

Mateusz Malinowski

CHANGES IN MUNICIPAL WASTE MANAGEMENT FOLLOWING THE AMENDMENT OF THE ACT ON MAINTAINING THE CLEANLINESS AND ORDER IN COMMUNES

Summary

A new act on maintaining the cleanliness and order in communes of 1 July, 2011, will become effective in Poland on 1 January, 2012. The act will come fully into force on 1 July, 2013. According to this act regulations, commune self-governments take over the obligations of the property owners concerning waste management, moreover, they become responsible for construction and maintenance of the infrastructure supporting recycling and waste disposal processes. The self-governments were granted a 1.5 year transition period to implement the act regulations.

The introduced changes are an adjustment of Polish regulation to the European law. Only in Poland and Hungary local self-governments have not yet been responsible for management of waste generated in their areas.

The article presents an analysis of the basic changes introduced by the act to the Polish system of municipal waste management. Presented are also the estimates of the mass of wastes collected on the territory of Poland with particular regard to the Małopolskie voivodeship. Calculations and forecasts were made on the basis of information collected by the Main Statistical Office (GUS) and commune offices, where systems similar to the one introduced by the act have been operating for several years. The act assumes that all citizens of Poland will be covered by a system of waste collection, but will also have to pay so called “garbage tax”, which should translate into increased amount of collected wastes, especially in these communes where wastes collection system was faulty. In Małopolskie only in 30 communes the 100% of inhabitants have signed contracts for garbage disposal. In the communes where the modern municipal waste management system has been operating, the increase in the mass of collected wastes (for the first three years of system operation) ranged between 31% and 94% in relation to the mass collected in the year preceding the introduction of the new system, although over

90% of local inhabitants were covered by the previous system. As results from the analyses, after introducing the new act the amount of wastes collected in the Małopolskie voivodeship may increase from the level of 765,000 Mg (2010) to over 1.1 M Mg (1.4 M Mg according to less optimistic forecasts), assuming that all generated wastes will be collected (the same amount as in 2010). In some of the Małopolskie communes the estimated increase in collected municipal wastes may reach over 500%.

Key words: municipal wastes, act on maintaining the cleanliness and order in communes, Małopolskie

INTRODUCTION

The act of 1 July, 2011 amending the act on maintaining the cleanliness and order in communes and some other acts [Journal of Laws of 2011, No. 152, Item 897], which becomes effective on 1 January 2012 in a revolutionary transformed Polish legal system concerning handling municipal wastes. In the new system the commune has to take over the responsibility for the wastes and their disposal. The system will introduce a fee (for the commune) for providing services of collecting and disposal of wastes. This fee will be a common performance for public benefit [Górski, 2011]. The commune should organize waste collection by means of selecting by tender the enterprise providing the services. This provision raises numerous controversies in so called “eco-business” because of total limiting the competition in the areas where free market was declared.

In pursuance of the act on wastes [Journal of Laws of 2010, No. 28, Item 145] communes should form regional unions for joint realization of tasks connected with waste management. Installations for waste processing should be established in these regions (MPB, composting plants or sorting facilities and municipal wastes incineration plants in larger regions). Wastes cannot be transported outside the boundaries of the voivodeship (regions) without special permission from Governor. Assuming full control over municipal wastes by self-governments will force them to undertake and realize numerous organizational endeavours to enable creation and functioning of the new system. It will be also connected with considerable financial outlays on the part of commune on establishing regional centres of waste management (ZZO), particularly in the communes in which until 2011 the waste collection and disposal systems were malfunctioning.

The act on maintaining the cleanliness and order in communes prepared by the Ministry of the Environment aims at including all inhabitants of Poland by a system of waste collection and increasing the level of recycling and recovery

of selectively collected wastes. The act assumes also relieving the inhabitants of the duty to sign individual garbage collection contracts. Introduction of so called garbage tax aims to limit negative practices of among others discharging wastes in the forest, or incinerating them in house boilers. The rates for waste collection are to be established by the communes.

The calculated rate should cover the costs of system operation, including the payments for local administration. It should be stated per capita or according to the area of living premises or the amount of water used [Journal of Laws of 2011, No. 152, Item 897]. Communes can also freely use preferential rates for the inhabitants who sort wastes in special sacks. Establishing the optimal rates currently poses one of the most serious problems for the local self-government administration because only few communes conduct investigations on the quantity and quality of collected garbage. The rates currently suggested by some communes range from 1.50 PLN to over 20 PLN per capita (for monthly waste removal). The dispersion of prices results from serious difficulties in determining real amounts of collected wastes following the introduction of the new system (e.g. mass density and unit waste accumulation rate) which determine total costs of the system functioning.

Self-governments were granted a period of time until 1 July 2013 to create an efficient system of waste management (tendering procedures, creating administrative departments, establishing the system of payments, their inventory and redistribution and enforcement of payments or construction of ecological infrastructure). Severe penalties will be imposed on the communes who will not realize the assumptions of the act. Therefore, communes must take steps to get ready for new tasks. In pursuance of article 3c of the Act on maintaining the cleanliness and order in communes [Journal of Laws of 2011, No. 152, Item 897], communes are obliged to limit the biodegradable municipal waste mass transferred for deposition:

- until 16 July 2013 – to no more than 50% of gravimetrically total mass of biodegradable municipal wastes transferred for deposition (minister in charge of the natural environment will determine by way of regulation the levels of limiting the mass of biodegradable municipal wastes),

- until 16 July 2020 – to no more than 35% of gravimetrically total mass of biodegradable municipal wastes transferred for deposition,

- until 31 December 2020 – the level of recycling and preparation for the reuse of the following fractions of municipal wastes: paper, metals, plastics and glass to at least gravimetrically 50%,

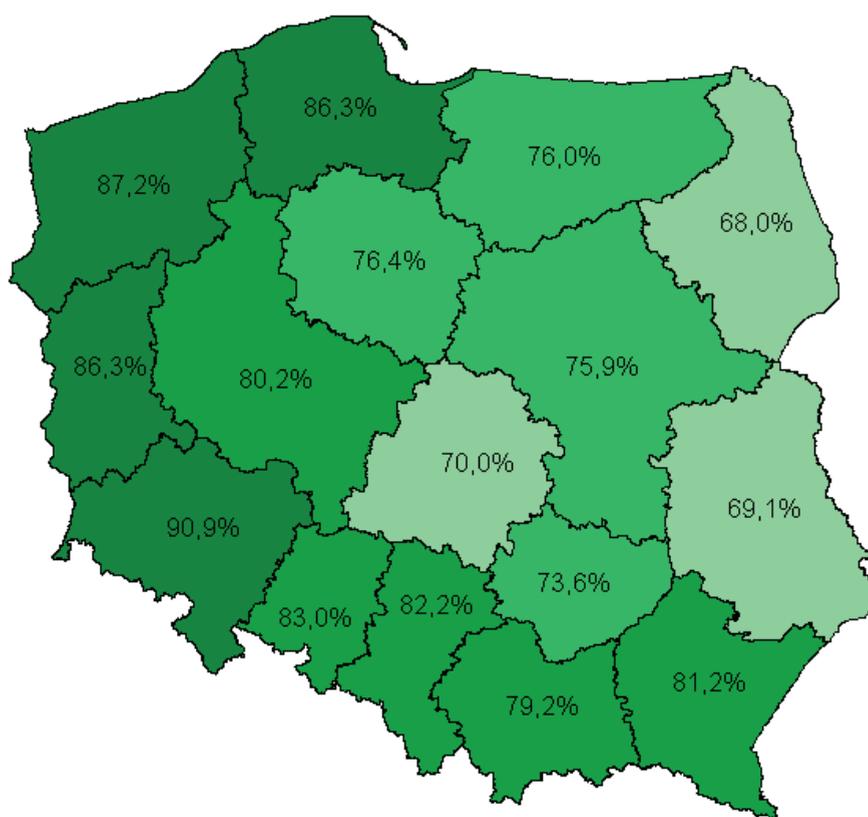
- until 31 December 2020 – the level of recycling, preparation for reuse and recovery using other than hazardous methods, of building and demolition wastes in the amount of at least 70% gravimetrically.

In 25 EU countries the half of all wastes is deposited in landfills, whereas the other half is utilized. These statistics still do not refer to Poland. Transferring wastes management to communes should be a chance to heal the system of waste management in Poland. Until 2011 such solution has not been introduced yet only in Poland and Hungary.

A number of controversies are connected with the new system resulting either from a short transition period (a year and a half) for the preparation of the system or problems with calculating real rates for waste collection, or expected opposition of local communities against the obligatory waste removal and “garbage tax” payment. However, the most serious controversies concerning such fast introduction of the system are caused by the inadequate number of ecological installations [Górski, 2011] which in the future should receive even between 6 and 8M Mg recovered wastes in all the country. The new act means also total limitation of competition in the areas where the system is functioning correctly, as well as a serious challenge for the self-governments in the areas where so far the eco-enterprises have been incapable to organize efficiently functioning system.

RESEARCH PROBLEM

Over 10M Mg of municipal wastes was collected in 2010 in Poland, of which 86% was deposited in landfills [Ochrona środowiska, 2010]. Introducing the new system should cause, mainly due to preferential fee rates, an increase in the quantity of selectively collected wastes. At the same time total waste mass will grow because all inhabitants will be covered by the “garbage tax”. In 2010 only about 80% of the inhabitants of Poland were included in waste collection system [Ochrona środowiska, 2010]. As shown in Fig. 1, the lowest percentage of the population covered by the system refers to the Podlaskie voivodeship. The situation is most advantageous in the Dolnośląskie voivodeship, where the system comprises almost 91% of the inhabitants. In the Podlaskie, Lubelskie and Łódzkie voivodeships the inhabitants will most acutely feel the introduction of the new system and the most serious opposition from the local communities is expected there. In the communes where the modern system has been operating for some years (Pszczyna, Legionowo, Starachowice and others) a referendum was conducted prior to its introduction and then for 2-3 years informational and educational campaign was run to prepare the inhabitants for the obligatory waste segregation and handling, according to the regulations on the environmental protection.



The average for Poland: 79.1%

Source: Author's own elaboration on GUS data

Figure 1. Percent of population served within the actual waste collection system

Table 1 contains computations of real rates of municipal wastes production in individual voivodeships (for the reference year 2010). According to GUS the quantity of wastes generated by the inhabitants in all voivodeships is definitely bigger than currently collected mass. It results among others from incinerating wastes in house boilers and other illegal practices, which results in a lesser amount of removed wastes. A smaller amount of removed wastes at the same time means lower cost born by the property owner for their removal. Currently in 98% of Polish communes the rate is calculated per volume and number of possessed waste containers. The amount of wastes uncollected from persons covered by the system in relation to the collected mass of wastes estimated by

GUS ranges from 7% in the Dolnośląskie voivodeship to 43% in the Lubelskie voivodeship. The actual mass of generated wastes was calculated according to the following formula:

$$R_{obl} = \frac{R_1 \cdot (S_{GUS} + 100\%)}{L_x} \quad [\text{thousand Mg} \cdot \text{year}^{-1}]$$

where:

R_1, S_{GUS} – as in Table 1

L_x – percent of inhabitants covered by the system in 2010.

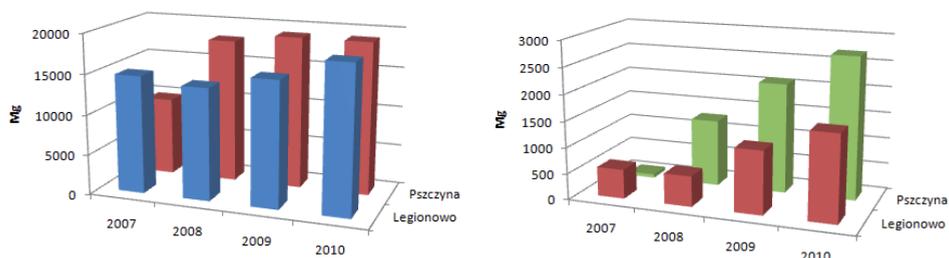
Table 1. Indices of estimated amount of wastes generated by the inhabitants of individual voivodeships

Voivodeship	R_1	S_{GUS}	W_{xobl}	$W_{xobl} - W_x$	R_{obl}
	thousand Mg·year ⁻¹	%	kg(M·year ⁻¹)	-	thousand Mg·year ⁻¹
POLAND	10 054	19.9	397.7	81.7	15 238
Dolnośląskie	990	7.6	405.8	35.8	1 172
Kujawsko-pomorskie	524	23.3	408.9	96.9	846
Lubelskie	332	43.4	318.6	97.6	689
Lubuskie	318	15.1	420.3	58.3	424
Łódzkie	633	31.6	466.8	138.8	1 190
Małopolskie	765	19.3	350.7	73.7	1 153
Mazowieckie	1 557	20.4	474.7	115.7	2 470
Opolskie	268	17.5	367.4	61.4	380
Podkarpackie	359	15.6	243.5	45.5	511
Podlaskie	247	40.5	428.5	136.5	510
Pomorskie	699	12.7	411.5	58.5	913
Śląskie	1 394	18.5	432.6	76.6	2 010
Świętokrzyskie	207	25.1	276.4	72.4	352
Warmińsko-mazurskie	323	24.5	370.7	88.7	529
Wielkopolskie	898	20.6	397.4	79.4	1 350
Zachodnio-pomorskie	539	14.3	417.3	53.3	707

- R_1 – mass of wastes collected in 2010
- S_{GUS} – estimated percent quantity of wastes non-collected from the population covered by the system in 2010
- W_{xobl} – calculated rate of quantitative accumulation of wastes from inhabitants (as of 2010)
- $W_{xobl} - W_x$ – difference between the computed rate and waste accumulation rate stated by GUS and in KPGO 2014].
- R_{obl} – real mass of wastes generated by inhabitants of voivodeships (as of 20110)

Source: Author's own elaboration on the basis of GUS data.

Under these assumptions when the new system is fully introduced in 2013, the mass of wastes collected in Poland may increase even by 51% in comparison with the currently collected amount and exceed $15.2 \text{ M Mg}\cdot\text{year}^{-1}$ (on the assumption that the mass of generated wastes will not change, which may be deduced from the fact that since 2007 the quantity of wastes collected in Poland has changed by no more than 5% and is on average 10 M Mg). Fig. 2 illustrates changes in the mass of collected wastes, both mixed and segregated, which occurred after the introduction of the new system in selected communes. Despite the fact that many enterprises collecting wastes were operating in the area of these communes and the average number of the inhabitants covered by the system exceeded 90%, a considerable increase in the amount of collected wastes, from 31 to even 94% (at forecasted 15-50% increase) was registered in relation to the mass collected in the year preceding the introduction of the new system. The growth resulted from higher production of wastes, but in the first place from the poor tightness of the previous system. The first conclusions seem to point to far insufficient frequency of waste removal causing that a portion of wastes was managed immediately by the households, for example for fuel. At the same time the quantity of selectively collected wastes increased (10% of the whole waste stream) [Zysk, 2011]. During three years the system of waste management was rebuilt, equipped in new composting and sorting plants (including facilities for mixed wastes, which several years ago was regarded as useless), whereas biodegradable waste recovery exceeded the level of 50%. Introducing the new system may be regarded as a success which was possible owing to the existence of good infrastructural base.



Source: Author's own elaboration on the basis of Zysk [2011] and Wieczorek [2011]

Figure 2. Mass of collected wastes after introduction of the new system in the communes of Pszczyna (1 May, 2008) and Legionowo (1 July, 2009), A - mixed waste, B - segregated waste

A question may be asked, how the new act and its regulations will affect the situation in individual communes and regions of Poland. Will individual region cope with the problem of an adequate infrastructure for processing a much larger mass of wastes and ensuring the required levels of recovery by 2013 (50% of biodegradable mass of wastes) and in 2020 (50% of recycled waste)?

The Małopolskie voivodeship, where great disproportions concerning the efficiency of waste collection from inhabitants have been registered currently, was chosen for the detailed analysis of the problem. The percent of population covered by the system in 2010 was equal to the national average. According to calculations, the increase in the mass of collected wastes in the Małopolskie voivodeship was estimated from the level of 765 000 Mg to over 1.1M Mg per year. The amount of wastes will grow most in the typically agricultural communes in Dąbrowa, Miechów, Limanowa, Nowy Sącz and Tarnów counties, where currently the index of inhabitants using the services does not exceed 70%, while in some communes (among others Łukowica, Gręboszów, Podegrodzie, Mędrzechów and Bolesław (Dąbrowa county) it does not exceed even 15% [Malinowski, 2011].

The conducted analyses assumed that in the first year after the system introduction communes would have to collect the whole mass of currently generated wastes. Beside the method which relies on computing the real waste accumulation rate by determining the degree of the inhabitants' services and GUS estimates, and also on the basis of the rates in PGOWM 2010, or by comparing these communes with those where the system has been operating for several years, one may use an average real waste accumulation rate in the Małopolskie rural communes established by Bergel and Kaczor [2006], i.e. $223.6 \text{ kg} \cdot (\text{M} \cdot \text{year})^{-1}$ (at current rate ranging from 30 to $120.6 \text{ kg} \cdot (\text{M} \cdot \text{year})^{-1}$ computed on the basis of the mass of collected wastes).

METHODS AND RESULTS

Proper estimation of the amount of wastes in communes is extremely important in order to establish the optimal fee rate for their collection. The duty was imposed on the commune self-governments. There are at least several methods of estimating the quantity of generated wastes. Assessing the amount of wastes is also connected with determining the needs of communes or regions concerning an adequate capacity of the ecological infrastructure, particularly mixed and segregated waste sorting plants, composting plants, biogas plants or incinerator plants.

Predicted amounts of currently generated wastes, compiled on the basis of subsequent indicators and methods for the Małopolskie voivodeship were presented in Table 2.

Table.2. Estimated mass of municipal wastes for collection in the Małopolskie voivodeship after introducing new system of waste collection

Method No.	Estimated mass of waste generated in the Małopolskie voivodeship (2010)	Percentage increase in mass of wastes
	M Mgyear ⁻¹	%
1	1.153	50.7
2	1.129	47.6
3	1.242	62.3
4	1.175	53.6
5	1.398	82.7

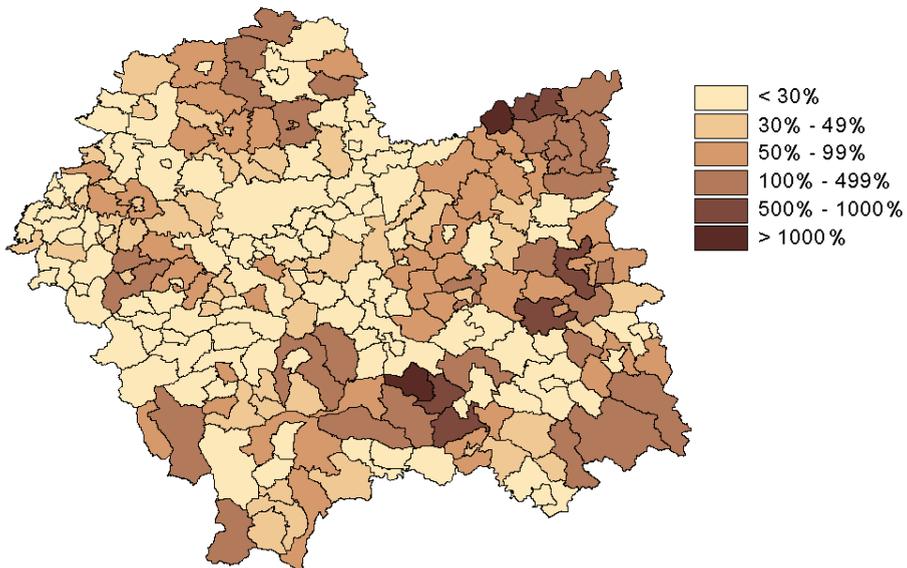
Source: Author's own elaboration, 2011

Method 1 relies on computing the forecasted real amount of generated wastes (R_{obl}) on the basis of uncollected wastes mass estimated by GUS (in Małopolskie region: 19.3% of the currently collected mass – Table 1) and the percent of served inhabitants with reference to the whole voivodeship. The data were obtained from the paper on the environmental protection (Ochrona środowiska, 2010).

Method 2 relies on computing the estimated mass of wastes by means of considering the level of inhabitant services in each commune of the voivodeship. The computations are the same as for method 1. The data on the level of currently collected wastes and the level of inhabitant services were obtained from GUS. Method 3 uses the rate determined in the paper by Bergel and Kaczor [2006]. Because the rate refers to rural areas, the results obtained using method 2 were used for the urban-rural and urban areas. Method 4 involves calculating the amount of produced wastes using the rates as stated in the Waste Management Plan for the Małopolskie Voivodeship 2010, respectively for rural, urban and urban-rural communes. Method 5 involves transposition of commune experiences in increasing the mass of collected wastes in the first year after the introduction of the new system. Information supplied by the communes of Pszczyzna, Legionowo, Końskie and Starachowice was used for the calculations. Communes of the Małopolskie voivodeship were compared with the above mentioned according to the administrative type and the current level of the inhabitant services.

In the communes where less than 60% of inhabitants participate in the current waste collection system, the estimated increase in the mass of wastes may be at least 100%. As may be seen in the Fig. 3, there are 37 such communes in the Małopolskie (20% of all communes in the voivodeship). The greatest number of communes (including agricultural ones) is situated in the Dąbrowa and Limanowa counties. In the communes where currently wastes are collected from less than 30% of the inhabitants, the estimated mass of generated wastes is thrice bigger than the mass of wastes collected in 2010. There are 6 communes in the Małopolskie region where the indicator of inhabitant services is lower

than 15%. It refers to the Podegrodzie and Łukowica communes, rural areas of Stary Sącz town, Mędrzechów, Gręboszów and Bolesław. In these communes the growth of the waste mass to be collected in the first year following the introduction of the new system may exceed 500%. Despite the fact that the estimated increase in the amount of wastes in 143 communes will be lower than 50%, while in 92 lower than 25% in relation to currently collected mass of wastes, the total amount of wastes generated in Małopolskie exceeds $1.1 \text{ M Mg} \cdot \text{year}^{-1}$ according to all tested methods. In methods 1, 2 and 4 the result of computations is similar and ranges from 1.129 to $1.175 \text{ M Mg} \cdot \text{year}^{-1}$. The least optimistic results were obtained using method 5 which assumed that the increase in the quantity of wastes will be proportional to the one registered in the communes where the rules of new waste management system were already introduced. As evidenced by the computations, the mass of generated wastes will reach almost $1.4 \text{ M Mg} \cdot \text{year}^{-1}$.



Source: Author's own elaboration on the basis data provided by GUS

Figure 3. Estimated increase in the mass of collected municipal wastes following the introduction of new system in the communes of the Małopolskie voivodeship

If in 2013 the amount of wastes to be collected in Małopolskie equals the mass of currently generated mass, the transport enterprises will be obliged to transport 1.1 M Mg of wastes. In Poland the amount of biodegradable municipal wastes constituted 45% of waste stream in 1995 whereas since 2008 the level

has increased to 55% [Jędrzak, 2010]. It means that in the Małopolskie voivodeship the waste processing installations will have to accept over 600 thousand Mg wastes per year, of which in 2013 only 50% will be deposited. Table 3 shows factual and planned capacities of the existing ecological installations and these under construction in the voivodeship area.

Table 3. Processing capacities of ecological installations in the Małopolskie voivodeship

Region	Composting plants	Mixed waste processing installations	Segregated waste sorting plants	Composting plants	Mixed waste processing installations	Segregated waste sorting plants
	Mg \cdot year $^{-1}$	Mg \cdot year $^{-1}$	Mg \cdot year $^{-1}$	Mg \cdot year $^{-1}$	Mg \cdot year $^{-1}$	Mg \cdot year $^{-1}$
	2008			2013 (planned productive capacities)		
Małopolska	26700	108000	136925	59200	229200	175200
Krakow	21000	39000	45175	27200	133500	82900
Myślenice	0	0	200	3500	7900	10000
Tarnów	4500	4500	2000	7000	20500	20400
Nowy Sącz	0	19500	0	6400	19100	18400
Nowy Targ	1200	1200	75500	3900	10600	11100
Wadowice	0	0	3200	3500	8900	10000
Oświęcim	0	43800	10850	3400	10600	9900
Chrzanów	0	0	0	4300	18100	12500

Source: Author's own elaboration on the basis of PGOWM, 2011

Actual productive capacities of the installations for mechanical and biological waste processing (MBP) allow accepting 272 thousand Mg of wastes per year. At present some of these facilities (e.g. sorting plants in the Bolesław-Kraków-Proszowice region) operate using only 25% of their capacity. Regulations of the new act on maintaining cleanliness and order in communes will contribute to improving the profitability of installations already operating in the voivodeship, mainly through the increase in the mass of segregated wastes. Profits generate by these facilities may also finance investments in waste management planned for 2013. It is very important because some regions (Myślenice, Nowy Sącz, Wadowice or Chrzanów) do not have sufficient number of MBP installations and according to the act on wastes they cannot be transported beyond the boundary of associated communes. Planned throughput of MBP installations in 2013 in the area of the Małopolskie voivodeship is 463 thousand Mg \cdot year $^{-1}$. Moreover a construction of 3 incinerator plants of mixed municipal wastes has been planned. Realization of all investment plans will cause that in 2013 the planned throughput of ecological installations will be adequate to fulfill the voivodeship needs concerning municipal waste management.

CONCLUSIONS

There will be many measurable benefits of the newly introduced system of waste management in Poland, among others: sealing the system, limiting the problem of illegal landfills, improving the community ecological awareness and increasing the recovery of biodegradable wastes. Regulations of the new act also cause controversies and problems most feared by small entrepreneurs engaged in collecting and processing of wastes. It seems possible that once they will lose tenders in communes to regional potentates, they will lose their clients and will be forced to wind up their Eco-firms. It refers mainly to the metropolitan areas where usually over 10 businesses operate in one commune. In rural areas the new act may prove a stimulus for establishing new businesses dealing with waste management. Estimated increase in the mass of wastes collected in Poland may exceed 50% of currently collected amount and reach 15 M Mg·year⁻¹. In the Lubelskie and Podlaskie voivodeship the estimated growth of the quantity of wastes twice exceeds the currently collected mass of wastes.

In the Małopolskie voivodeship the amount of wastes will grow most in the Dąbrowa and Limanowa counties where in 2010 the indicator for inhabitant services was the lowest. In order to fulfill the country obligations (resulting from the framework Directive 2008/98/EC and National Waste Management Plan 2014), among others concerning 50% recovery of biodegradable wastes in 2013 and 50% of recycled waste in 2020, many ecological installations must be constructed, which will pose the greatest challenge for the local self-governments, in the first place in the communes where so far the system has been faulty. Realization of the assumed investment plans concerning MBP installations in the Małopolskie voivodeship will allow guaranteeing feasibility of obligations towards the National Waste Management Plan. According to the estimates in the Małopolskie voivodeship over 1.1 M Mg of wastes will have to be collected from inhabitants when the new system is introduced. The biodegradable waste mass constitutes over 300 thousand Mg and this will have to be recovered. Throughput of the ecological installations currently operating in the voivodeship is 272 thousand Mg ·year⁻¹ and by 2013 it should increase to 463 thousand Mg ·year⁻¹.

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Mateusz Malinowski, MSc.
University of Agriculture in Krakow
Institute of Agricultural Engineering
and Computer Science
30-149 Kraków ul. Balicka 116B
tel. (4812) 662 4660
Mateuszmalinowski1985@o2.pl