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**BASIC PRINCIPLES OF WASTE MANAGEMENT  
IN THE MUNICIPAL AND ECONOMIC SECTORS  
IN THE ŚWIĘTOKRZYSKIE PROVINCE  
IN THE YEARS 2003–2006**

**GŁÓWNE ZAŁOŻENIA GOSPODARKI ODPADAMI  
W SEKTORZE KOMUNALNYM I GOSPODARCZYM  
W WOJEWÓDZTWIE ŚWIĘTOKRZYSKIM  
W LATACH 2003–2006**

**Abstract**

After joining the EU one of the important instruments supporting the realization of correct actions regarding waste management in Poland is waste management plans worked out on the national, provincial, county and district levels. For the Świętokrzyskie Province the first provincial "Waste Management Plan for the Świętokrzyskie Province" (WPGO) was adopted on July 1, 2003, and then revised on September 20, 2007. In the paper the realization of the plan and its role in waste management are presented.

*Keywords: municipal waste management, landfilling, separate collection*

**Streszczenie**

W artykule przedstawiono założenia planowanego systemu zarządzania odpadami komunalnymi i gospodarczymi w województwie świętokrzyskim oraz wyniki jego praktycznej realizacji. Za główne założenia planu uznano uporządkowanie gospodarki odpadami, ich odzysk i recykling, minimalizację ilości odpadów składowanych na składowiskach odpadów, minimalizację i eliminację zagrożeń wynikających z gospodarowania odpadami, stworzenie wystarczającej liczby instalacji do odzysku i unieszkodliwiania odpadów, dostosowywanie, zamykanie i rekultywację składowisk odpadów niespełniających określonych wymagań.

*Słowa kluczowe: zarządzanie odpadami komunalnymi, składowanie, segregacja odpadów*

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## 1. Introduction

The population of the Świętokrzyskie Province is about 1,300,000. The role of an administrative, cultural and economic centre of the region is played by the city of Kielce (200 thousand inhabitants). The province is divided administratively into 14 counties, including one city-county and 102 districts – five municipal districts, twenty-four municipal-rural districts and 73 rural districts. In the area of the province two regions can be distinguished: the northern region of an industrial character and the southern, agricultural region. Considering land utilization the province is characterized by 63% of agricultural land, 28% of forests, 9% of urbanized areas and idle land.

The important instruments supporting the realization of correct actions regarding waste management are waste management plans worked out on the national, provincial, county and district levels. The first provincial “Waste Management Plan for the Świętokrzyskie Province” (WPGO) was adopted as the resolution No. XI/87/03 of the Regional Council of the Świętokrzyskie Province of July 1, 2003 [1, 2]. Its revision was adopted as the resolution No. IX 152/07 of the Regional Council of the Świętokrzyskie Province of September 20, 2007. Initially the basic principles of the Plan were as follows:

- to organize waste management in the Świętokrzyskie Province,
- to recover and recycle waste,
- to minimize waste deposited in landfills,
- to minimize and eliminate hazards resulting from waste management,
- to open a sufficient number of waste recovery and treatment installations,
- to adjust, close and reclaim landfills that do not meet the requirements.

While the Plan was being revised, more attention was given to the aspects connected with waste generation prevention and ecological education of people. In order to systematize municipal waste management in the Świętokrzyskie Province, the division into four waste management regions was maintained. However, because districts joined interdistrict unions, the range of their activities was changed. The division was made according to both geographic, economic, and environmental conditions, and the density of population. The important feature of this decision is the fact that the region boundaries can be changed with the formation or modification of intercounty or interdistrict organizations engaged in waste management. The present paper refers to the principles of the 2003–2006 Plan.

## 2. Municipal sector

In the years 2003–2006 about 250 thousand Mg of municipal waste was generated yearly in the Świętokrzyskie Province, 90% of which (225 thousand Mg) was disposed of in landfills and 10% was recovered [3].

Taking into consideration the demographic and economic situation, as well as the amount of generated waste, the province was divided into four waste management regions (Fig. 1).

In each of the regions regional waste management plants were planned to be opened, one or two plants per region. According to the plan, such a plant should comprise a sorting section, composting section and a landfill. These objects, under the conditions of the

Świętokrzyskie Province, should meet the needs of 100–150 thousand inhabitants, and waste transportation distance should not exceed 30 kilometres. If the waste transportation distance exceeds 30 kilometres, it is necessary to build a waste reloading station. At present the Regional Waste Management Plant (RZGO) operates in the south-eastern region, in Janczyki, Baćkowiec district; another plant is being built in the central region. The priority investment needs in the years 2003–2006 as regards waste management in the province are presented in Table 1.

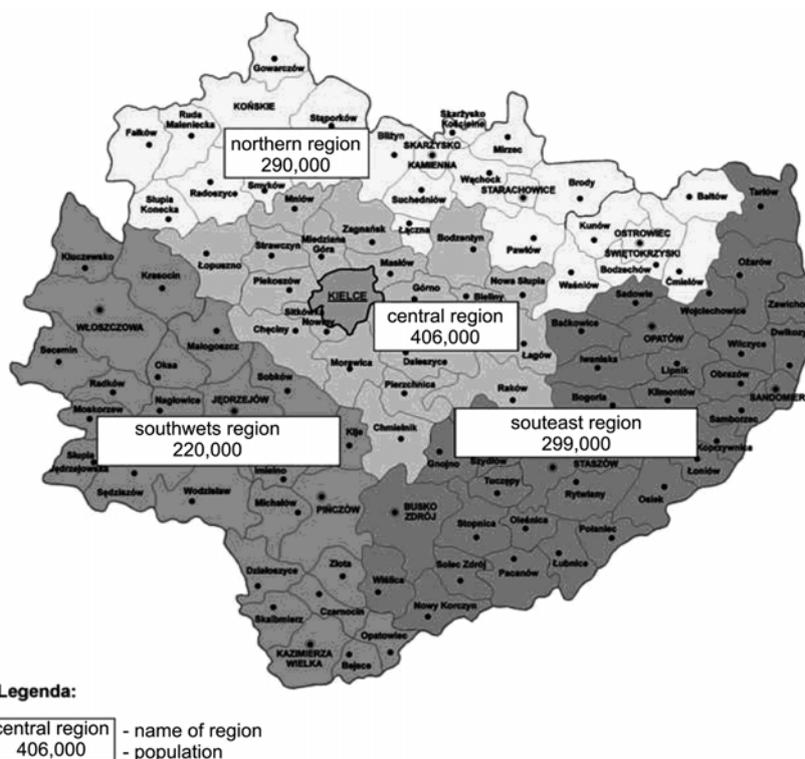


Fig. 1. Division of the Świętokrzyskie Province into waste management regions  
Rys. 1. Podział województwa świętokrzyskiego na rejony gospodarki odpadami

Table 1

#### Investment tasks in the Świętokrzyskie Province

No.	Task	Estimated cost of the task
1	Building a RZGO in the northern region	5 million EURO
2	Building a RZGO in the south-eastern region	5 million EURO
3	Building a municipal waste reloading station	1 million EURO

### 3. Economic sector

A considerable part of waste generated by economic subjects in the years 2003–2006 was the thermal process waste (group 10) [4]. This waste included waste products from electric power stations and other power plants, ash and slag mixtures, coal fly ash, solid waste produced when using calcium methods for desulfurization of waste gases, as well as waste coming from iron and steel industry and from glass plants, waste generated during building ceramics production, and iron foundry waste. A considerable part of the generated waste was also agricultural waste and food processing waste (group 02), mainly sugar industry waste, dairy industry waste, waste generated during the production of alcoholic and non-alcoholic beverages and processing of animal origin food. A significant part of the generated waste was the waste produced when prospecting and exploring mineral resources (group 01) and the waste generated while repairing and disassembling buildings and roads, mainly ferrous metal waste, building debris and excavated earth (group 17).

In spite of the fact that thermal process waste, for example ash and slag mixtures, is more and more frequently used for road building, a significant part of it is still deposited in landfills. Agricultural waste and food processing waste, for example beet pulp and whey, are gladly used as animal feed, while oil cake, must and postfermentation sediments are used for soil fertilization and improvement. Extractive industry waste is used for filling up areas that have been unfavourably transformed, such as collapses or exploitation hollows, besides being deposited in waste tips. As regards ferrous metal waste, because of a steel mill operating in the province, a greater amount of this waste is used than it is produced [3]. Soil and debris are used for terrain surfacing and levelling, and as a technological material on landfills.

Besides, the recently enforced regulations, for example those prohibiting the use of meat-and-bone meal in animal feed, have made it difficult to manage slaughterhouse waste, the production of which in the Świętokrzyskie Province amounts to 14 thousand Mg per year. Certain processing plants have started technological lines for the production of pet feed. Part of the waste is burnt in special installations but this process is rather expensive. Thus, both big and small-sized meat enterprises have problems with managing the waste produced while preparing and processing animal origin food. The priority investment needs as regards waste management are presented in Tab. 2.

Table 2

#### Investment needs as regards industrial waste

No.	Task	Estimated cost of the task
1	Building an installation for energy recovery from slaughterhouse waste and other biodegradable waste products	0.5–1 million EURO
2	Building an installation for alternative fuel production (for the needs of cement mills)	0.5 million EURO
3	Building a slag and cinders recovery installation (to use them for example in road building)	2 million EURO

#### 4. Organizational and economic aspects of closing municipal waste landfills in the Świętokrzyskie Province

The production of waste and its increasing amount indicate social and economic development. In Poland municipal waste management still consists in depositing the waste in landfills. At the end of 2006 one thousand municipal waste landfills were in operation in Poland. Unfortunately a majority of them did not meet elementary location, technical and formal requirements. For that reason the managers of the landfills were obliged by competent administrative organs to close and reclaim them or to adjust their operation to the current requirements. That in turn should result in a more efficient and effective operation of the landfills by prolonging the landfill life and minimizing the unfavourable effect on the environment. However, such activities require considerable financial and organizational outlays.

In the Świętokrzyskie Province there are 50 municipal waste landfills (Fig. 2). In 2003 thirty-seven landfills were in operation and in 2006 twenty-four landfills (two landfills did not receive waste). Part of them have already been closed and reclaimed. Several landfills that are still in operation need, however, modernization. Only four of the currently operating landfills meet the requirements specified in the Waste Act. In the years 2006–2009, in accordance with the administrative decisions issued, six landfills will be closed because it is impossible to adjust their operation to meet the requirements specified in the Waste Act. The managers of fifteen landfills have been obliged to adjust the operation of the landfills to meet the regulations by 2009.

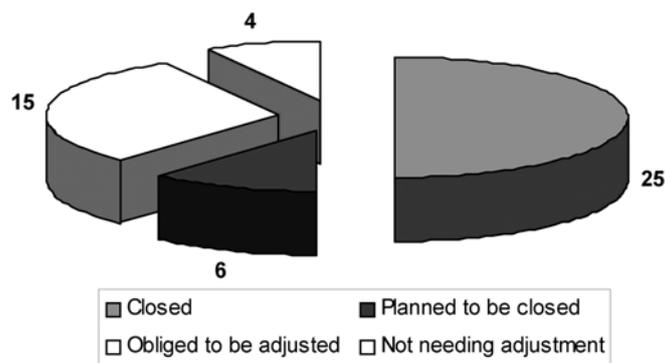


Fig. 2. Municipal waste landfills located in the Świętokrzyskie Province

Rys. 2. Składowiska odpadów komunalnych zlokalizowane na terenie województwa świętokrzyskiego

The adjustment consists first of all in equipping landfills with scales, disinfectant footbaths and other auxiliary facilities, or rebuilding the landfills, i.e. making seals, a draining system, slopes etc. Ultimately, by 2012, in individual provinces, according to the provincial and national waste management plans, the amount of small and ineffective local landfills is to be reduced and the operation of 5 to maximum 15 supradistrict landfills per province is to be ensured. In the Świętokrzyskie Province this task is being successively realized [3] and after 2009 the province should possess 19 municipal waste landfills.

Landfills that are to be closed and reclaimed are mainly local objects the area of which is 0.5–2 ha. The reclamation costs, depending on the number and sort of the tasks performed amount to 50-150 thousand zlotys/ha. In some cases the cost of reclamation can be greater because of the necessity to perform certain works so as to avoid the unfavourable effect of the landfill on the environment and human health. Lately, the cost of reclamation of a local landfill covering an area of 0.75 ha has amounted to 120 thousand zlotys. The undertaking included the technical documentation for closing and reclamation of the landfill (the cost exceeded 20 thousand zlotys). The technical reclamation covered the shaping of the landfill mass, installation of the degassing system (passive degassing), geodetic benchmarking, drainage of the bowl, spreading of a layer of arable soil and seeding of grasses [3].

In the Świętokrzyskie Province, like in the whole country, there were many municipal waste landfills which did not meet the basic technical, or even organizational, requirements (lack of supervision). After they have been closed, some construction works, sometimes very expensive ones, are necessary. It also happens that the waste deposited in them must be carried away to other “legal” landfills. Such undertakings may be very complex and multidimensional. Thus it is difficult to determine unambiguously the costs of landfill reclamation because each landfill is different and requires an individual approach to determine all the activities needed.

## 5. Waste segregation in the Świętokrzyskie Province

Selective waste collection can be realized using various systems, depending on land development (compact settlement, dispersed development) and the equipment available for collecting and transporting waste [4]. The obligation of each district is to ensure the conditions for the functioning of the selective municipal waste collection and removal system. In 2003 the selective municipal waste collection and removal system was working in 38 districts, and in 2006 in 69 districts [2, 3]. Mainly packaging and large-sized waste was collected. The percentage of districts in which in 2006 the selective waste collection system was used was as follows:

- 41% of districts – packaging waste,
- 38% of districts – large-sized waste,
- 20% of districts – hazardous waste.
- 14% of districts collected selectively building waste.

90% of the inhabitants of rural districts and 15% of the inhabitants of municipal districts collected selectively biodegradable waste. In 2003 the organized system of municipal waste collection covered 83% of the inhabitants of the province, and in 2006 – 84%. In certain districts a small decrease, and in other districts an increase in the percentage of inhabitants participating in the organized system of municipal waste removal were observed. Probably the reason for the decreased participation of inhabitants in the organized waste removal system was the change from the free waste removal system (KP7 containers in each village) to the chargeable system (a container in each household).

The reason for the increase in the participation of inhabitants in the organized municipal waste removal system, observed in certain districts, was the increased ecological consciousness of people, owing to the organized conferences and talks, and distributed

information leaflets. Owing to these actions the inhabitants were more willing to cooperate with local authorities, to conclude contracts with firms taking the waste away, and to pay for the service rendered.

## 6. Packaging waste

The responsibility for creating a coherent waste management system lies largely with local authorities. It is the task of the local authorities to ensure the selective waste collection system. According to the Law [5] on the obligations of entrepreneurs as regards the management of some waste as well as product charge and deposit charge, a borough leader (mayor, mayor of the city, districts association board) is obliged to submit an annual report informing on the type and amount of packaging waste collected by the district authorities (or a subject acting on behalf of the local authorities) and intended for recovery and recycling. The report should also contain information on the costs incurred on the abovementioned activities and should be submitted in that form to the marshal of Province and The Provincial Environmental Protection and Water Management Fund (WFOŚiGW).

The data obtained for the Świętokrzyskie province show that in 2006 organized selective collection of packaging waste, mainly glass, plastics, paper and cardboard was carried out in 41 districts. These districts can obtain financial means derived from the so-called product charges which are transferred by WFOŚiGW, in proportion to the amount of packaging waste intended for recovery and recycling. These funds support undertakings connected with the recovery and recycling of packaging waste and ecological education [2, 3]. Selective collection of packaging waste in the districts of the Świętokrzyskie Province in the years 2003–2006 is presented in Tables 3 and 4.

Table 3

**Selective collection of packaging waste in the districts of the Świętokrzyskie Province in the years 2003–2006**

Year	Amount of packaging waste collected in the districts [kg]	Amount of collected packaging waste intended for recovery and recycling [kg]	Costs incurred on collecting and removing packaging waste intended for recovery and recycling [zlotys]
2003	3,189,366.00	2,037,093.00	528,319.16
2004	2,934,605.82	2,679,734.82	801,527.32
2005	2,891,033.00	2,670,843.40	1,262,483.89
2006	2,259,587.95	2,131,511.95	1,129,921.80
Total	11,274,592.77	9,519,183.17	3,722,252.17

The districts carrying out selective waste collection in the years 2003–2006 collected 11,274,592.77 kg of packaging waste from which 9,519,183.17 kg, i.e. 84.43% of the total waste collected was intended for recovery and recycling. The greatest amount, i.e. 5,198,943.90 kg, or 54.62% of the total waste, was the recoverable and recyclable glass packaging waste. Paper, cardboard and plastic waste was next in respect of the amount.

Table 4

**Type and amount of packaging waste selectively collected in the districts of the Świętokrzyskie Province in the years 2003–2006**

No.	Packaging waste type	Amount of packaging waste collected in the districts [kg]				Total
		Years				
		2003	2004	2005	2006	
1	Plastic packaging	396,717.90	518,027.40	441,648.90	455,132.95	1,811,527.15
2	Aluminium packaging	41,462.10	30,154.82	3,953.00	1,372.00	76,941.92
3	Steel packaging including steel sheet	29,792.00	14,887.00	10,280.00	48,570.00	103,529.00
4	Paper and cardboard packaging	856,748.00	903,976.00	961,132.20	440,903.00	3,162,759.20
5	Domestic glass packaging, ampoules excluded	1,214,646.0	1,465,590.6	1,470,939.3	1,309,440.00	5,460,615.90
6	Natural material packaging (wood and textiles)	650,000.0	1,900.00	780.00	4,170.00	656,850.00
7	Multi-material packaging	0	70.00	2,300.00	0	2,370.00
Total		3,189,366.0	2,934,605.8	2,891,033.4	2,259,587.9	11,274,593.2

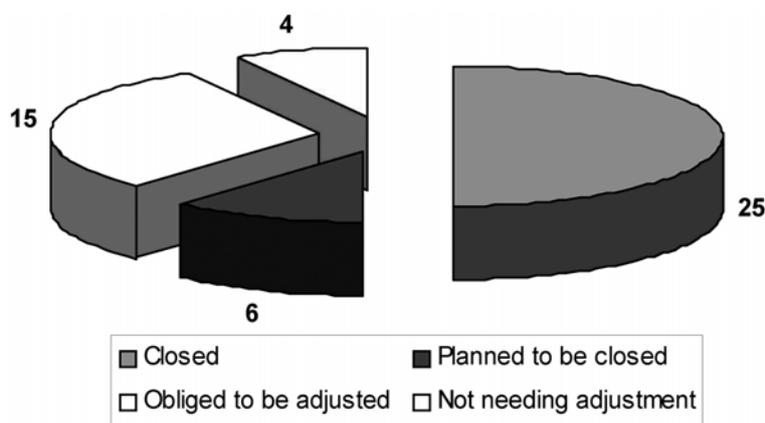


Fig. 3. Percentage of individual types of recoverable and recyclable packaging waste collected in the districts of the Świętokrzyskie Province in the years 2003–2006

Rys. 3. Wyrażone w procentach wielkości poszczególnych rodzajów odpadów opakowaniowych przekazanych do odzysku i recyklingu przez gminy z terenu województwa świętokrzyskiego, w latach 2003–2006

The amount of collected recoverable and recyclable multi-material waste was the smallest. The heterogeneity of this type of waste makes it difficult to be collected and recycled. The number of waste recovery and recycling installations for multi-material waste is also insufficient.

The gradual development of packaging waste management systems is connected with joint responsibility of entrepreneurs as regards the introduction of a packaging material into the home market and the obligation to obtain the required levels of packaging waste recovery and recycling, as well as with the information and educational activities of district, county and province governments as regards the selective waste collection.

### **7. Large-sized waste**

One of the targets of the Plan was to organize the system of selective large-sized waste collection and removal. According to the information obtained from local authorities, the amount of selectively collected and removed large-sized waste is successively increasing. In the years 2003–2006 we could observe an increase in the number of districts which organized the system of selective large-sized waste collection and removal. In 2003 large-sized waste was selectively collected in 18 districts and in 2006 – in 38 districts.

### **8. Building waste**

In 2006 in the Świętokrzyskie Province in 15 districts, mainly municipal ones, waste generated during repairs was selectively collected and removed. Such waste was chiefly collected and removed in towns, after such a need had been reported by the inhabitants to a firm taking the waste away. Usually such waste was deposited in landfills where it was used as a technological material. In rural areas building waste was collected and removed occasionally. In most cases this waste was used by the inhabitants for their individual purposes, for example for road surfacing.

### **9. Biodegradable waste**

According to the amended law on waste, the amount of biodegradable municipal waste which is directed to landfills should be as follows [6]:

- in 2010 – 75% (by weight) of the total amount of biodegradable municipal waste generated in 1995,
- in 2013 – 50% (by weight) of the total amount of biodegradable municipal waste generated in 1995,
- in 2020 – 35% (by weight) of the total amount of biodegradable municipal waste generated in 1995.

Household biodegradable waste includes mainly: kitchen waste, green waste, paper and cardboard, and partly textiles. Because of the typically agricultural character of the Świętokrzyskie Province, biodegradable waste in rural regions was collected and managed

by the inhabitants themselves. The situation is different in the case of compact municipal housing from where biodegradable waste is taken to landfills.

Assuming that 90% of biodegradable waste generated in rural areas and 15% of this waste generated in urban areas is managed by people themselves it can be stated that in 2006 the obligation to reduce the amount of biodegradable municipal waste deposited in landfills was fulfilled in the province. In 2006 the amount of biodegradable municipal waste deposited in landfills in the Świętokrzyskie Province was 62% of this type of waste generated in 1995.

### **10. Municipal sewage sludge**

In the Świętokrzyskie Province the amount of generated municipal sewage sludge is increasing. This results from the development of the sewerage system and an increase in the number of sewage-treatment plants in which municipal sewage sludge is produced.

The main method for managing municipal sewage sludge in the Świętokrzyskie Province is its use for the purposes defined in Article 43 of the Act [4]:

- in agriculture, understood as cultivation of all the crops introduced on the market, including fodder crops,
- for land reclamation, including land for agricultural purposes, to adjust land to the definite needs resulting from the waste management plan, spatial management plans or decisions concerning land development and land management conditions,
- for cultivation of plants intended for compost production,
- for cultivation of plants not intended for consumption and fodder production.

In the years 2003–2006 in the Świętokrzyskie Province 72% of the generated municipal sewage sludge was managed, 60% of which was used for the purposes defined in Article 42 of the Waste Act, 1% was used for example for humusing landfill banks, and 5% was deposited in landfills. The remaining 28% of the generated sludge was transported outside the province.

### **11. Hazardous waste generated in the municipal sector**

Hazardous waste makes about 1% of the total amount of waste generated in Poland. This waste is generated both in the economic sector and the municipal sector. Hazardous waste generated in households, deposited together with the whole stream of municipal waste in landfills, is a significant danger to the environment. It should be collected selectively “at the source”, i.e. by the inhabitants, and then it should be taken to special waste collection centres. Such collection centres should be for example Local Hazardous Waste Collection Centres (GPZON), and all the inhabitants of the province should have access to them.

In 2003 hazardous waste was collected and removed in 11 districts, and at the end of 2006 in 20 districts. The organized systems cover a selective collection of:

- used oils – GPZON,
- small-sized batteries – GPZON,
- educational and cultural institutions, electrical and electronic equipment service points,

- offices and institutions,
- pharmaceuticals that are past their sell-by date – GPZON,
- pharmacies,
- used electrical and electronic equipment – GPZON,
- wholesale and retail sale outlets,
- packaging of hazardous products – retail sale outlets.



Legend:

 Districts where hazardous waste was selectively collected and removed

Fig. 4. Districts where hazardous waste was selectively collected and removed, as on December 31, 2006

Rys. 4. Gminy, na terenie których prowadzi się selektywne zbieranie i odbieranie odpadów niebezpiecznych, stan na dzień 31.12.2006

In spite of the rising tendency (in 2001 – 3%, in 2006 – 20% of the districts) in selective collection of hazardous waste, the district activities regarding selective collection of this type of waste are still unsatisfactory.

The first draft version was prepared during the realization of European Waste Management project (EWM), Interreg IIIC, and the final one during the realization of the project Municipal waste management system and methods of its assessment used for decision support process No 14-0016-04/2008.

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