This proportion, however, has this deficiency that the parameters used are not bound by the same (common for both parameters) reference value. Such reference value should be the amount of generated communal waste (W_{ok}).

In case of mixed waste, the amount of gathered mixed waste (O_z) is identical with the amount of generated waste ($O_z = W_{ok}$), therefore the degree of recovery from mixed waste, referred to the average annual amount of generated waste (for data in Table 1) also equals 3%.

10 In selective gathering, there are many streams of waste (differentiated by types: plastics, paper, fabrics, glass, etc., and mixed waste), while during the collection the number of streams is restricted to two: selectively gathered waste (together as one stream) and mixed waste.

11 According to Różańska B., Sobczyk M., *Infrastruktura Komunalna w 2009 r.*, Główny Urząd Statystyczny, Warszawa 2010. [in:] <http://www.stat.gov.pl> – table 33: Selective gathering of communal waste in communes, line 1, column 2.

In case of selectively gathered waste, the amount of gathered segregated waste (O_s) is not equal to the amount of generated waste ($O_s < W_{ok}$), as selective gathering refers only to certain types of materials (for example glass, metals, plastics), and the remaining waste is gathered jointly, as mixed waste. The degree of recovery from selectively gathered waste referred to the amount of generated waste is therefore lower than 100%.

Scarcity of research on the structure of communal waste in Poland, coupled with lack of uniform methodology of conducted research^[12], account for difficulties in formulating a credible answer to the question concerning the value of achieved degree of recovery referred to the amount of generated communal waste^[13]. Using the results of research on material structure of communal waste that can be found in specialist literature^[14] we can accept an approximate figure of 37%, taking into account the fact that the average content of materials prone to selective gathering, such as wood, paper, cardboard, plastics, glass, fabrics, metals – equals 37.8%. If we assume that this group may also cover organic, biodegradable materials, the value increases to 78.3%.

Assuming also that the purity of segregation equals 80% (that is from the amount of selective gathering prone materials, only 80% are actually selected in the process of gathering^[15]), we still obtain impressive results:

$$so_s' = 80\% * 78,3\% = 62,6\% \quad (2)$$

This means that it is practically possible to achieve 63% recovery of the mass of generated waste. Using the so_s' parameter instead of so_s , the proportion (1) assumes the value of 20.88. This proves that with selective gathering and collection of communal waste, potential profit is around 20 times higher than in case of recovery from mixed waste.

The first place in which we mix waste, bringing the most painful effects, is the place where it is generated. Therefore if we strive at limiting the amount of communal waste landfill through increasing recovery rate, selective gathering should be initiated at the very place of their generation. This is a widely accepted standard of conduct.

Selective gathering in the place of generation allows us to selectively gather in our houses or housing districts segregated waste with high level of

12 According to A. Jędrzak and R. Szpadt (*Określenie metodyki badań składu sitowego, morfologicznego i chemicznego odpadów komunalnych*, [in:] <http://www.mos.gov.pl>).

13 By the quantity of generated communal waste we should understand the quantity which was generated in the area in which selective gathering and mixed collection of waste is conducted.

14 For example: Jędrzak A, Szpadt R., *Określenie metodyki badań składu sitowego, morfologicznego i chemicznego odpadów komunalnych* or Clément F., *Gestion des déchets organiques municipaux*, Cré-ation & Réalisation Design Média, Paris, 2001.

15 As, for example, other quantities constitute sieve fractions with below 10 millimeter size.

homogeneity (purity) and high level of mixed waste limitation. Collection of waste from points of collection – where it is segregated – also allows selective collection with the same level of homogeneity and greatly limits the amount of mixed waste. The consequence of using these forms of gathering and collection is high effectiveness of recovery with considerable percentage of the mass of waste obtained in comparison with the mass of collected waste.

Thus selective gathering of waste in the place where it was generated allows us to achieve highly effective and limiting further expenses recovery. It realizes then one of the basic ecological standards: providing recovery in accordance with environment protection principles, if the waste generation could not be prevented..

5. Further directions of development in selective gathering and collection of waste

Our analysis so far has pointed out that selective gathering of waste in the place where it was generated ensures effective results. Therefore, the directions of further development should revolve around this place and this process. Further directions of the development of selective gathering and collection of communal waste should be connected with:

- a) as regards the place: the place of generation and the place of the first gathering
- b) as regards the process: gathering in a selective way (segregating before placing for temporary storing).

Table 3. Data for extrapolation calculation of amount of waste that could be gathered in selective gathering, if all communes in Poland conducted selective gathering of waste in Poland

No	Year	Communes in Poland						Communal waste					
		total		Conducting selective collection of waste		Not conducting selective collection of waste		Total		Actual amount of selectively gathered waste ^[16]		Theoretical amount of selectively gathered waste ^[17]	
		number	[%]	number	[%]	number	[%]	[thousand tones]	[%]	[thousand tones]	[%]	[thousand tones]	[%]
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.	2005	2478	100	1547	62.4	931	37.6	9 352.1	100	295.31	3.2	473.03	5.1
2.	2006	2478	100	1920	77.5	558	22.5	9 876.6	100	403.39	4.1	520.63	5.3
3.	2007	2478	100	2166	87.4	312	12.6	10.082.6	100	513.00	5.1	586.89	5.8

¹⁶ In communes realizing the system of selective gathering and collection of waste.

¹⁷ Assuming that all communes in Poland would conduct selective gathering of waste.

No	Year	Communes in Poland						Communal waste					
		total		Conducting selective collection of waste		Not conducting selective collection of waste		Total		Actual amount of selectively gathered waste ^[16]		Theoretical amount of selectively gathered waste ^[17]	
		number	[%]	number	[%]	number	[%]	[thousand tones]	[%]	[thousand tones]	[%]	[thousand tones]	[%]
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
4.	2008	2478	100	2290	92.4	188	7.6	10 036.4	100	682.48	6.8	738.51	7.4
5.	2009	2478	100	2331	94.1	147	5.9	10 053.5	100	788.87	7.8	838.62	8.3
6.	average	2478	100	2051	82.8	427	17.2	9 880.2	100	536.61	5.4	648.33	6.6

Source: own elaboration on the basis of Infrastruktura Komunalna 2005 (and further years until 2009), Główny Urząd Statystyczny, Warszawa 2006 – 2010.

Using the data from Table 3 we can obtain the information that even if all communes in Poland conducted selective collection of waste, in the analyzed period of five years the amount of selectively gathered waste would only range from 470.03 thousand tones to 832.62 thousand tones (on average 648.33 thousand tones), which would amount to between 5.1% and 8.3% (average – 6.6%) of the total amount of gathered communal waste.

Even if we continue a widespread management of selective gathering of waste, we are unable to exceed the level of 10% of the share of selectively gathered waste in the total mass of generated waste! This means that selective gathering and collection of communal waste is a pretended activity in our country.

This conclusion refers to the last five years from the years covered by statistical data publications by Central Statistical Office^[18]. These are the years in which selective gathering of waste only started to become popular and widespread. As an example we can quote the fact that in 2005 selective gathering of waste was conducted in 2308 communes, but only in 1547 communes this referred to something more than just collection of paper and cardboard. In 2006, for the first time the research covered selective collection of biodegradable waste. Such waste was collected separately in 201 communes in 2006, in 252 communes in 2007, but in 2008 in as many as 834 communes.

¹⁸ According to the publication plan of GUS, the data from 2010 showing waste management (Rocznik Statystyczny Rzeczypospolitej Polskiej 2011 and Infrastruktura komunalna w 2010 roku) are to come out in October-December 2011.

6. Conclusions

The activity related to selective gathering and collection of communal waste so far has brought meager effects (below 10% of total collected communal waste) compared to the level of 62.6% which is practically achievable.

The effectiveness of expenses on selective gathering and collection of waste is still far from the condition of economic effectiveness (so distant that it can be practically considered as wasting resources).

The activity related to selective gathering and collection of communal waste so far has not met the expectations concerning increasing the amounts of waste that is subject to recovery, nor has it fulfilled the requirements of gradual reduction of the amount of waste (especially biodegradable one) deposited on landfills.

These conclusions can be drawn from the analysis of the past. The conclusions concerning the future will allow us to determine the directions of further development.

The directions of further development in selective gathering and collection of waste should be connected with the issue of segregating waste in the place where it is generated and in the first nearest place of its storage.

The development of selective gathering and collection is conditioned not so much by further expenses on increasing material elements of the organized system, but by attempts at streamlining the system and better use of gathered means, therefore it will be more difficult to perform these activities and to achieve objectives.

There is an urgent need to increase the amount of waste subject to recovery, mainly due to the obligation of successive lowering of the amount of biodegradable waste deposited on landfills.

The identification of the factors which determine the development of selective gathering of waste requires a systemic approach as regards waste management and considerable extension of the process participants term.

The development of selective gathering of waste, in a simplified version, should be associated with increased reliability in performing obligations in each element of adopted procedure. Thus it all boils down to: responsibility, respect for law, awareness and growing role of culture in social life.

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