



Waste Management in the Region of Płock – Declarations of Residents

Anna Prędecka^{}, Stanisław Biedugnis, Adam Zmysłowski*

Main School of Fire Service, Warsaw, Poland

**corresponding author's e-mail: apredecka@sgsp.edu.pl*

1. Introduction

The paper discusses waste management on the territory of local governments belonging to the Union of Płock Region Communes and as its members involved in joint waste management. During a review of the waste management system, in the first stage a selection was made of a local governments with values as close to the mean level as possible. Afterwards local governments were chosen characterised by the biggest disparities with respect to population density and the number of registered residents per one declaration related to waste submitted by inhabitants. It was decided that the Czerwińsk nad Wisłą Commune was the most representative local government; the highest population density was recorded for the Stara Biała Commune, and the lowest one – in the Szczawin Kościelny Commune. The biggest number of registered residents per one declaration was recorded for the Pacyna Commune, and the smallest number in the Łąck Commune. Next a comparison was made of changes to amounts of generated waste in selected local governments in six-month periods.

2. Act of 1 July 2011

On 25 July 2011 a new act was announced on amendment of the act on maintaining cleanliness and order in communes and of certain other acts of 1 July 2011 (Polish Journal of Laws/Dz. U. 2011 No. 152 item 897). This act incorporated certain vital changes to the act on maintaining cleanliness and order in communes of 13 September 1996 (Polish Journal of Laws/Dz. U. of 2005 No. 236, item 2008, as later amended). The act came into life gradually, and came into effect fully on 1 July 2013. One of the most significant changes was releasing property owners from responsibility for waste management in favour of local governments (Zmysłowski & Biedugnis 2013). The Act reflects activities of the

European Union with respect to the impact that humans have on the environment. The EU institutions have published numerous documents and reports related to urbanization (Baran S., i in. 2014).

The Act, diverse publications and other documents promote recycling and are oriented at reducing the amount of deposited waste. In 2012 waste was neutralized by storing 62% of the total amount of waste collected. Mixed municipal waste accounted for almost 90% of all municipal waste deposited (Gaska K. & Generowicz A.).

3. Union of Płock Region Communes

The Union of Płock Region Communes (ZGRP) was registered in the Office of the Council of Ministers on 14 April 1994. Statutory tasks of the Union that are of key importance for waste management are as follows:

- “Joint resolving of problems of supra-commune nature” (Union of the Płock Region Communes 2015),
- “Representing joint interests of communes comprised by the Union” (Union of the Płock Region Communes 2015),
- “Taking up integration measures connected with plans of the establishment and functioning of the Płock County” (Union of the Płock Region Communes 2015),
- “running a waste management system on the area of communes being Union members, such as: Bielsk, Brudzeń Duży, Czerwińsk nad Wisłą, Drobin, Gąbin, communes: Gostynin, Łąck, Nowy Duninów, Pacyna, Słupno, Stara Biała, Staroźreby, Szczawin Kościelny, Wyszogród” (Public Information Bulletin 2015),
- “launching and implementing a programme of ecological education of the society” (Public Information Bulletin 2015).

Given the changes incorporated by the act on amendment of the act on maintaining cleanliness and order in communes and of certain other acts of 1 July 2011 (Polish Journal of Laws/Dz. U. 2011 No. 152 item 897), as of 1 July 2013 the Union of Płock Region Communes has taken over the responsibility from a part of local governments comprised by Union, which have consequently waived in its favour their liability for waste management.



Fig. 1. Local governments participating in joint waste management system as members of the Union of Płock Region Commune (own study based on data provided by the Union of the Płock Region Communes)

The Union of Płock Region Communes lies in the north-western part of the Mazovian Province, and associates 18 communes of a total area of 12088.79 km², with 236000 inhabitants [1]. Local governments being a part of the Union are in three counties: the County of Gostynin – 3 communes, the County of Płock – 14 communes, and the County of Płońsk – 1 commune.

The joint waste management system under the Union of Płock Region Communes comprises 13 local governments, and namely: the Bielsk Commune, the Brudzeń Duży Commune, the Czerwińsk nad Wisłą Commune, the City and the Drobin Commune, the City and the Commune Gąbin, the Gostynin Commune, in the Łąck Commune, the Pacyna Commune, the Słupno Commune, the Stara Biała Commune, the Staroźreby Commune, the Szczawin Kościelny Commune, the Commune and the city of Wyszogród. The location of particular local governments has been presented on the below figure, with local governments marked red. In 2013 the Union of Płock Region Communes comprised an area of 171800 ha with 102520 inhabitants under the joint waste management system (Table 1) (Central Statistical office 2013).

The average area of local governments participating in the joint waste management system within the Union equalled in 2013 to 13215.38 ha, with the largest local government comprising the area of 27037 ha being the Gostynin Commune, while the smallest local government was the Słupno Commune, which comprised an area of 7493 ha. (Table 1)

The average number of inhabitants of local governments participating in the joint waste management system under the Union equalled in 2013 to 7886.15 people, coming up to average population density of 62.69 persons/km². The highest number of inhabitants was recorded in the Gostynin Commune – 12185 people (the population density equalled to 45 persons/km²), while the lowest number of inhabitants amounting to 3795 people (the population density equalled to 42 persons/km²) was recorded by the Pacyna Commune. The highest population density in 2013 was recorded in the Stara Biała Commune (the population density was 101 persons/km²), which came up to 161.11% of the mean population density in the analysed region. The Szczawin Kościelny Commune was characterised by the lowest population density (the population density equalled to 40 persons/km²), which came up to 63.81% of the mean population density of the analysed region (Table 1.)

Table 1. Local governments participating in joint waste management system under the Union of Płock Region Communes (own study based on data provided by the Union of the Płock Region Communes and the Central Statistical Office)

Item	Commune	Area (ha)	Number of inhabitants (persons)	Population density (person/km ²)
1	Bielsk	12517	9133	73
2	Brudzeń D	15984	8189	61
3	Czerwińsk	14411	7896	55
4	Drobin	14350	8316	58
5	Gąbin	14421	11101	76
6	Gostynin	27037	12185	45
7	Łąck	9399	5288	56
8	Pacyna	9029	3795	42
9	Słupno	7493	6874	92
10	Stara Biała	11112	11245	101
11	Staroźreby	13766	7553	55
12	Szczawin	12716	5092	40
13	Wyszogród	9565	5853	61
Total		171800	102520	
Average		13215.38	7886.15	62.69

4. Declarations of inhabitants pertaining to waste

The Union of Płock Region Communes imposed charges for waste management on the inhabitants of local governments, for the waste management of which it is responsible. Fees were charged to households on the basis of declarations submitted by them. Furthermore, charges collected from uninhabited property were calculated based on the amount of collected waste, with charges depending on the number of containers.

The total number of declarations submitted on the area of local governments that participate in joint waste management system came up to 28181; typically there were 2167.77 declarations per local government. On average there were 6.44 ha of local government area per one declaration and 3.68 inhabitants (registered residents). The biggest number of declarations have been submitted in the Gostynin Commune – 12185 pcs., which comes up to 8.14 ha of local government area per one declaration and 3.67 registered residents per declaration; the lowest number of declarations was received from the Słupno Commune – 7493 pcs., which came up to 3.25 ha of local government per declaration, with 2.98 registered residents per one declaration (Table 2).

A determinant pertaining to the number of declarations may be obtained by adopting an average based on the registered residents per one submitted declaration. The mean number of registered residents in the analysed region per one submitted declaration equalled to 3.68. The highest number of persons per declaration was recorded in the Pacyna Commune 4.02, and the smallest one in the Łąck Commune – 2.38. Also in the Słupno Commune a low number per one declaration was recorded – 2.98, which may arise from the fact of robust economic relations with Płock (Table 2). The number of submitted declarations may be directly correlated with the social structure of the population on the area of the given local government, because in most cases one declaration corresponded to one family or one property.

5. Representative local governments

Further analyses were based on representative local governments. A local government demonstrating values most similar to the mean one as regards social structures and location was the Czerwińsk nad Wisłą Commune. Also the most differentiated local governments were considered as representative ones. Local governments with biggest disparities with respect to the number of registered residents per one declaration included the Pacyna Commune and the Łąck Commune. As regards population density, such local governments comprised the Stara Biała Commune and the Szczawin Kościelny Commune.

Table 2. Local governments participating in joint waste management system as members of the Union of Plock Region Communes (own study based on data provided by the Union of the Plock Region Communes and GUS [Central Statistics Office])

Item	County	Commune	Area		Population persons	Submitted declarations pieces	Hectares per declaration		Population persons/ declaration
			ha	ha			ha/ declaration	persons/ declaration	
1	Płock County	Bielsk	12517		9133	2317	5.40	3.94	
2	Płock County	Bruźeń Duży	15984		8189	2192	7.29	3.74	
3	Płońsk County	Czerwińsk nad Wisłą	14411		7896	2031	7.10	3.89	
4	Płock County	Drobin	14350		8316	2124	6.76	3.92	
5	Płock County	Gąbin	14421		11101	2933	4.92	3.78	
6	Gostynin County	Gostynin	27037		12185	3323	8.14	3.67	
7	Płock County	Łąck	9399		5288	2222	4.23	2.38	
8	Gostynin County	Pacyna	9029		3795	943	9.57	4.02	
9	Płock County	Słupno	7493		6874	2304	3.25	2.98	
10	Płock County	Stara Biała	11112		11245	3108	3.58	3.62	
11	Płock County	Staroźreby	13766		7553	1979	6.96	3.82	
12	Gostynin County	Szczawin Kościelny	12716		5092	1350	9.42	3.77	
13	Płock County		9565		5853	1355	7.06	4.32	
			Total	171800	102520	28181			
			Average	13215.38	7886.15	2167.77	6.44	3.68	

5.1. Amount of waste per declaration

The average value related to the mean monthly amount of waste per one declaration in five selected local governments was 0.04 Mg; the same amount was recorded for the Czerwińsk nad Wisłą Commune and the Szczawin Kościelny Commune. The value of 0.03 Mg of waste per one declaration was recorded for the following local governments: the Pacyna Commune and the Łąck Commune. A value that considerably exceeded the average one, amounting to 0.06 Mg, was recorded in the Stara Biała Commune. No relation may be formulated for the amount of waste per one declaration and the amount of registered residents per one declaration, similarly as it is impossible to relate it to the population density.

5.2. Share of half-year periods in total amount of waste collected in particular years

Waste collected in the first six-month period in the Łąck Commune, the Pacyna Commune, the Szczawin Kościelny Commune and the Stara Biała Commune amounted on average to 39% of all waste deposited in 2013. The smallest share was recorded in the Szczawin Kościelny Commune at the level of 31%, and the highest one in the Łąck Commune at the level of 49%. The average increase in the amount of waste collected in the second half of 2013 as compared to the first half of 2013 equalled to 65%. The highest increase was found to have taken place in the Szczawin Kościelny Commune and equalled to 121%, and the lowest one in the Łąck Commune and amounted to 5% (Fig. 2).

The average share of the first six-month period in the amount of collected waste equalled to 52%, which was the same amount as in the Łąck Commune. For the Pacyna Commune this value equalled to 56%, for the Szczawin Kościelny Commune the share was 50%, and for the Stara Biała Commune – 49%. It may be assumed that the volume of deposited waste in particular six-month periods amounted approximately to half the amount of generally collected waste in 2014 (Fig. 3).

A comparison of the share of the first six-month period in collected waste in 2014 as compared to 2013 depicts changes of the mean value of 39% in 2013 that grew to 52% in 2014.

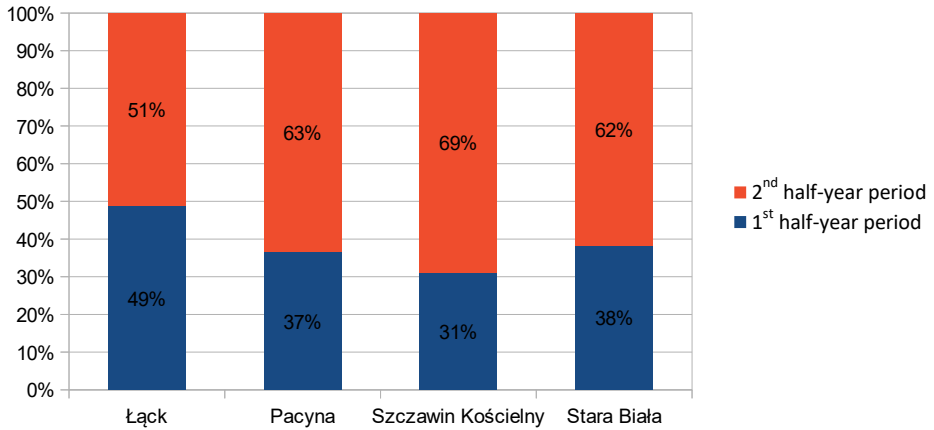


Fig. 2. Share of particular six-month periods in the total amount of waste collected in 2013 (own study based on data provided by the Union of the Płock Region Communes)

The Łąck Commune was found to differ from the remaining communes, because the value for the first half of 2013 amounted to 49%, while for the first half of 2014 it equalled to 52%. Such a minor difference may arise from the fact that the collected waste was removed in the second half-year period of 2013, which could be connected with removal of deposited waste.

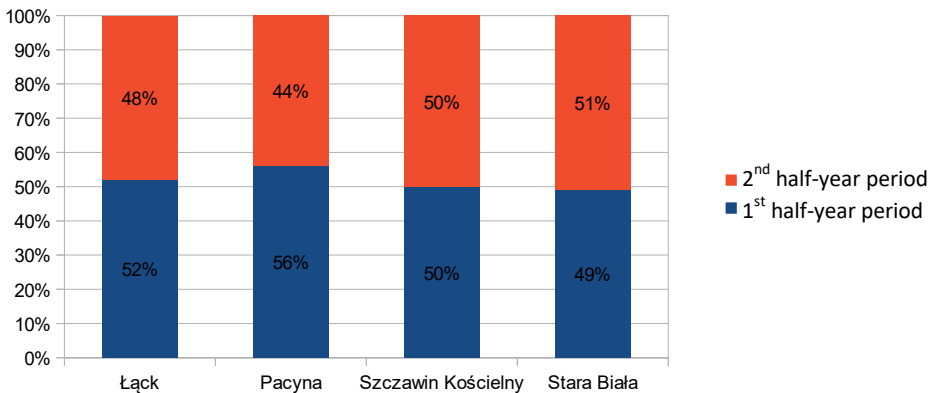


Fig. 3. Share of six-month periods in the total amount of waste collected in 2014. (own study based on data provided by the Union of the Płock Region Communes)

6. Changes in volume of collected waste as compared to corresponding periods

The conducted comparison of changes that have been recorded in the amount of waste obtained in the process of separate waste collection in the representative self-government authority (Czerwińsk nad Wisłą) in the first six-month periods of 2013 and 2014 and in the second half-year periods of 2013 and 2014 have pointed to the existence of significant differences.

Changes in the volume of waste collected in the second half-year period of 2013 as compared to the second six-month period of 2014 were found to be distinct. Comparisons of the volume of collected waste in particular months point to noticeable yet slight disparities. It may be presumed that those disparities arise from factors that are not directly connected with the generation of waste, such as public holidays, collecting waste on pre-agreed dates with their volume differing in particular months. The amount of waste collected from non-inhabited houses remained on a constant level. A quite significant difference has been recorded as compared in particular months for July 2013 and 2014, which may be a result of coming into effect of the Act of 1 July 2011 (Fig. 4).

The volume of waste collected in the first half of 2013 is much lower as compared to the volume of waste collected in the first half of 2014 (Fig. 5).

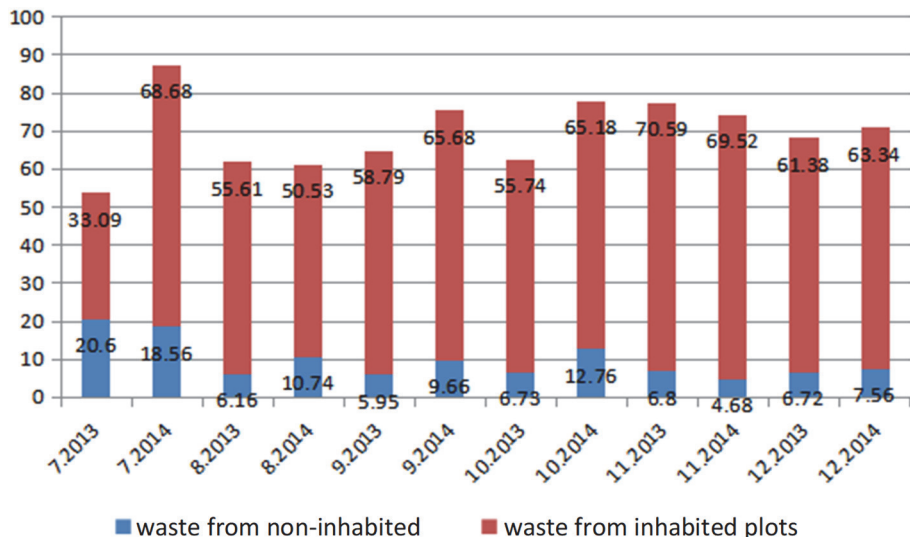


Fig. 4. Amount of waste collected in the Commune of Czerwińsk nad Wisłą for the second six-month period of 2013 and 2014 (Compiled on the basis of data submitted by the Union of the Płock Region Communes)

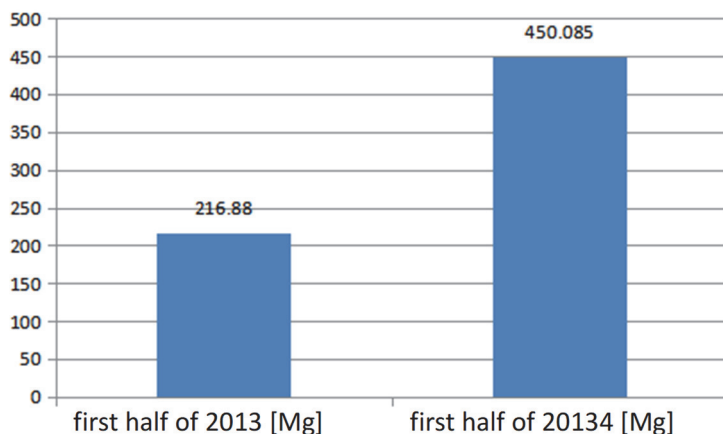


Fig. 5. Volume of waste collected in the Commune of Czerwińsk nad Wisłą for the first half of 2013 and 2014 (Compiled on the basis of data submitted by the Union of the Plock Region Communes)

The noticeable difference arises from the adoption of the Act on 1 July 2011.

A comparison of changes with respect to the volume of waste obtained from separate collection in the first three months following the adoption of the act as compared to the same period of 2012 shows that a significant increase is visible in the volume of collected waste (Fig. 6).

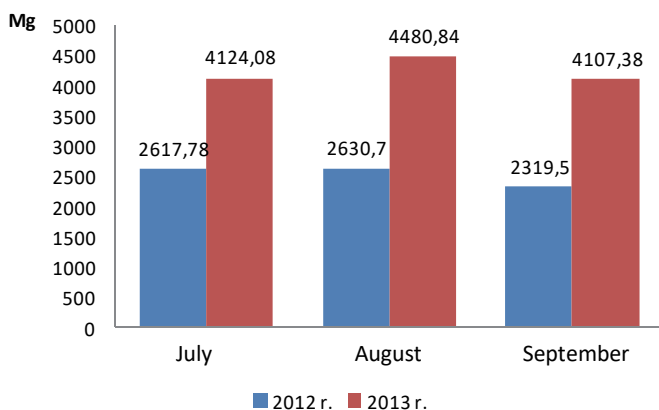


Fig. 6. Volume of waste delivered to the waste segregation facility in July, August and September 2012 and 2013. (Change in the quality of waste applied to the Waste Management Plant in Poświętne after 1 July 2013)

A conclusion may be drawn that adoption of the act of 1 July 2011 has caused a considerable increase of obtained waste.

7. Changes in volume of waste obtained from separate collection

The adoption of the act of 1 July 2011 caused an increase in the volume of waste obtained in the process of separate collection. A comparison of corresponding periods that followed the adoption of the act has indicated that values were similar. Proof may be found by making a comparison of the share of half-year periods relating to self-governments characterised by the most profound differentiation between each other (Fig. 3) and a comparison of monthly amounts of waste collected by the representative self-government authority in comparable periods (Fig. 4).

The determination of a representative self-government authority allows simplifying analyses of ongoing changes, because it has to be borne in mind that self-government authorities differ highly from each other in several ways, and consequently adopting parameters that pertain only to an extreme self-government authority is not likely to reflect a more extensive aspect of the above discussed changes.

8. Conclusions

1. The lower the number of registered residents per one declaration, the more similar the share of particular six-month periods in the general amount of waste generated in the given year.
2. The population density had no significant impact on the distribution of shares of particular six-month periods in the total volume of generated waste.
3. Coming into effect of the act caused an increase in the amount of waste collected during separate waste collection.
4. In 2014, which may be considered the full functioning cycle of the act, no marked differences have been observed as to the volume of deposited waste during separate collection.
5. As it turned out the most important indices used to compare local governments for waste management comprised the population density and the number of registered residents per one declaration.
6. It is possible to determine the representative local government reflecting mean values for a group of local governments.
7. Adoption of the act resulted in a considerable increase in the amount of waste obtained during separate collection process.

References

- Baran, S., Pawłowski, L., Józwiakowski, K., Futa, B., Bik-Małodzińska, M., Mucha, Z., Generowicz A., (2014) Theoretical aspects of the integrated protection of suburban areas. *Problemy Ekorozwoju*, 9(1), 127-39.
- Biuletyn Informacji Publicznej (Public Information Bulletin) <http://zgrp.bip.org.pl/?tree=102> (available as of 29.01.2015).
- Gaska, K., Generowicz, A. (2017). Advanced computational methods in component-oriented modelling of municipal solid waste incineration processes. *Architecture Civil Engineering Environment ACEE*, ISSN: 1899-0142, ACCE, 1, 117-130.
- GUS (Central Statistical office) *Powierzchnia i ludność w przekroju terytorialnym w 2013 r. (Area and population in territorial aspect in 2013)*, Warsaw 2013.
- Statute of the Związek Gmin Regionu Płockiego (Union of the Płock Region Communes) <http://zgrp.pl/zwiazek/statut/> (available as of 29.01.2015).
- Zmysłowski A., Biedugnis S. (2013). *Zmiana jakości odpadów dostarczanych do Zakładu Zagospodarowania Odpadów w Poświętnem po 1 lipca 2013 roku (Changes in the quality of waste supplied to the Waste Processing Plant in Poświętne after 1 July 2013)*, 11th Conference Dla Miasta i Środowiska (For the City and for the Environment) – Problemy Unieszkodliwiania Odpadów, Warsaw 25.11.2013.

Abstract

The text of the article pertained to waste management in local government in the region of Płock. In my article described were changes to waste management after 1 July 2013, as well as methods of comparing local governments.

Keywords:

waste, management, Union of Płock Region Communes (ZGRP), Płock region, declaration, act, 2013, 2014, population density, Mazovian province

Gospodarka odpadami w ramach regionu płockiego – deklaracje mieszkańców

Streszczenie

Tekst artykułu dotyczy gospodarki odpadami w samorządzie w regionie płockim. W artykule opisano zmiany w gospodarce odpadami po 1 lipca 2013 r., a także metody porównywania samorządów.

Słowa kluczowe:

odpady, gospodarka, ZGRP, region płocki, deklaracje, ustawa, rok 2013, rok 2014, gęstość zaludnienia, mazowieckie