
26 EVALUATION OF WASTE PACKAGING MANAGEMENT SYSTEM IN LUBUSKIE

26.1 Introduction

Waste management system in the European Union until 2004 was regulated by the European Parliament Directive 94/62/EC on packaging and packaging wastes. According to it, all EU countries by 2001 were required to achieve min. 50% of the recovery level and min. 25% of recycling of packaging wastes. Because of the transitional period, Poland could obtain those levels in 2007. In 2004, European Parliament amended the previous directive of 1994 by enacting a new, more stringent Directive 2004/12/EC and Directive 2005/20/EC. These directives have imposed a requirement for the member countries of a higher level of packaging wastes recovery than before, namely in the amount of 60%, and recycling - min. 55% of containers entering the market. According to Directive 2004/12/EC for the various types of packaging a minimum level of recycling is set at:

- Glass - 60%;
- Paper and cardboard - 60%;
- Metals - 50%;
- Plastic - 22.5%;
- Wood - 15%.

Member States which joined the European Union under the Treaty of Accession of 16 April 2003 (paragraph 1 point. b, d, e) may postpone the attainment of these objectives by the day which they shall determine, but in case of Poland not later than the 31 December 2014.

According to the Central Statistical Office (GUS) the financing of waste management investments is the lowest in comparison to other environmental components such as air protection and purification of surface water. In July 2011 the provisions of the act of maintaining cleanliness and order in municipalities - Ustawa o zmianie ustawy o utrzymaniu czystości i porządku w gminach oraz niektórych innych ustaw z dnia 1 lipca 2011r. (OJ 2011, No. 152, item 897, as amended) was changed, in order to solve the problem of waste management and to achieve target levels of recovery and recycling of wastes and also meet other requirements of this Directive. This article presents an analysis of selected statistics on packaging waste management and evaluation of progress made by Lubuskie in the recovery and recycling of such wastes in proportion to the country.

26.2 Packaging and packaging wastes in Poland

Under the Act on packaging and packaging waste (Article 3. 3) *packaging wastes* are "all packaging, including reusable packaging withdrawn from the re-use, which are wastes within the meaning of the law of waste, except wastes generated in the process of packages production", which are the waste arising from packaging unit (e.g., bottles, cups), collective (e.g., cardboard) and transportation (e.g., pallet) used in the context of whole system of the packag-

ing goods introduced into the market. Product waste's catalogue was brought into force on 1 January 2002, by the Minister of Environment's regulation (Journal of Laws 2001, No. 112, item 1206) which includes packaging waste to 15th group. Packaging as products are made of any materials of single or several inextricably connected so those are composite. In addition, packaging within the meaning of the Act is the product, including product non-refundable, suitable for: containment, protection, transportation, delivery, presentation of products from raw materials to processed goods, so they can be part of the packaging and auxiliary elements combined with the packaging which are intended for that same purpose as the packaging. Therefore, speaking of packaging waste, we mean wastes firstly generated ones in: manufacturing, service, business units, as well as in businesses, households, offices, schools and other public places, restaurants, cafes, markets, etc. (see fig. 26.1).

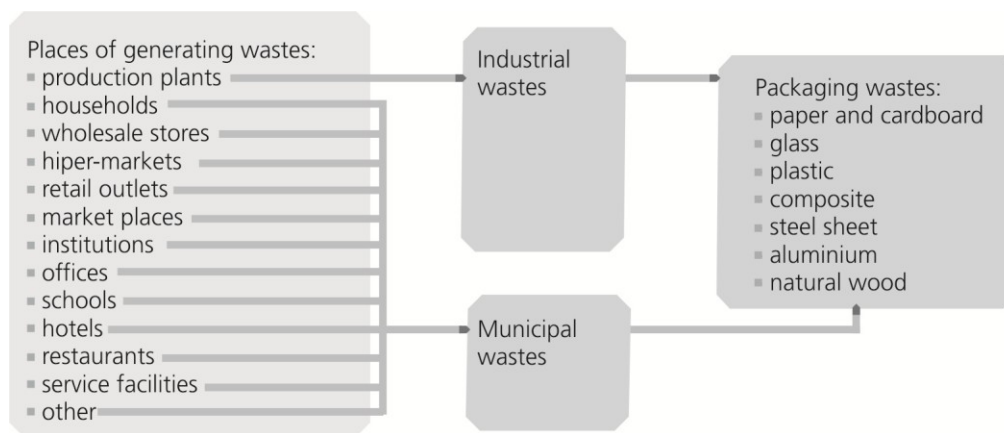


Fig. 26.1 Place of packaging wastes' production

Source: author's own research

Packaging waste is often considered as part of municipal waste (waste code 15 01 if coming from the municipal sector and a group of 20 waste catalogue), and as such in accordance with the Draft Law on waste (Article 3.1, point 7) include: "the waste from the households, with the exception of end of life vehicles and waste not containing hazardous waste from other waste producers which, because of its nature or composition is similar to waste from households". As follows from the definition of waste, packaging wastes are produced in almost any place connected with the business, and their diversity is not only applied of creation but also of their composition, i.e. the type of material of which they are made of. Packs should be adapted to the characteristics of the goods. Selection of a suitable material or several materials to the packaging is a very complex, given the enormous variety of products and increasingly wider range of packaging applications in the packaging production and methods of packing. The primary materials used for packaging are paper and cardboard, glass, plastics, metals, ceramics, wood and wood products, textiles, materials complex (obtained by coating, laminating or co-extrusion). Co-extrusion (COEX) - the process of combining two or more layers of extrudates to produce a one-time multi-product (www.colex.com.pl); production method of multilayer packaging made of plastic, blow extruded using co-extrusion technology. COEX multilayer packaging are used for many years in Poland for packaging of plant

protection products and veterinary medicines. For example, multilayer bottles and canisters from plastic, co-extruded (COEX), guarantee the barrier effect - the inner layer is made of polyamide (PA) is impermeable to solvents, gases, the outer layer of high density polyethylene (HDPE), provides resistance to mechanical factors (www.opakowania.info.pl). The biggest technological progress concerns plastic packaging, especially in terms of materials (e.g. PE-polyethylene, PP-polypropylene, polyesters, PVC-poly (vinyl chloride), PS-polystyrene, PA-polyamide copolymers, and combinations of these materials). The great variety of plastics is a good thing because it allows the selection of relevant characteristics of the material to the requirements of the packed product. But from the point of view, counteract the waste, a variety of materials is a major difficulty in conducting such as: selective collection and re-processing of wastes. This is extremely important to the large consumption of plastics and the need to protect the environment from the mixed packaging waste. Fig. 26.2 shows the bulk of packaging placed on the domestic market in 2010 (GUS 2011). And so, in 2010, 733113 Mg of plastic packaging was introduced to the domestic market, which is fourth place after the packaging of paper and cardboard (1322984 Mg), glassware (955407 Mg) and wood (1036976 Mg).

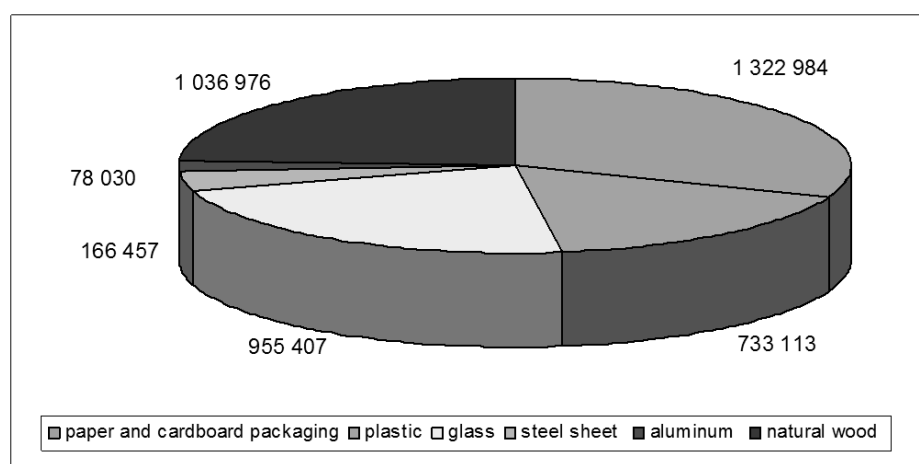


Fig. 26.2 Bulk of packaging introduced into the national in 2010 [Mg]
Source: author's own researched based on GUS data

The packaging industry and packaging themselves occupy an important position in the economy of each country. According to A. Korzeniowski, "nearly 90% of all products manufactured in the world requires the use of appropriate packaging. Relationship between packaging with modern technology and organization of distribution, their impact on capacity utilization of warehouses and transport mechanization of cargo handling, as well as the importance of packaging in protecting the quality of products make it necessary for the search of new packaging materials and packaging design. Progress on the packaging is primarily on improving their barrier properties, strength, aging resistance, etc., while looking for new materials that solve environmental problems." Different types of packaging such as: boxes, cups, tubes, bags, bottles, cans, jars, cans and carrier bags are up to 60% of the European landfills. In Poland, the amount of packaging waste by weight of municipal waste is estimated at about 30%

by weight and 50% by volume, although in the literature we can find estimates of the volume - 50% by weight and 70% by volume.

All of the mention above factors affect the fact that getting rid of waste packaging is a serious environmental and economic problems, it also requires the introduction of more and more treatable waste management system solutions. Under this system, as mentioned in Draft Law on Waste from 2012, packaging waste are a subject to collection, transport, recovery and disposal operations, including supervision of such operations and after-care of disposal sites including actions taken in as a dealer and broker. The forecasts of the National Waste Management Plan 2014 (the KPGO 2014), published in 2010 „are expected to increase the weight of packaging waste in relation to previous years, which means to step up and intensify action on packaging waste management”. Tab. 26.1 shows the bulk of produced and recycled packaging waste in Poland during the selected years 2000, 2006 and 2010 with a perspective view to the year 2022.

Tab. 26.1 Bulk of generated and recycled packaging wastes in Poland throughout the selected years including prognosis until 2022 [12]

I.	Type of packaging material	Amount of packaging wastes in Poland [thousand Mg/year]					
		2000	2006	2010	2014	2018	2022
1.	Paper and cardboard	1226,47	1729,91	2199,91	2228	2557	2933
2.	Glass	956,59	1205,57	1422,92	1546	1774	2035
3.	Plastic	473,54	656,89	828,78	850	976	1120
4.	Composite	137,74	194,28	247,06	248	284	326
5.	Steel sheet	134,01	162,26	185,56	195	224	257
6.	Aluminum	39,11	46,89	53,26	56	65	74
7.	Wood and textiles	488,00	399,64	418,32	633	727	834
8.	Total	3455,46	4395,44	5355,81	5757	6606	7580

Prognosis for years: 2014, 2018, 2022 on mass produced only from packaging wastes

Despite differences in the quantitative data from previous years (for example, compared to the data contained in the National Waste Management Plan 2010 (KPGO in 2010), GUS data from the developed by the Institute of Ecology of Industrial Areas in Katowice) in relation to the present statements of KPGO in 2014 and GUS 2011, you can deduce that for many years occurs, and will still occur continued growth in packaging waste, of which the predominant due to the mass will be (table 2): packaging waste paper and cardboard waste, glass, wood and plastic. Unfortunately, a careful analysis of the variety of combinations makes it difficult, where there is disagreement as to an amount of packaging entered on the market and packaging waste generated, mass produced and recycled packaging waste, whether achieved recovery and recycling limits presented by the Ministry of the Environment and the Centre for Research and Development packaging in Warsaw (COBRO).

The results so far in the management of packaging waste shows that meet the requirements of EU Directives, takes place in our country with varying results. In the literature we read, that these difficulties arise primarily due to: too extensive system of legal acts covering both international conventions, EU law and national acts (such as the Environmental Protection Law, Law on Packaging and Packaging Waste, the Act of entrepreneur obligations in the managing of certain wastes and on the product and deposit fees, other acts relating to: environmental protection, prevention of environmental damage and their repair, monitoring and statistics on waste management, etc.), a separate methodology for the calculation of the recovery and recycling in various public institutions, long period of preparation of the new uniform law on Waste (Draft Law on the management of packaging and packaging waste and the Draft Law on Waste were already available for public consultation on the websites of Ministry of Environment in 2008 and in January 2012 appeared the next draft of the Waste Act). Below in tab. 26.2, levels of recovery and recycling of packaging waste are summarized, the overall achieved in the years 2005-2010 and targets for 2007 and 2010 and tab. 26.3 - the weight of packaging entered the market and achieved the level of recycling in relation to that required in 2008 and planned in 2014, also the various types of materials were taking into account.

Tab. 26.2 Recovery and recycling level of packaging wastes in years: 2005-2010

Specification	2005	2006	2007	2007 target level	2008	2009	2010	2010 target level
Recovery in %	n.a.	54,5	60,0	50	60,6	50,22	53,81	53
Recycling in %	46,7	62,5	48,2	27	43,0	36,85	38,92	35

Source: author's own research based on GUS data [18]

According to the Ministry of Environment's data, Poland reached the designated levels of recovery and recycling of packaging waste (tab. 26.2 and tab. 26.3). However, given the forecast (presented in tab. 26.1), it is clear that increase in weight of packaging waste will be observed in the interval 2000-2022, which leads to one conclusion, that would significantly increase the activities towards recovery and recycling of packaging waste. And so, in glass packaging group the difference between the required level of recycling and achieved level in 2008 was 4.8%, while in the group of steel containers only – 1.4% (see tab. 26.3).

Recycling materials in these groups are just a few percent higher than required, and given the fact that from year to year, Poland has achieved ever higher levels of overall recovery and recycling (in 2014: recovery – min. 60%, recycling – min. 55% of packaging introduced into the market), immediately stepped up efforts in this direction. Similarly, analyzing the data in tab. 26.2, it is clear that the achieved levels of recovery and recycling requirements are minimal, and every year the difference between them is decreasing (in 2010 for the recovery the difference was only 0.81% and recycling – 3.92%).

Increased recovery and material recycling of packaging wastes, not only protect us from the prospect of paying fines for not keeping agreements with the EU, but can significantly reduce domestic consumption of natural resources. Such policy in the field of packaging waste management would be consistent with the priorities and objectives of the Directive

2008/98/EC of the Waste Act, which stress the need for sustainable production and consumption of products that taking into account the entire life cycle of products (LCA - Life Cycle Assessment), and not only the phase of disposal.

Designation tab. 26.3:

* Does not apply to packaging items in a direct contact with medical products defined in the regulations of the Pharmaceutical law and the packaging of dangerous goods within the meaning of the Act on packaging and packaging waste,

** The level of recycling includes only recycling as a result of which the obtained product is made of plastic,

*** Recycling at the level of 80% in 2014 is provided for in KPGO 2010 , but it is not provided by draft of packaging management. and KGPO 2014.

**** The composite packaging are not included in the KGPO in 2014, their mass is included in the group of materials because of the dominant material and does not provide for them a separate recycling.

Tab. 26.3 Bulk of packaging introduced into the market in 2008 and reached recycling level compared to required and planned in 2014

I.	Type of packaging material	Packaging introduced into the market [thousand mg]	2008 y. % level		2014 y. % level	
			Gained Recycling	Required recycling	Recovery	Recycling
1.	Paper and cardboard packaging	1237	67,1	49		60*
2.	Glass excluding ampoules	1019	43,8	39		60*
3.	Plastic	669,9	23,9	16		22,5* **
4.	Composite****	203,8	25,0	25		-
5.	Steel sheet	167,2	26,4	25		50*
6.	Aluminum	81,4	60,5	41		50*
7.	Natural wood and textiles	1007,7	26,3	15		15*
8.	Total	4181,9	42,9	27	60*	55*- 80***

26.3 Assessment of waste management system in Lubuskie in the relations to the rest of the country

Lubuskie is in the border area with no significant level of urbanization because 51% of its surface is covered by forests, 41% – agricultural land, and only 8% – built-up areas, rivers and lakes. It was established in 1999 with most of the territories of the former provinces of gorzowskie, zielonogórskie, and a small part of leszczyńskie. The province consists 12 poviats and two municipal districts and 83 municipal ones who lived in 2010, 1.01 million of dwellers and in 2011 – 1.04 mln. Lubuskie is one of the provinces with the smallest populations, of which 63.5% are urban inhabitants. The main cities are Gorzów Wielkopolski and Zielona Góra. In the spatial conditions, functional relationships of Gorzów Wlkp.

And Kostrzyn, Witnica, Strzelce Krajeńskie, Drezdenko and Skwierzyna, and also between Zielona Góra and Sulechów and Nowa Sól (known as Lubuskie Classifieds) are discernible. In addition, a large demographic potential is located in the southern part of province a group of towns like Żary, Żagań and Szprotawa.

According to the data contained in the Waste Management Plan Update for Lubuskie (APGOWL 2010, p. 21) in 2007 395.6 thousands Mg of municipal waste was produced in the province what per dweller is 392 kg of waste per year. In subsequent years, according to GUS data, there was a decrease and then increase of collected municipal waste in the province, and so in 2009 collected 300.1 thousands Mg (305.3 kg per inhabitant), and in 2010 – 404.7 thousands Mg (400.6 kg per inhabitant). Most of waste per dweller during the year are produced in the cities – the indicator of production in 2009 amounted to about 444 kg of waste per dweller per year, and the lowest was recorded in rural areas, where it was – 172 kg per inhabitant per year.

Also note that collected municipal waste from the Province were mainly collected as mixed waste. In this way, in 2009, 84.4% of all municipal waste were collected and in 2010 – 81.5%. In addition, the province developed more waste than was collected:

- In 2009 – 279 315.64 Mg (representing 153.03% of the total mass of the collected wastes),
- In 2010 – 257 792.35 Mg (representing 109.33% of the total mass of the collected wastes).

Tab. 26.4 The level of recovery and disposal of municipal wastes in Lubuskie Province in years 2009-2010

Specification	2009	2009 target level	2010	2010 target level
Recovery in %	65,74	51	70,14	53
Disposal in %	34,26	-	29,86	-

Source: authors' study based on data [18]

According to a Report on the implementation of a waste management plan for the province lubuskie for the years 2009-2010, both in 2009 and 2010 more wastes were subjected to recovery processes than it was marked in targets level of the RM Regulations (tab. 26.4). All wastes were managed in systems. Municipal wastes were primarily subjected to recovery processes classified as R15 what means processing of waste in order to prepare them for recovery, including recycling. Unfortunately, among the methods of disposal of municipal waste the dominant method was D5 – landfilling of hazardous waste in landfills or non-hazardous waste. In the Lubuskie there were 21 municipal landfills operated in 2009-2010 with total area of 92.11 ha (annual amount of waste deposited – 151 818 Mg) and 4 industrial waste landfill in total area of 40.3 ha (annual amount of waste deposited – 47 360 Mg). In addition, in 2010, disposed in landfills were 922.618 122 Mg of biodegradable waste which accounted for 80% of biodegradable waste generated in relation to the 1995. Unfortunately, this means that during the year 2010 their objective of storage at most 75% by weight of biodegradable waste was not completed. Existing management of biodegradable waste systems

in the province which permit only to manage 36.14% of needs in this area in 2020, and in the east there are no facilities for the management of biodegradable wastes.

In 2010, in the Province was 9 sorting stations with total capacity units of 360.9 thousands Mg/year in single shift operation, and in a given year only 55.4% were used. As APGOWL indicated the largest municipal waste recovery level in Lubuskie was in:

- Celowym Związku Gmin CZG-12 – Sulęcín – 36,5%,
- Zakładzie Utylizacji Odpadów Sp. z o.o. – Chruścik – Gorzów Wielkopolski – 33,7%,
- Dziale Zagospodarowania Odpadów w Zielonej Górze – 22% of total mass of municipal wastes.

In 2006 in Lubuskie province, according to APGOWL, about 10% of municipal wastes - 75 482.67 Mg were wastes included in the 15th group, including: waste packaging, absorbents, wiping cloths, filter materials and protective clothing not specified in other group. Similarly, assuming 10% in 2010, it can be concluded that the level of collected packaging waste in Lubuskie that year was only 1.55% so 6295.25 Mg – compare Fig. 26.3. The level of recycling of these wastes are formed mainly by the Lubuskie’s cities, including the largest: Zielona Góra and Gorzów Wielkopolski. Recovery and recycling system of municipal waste is smaller in rural areas due to incomplete, because 84% of inhabitants of municipalities are organized by waste collecting system. Changes in waste management system, introduced by the Act amending the act on maintain cleanliness and order in municipalities and certain other laws, will lead to a complete coverage of all the inhabitants of towns and cities by waste collection system, but its effectiveness will depend on the attitude of its population.

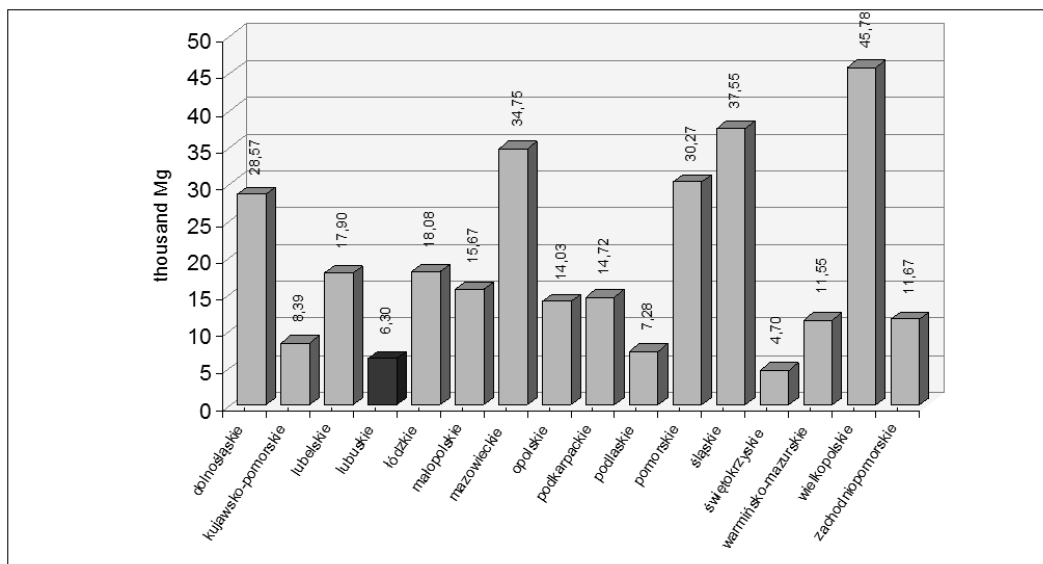


Fig. 26.3 Bulk of packaging wastes collected by municipalities in 2010 in individual provinces in Poland [20]

Currently, according to the Ministry of Environment’s data Lubuskie ranks in the last place in the country, in almost all rankings of packaging waste management. Below, fig. 26.3 shows the bulk of collected packaging waste by municipalities in 2010 in individual Polish provinces, where the lubuskie (with a mass of 6.3 thousand Mg collected packaging wastes)

occupies penultimate place, just before the Świętokrzyskie province, where it collected 4.7 thousand Mg of packaging wastes. In the province of Opole, where the population is comparable to the population in Lubuskie, 14.03 thousand Mg of packaging waste was collected.

The next ranking (fig. 26.4) compares the weight of packaging wastes transferred to recovery and recycling by municipalities in each province in 2010. Lubuskie with the mass of 0.22 thousand Mg (representing 0.08% of all packaging waste collected in the country) is in the last place after the świętokrzyskie province, where was transferred over 4.4 thousand Mg of wastes (1.62%). For comparison, in the opolskie province 10.85 thousand Mg of packaging waste was transferred to recovery and recycling. In total, all municipalities in Poland in 2010, transferred to the recovery and recycling over 272.11 thousand Mg of packaging waste, which accounted for 88.58% of all collected the packaging waste by municipalities. Most recovered and recycled packaging waste was transferred by the provinces: wielkopolskie – 41.13 thousand Mg (15.11% of all packaging waste collected in the country), śląskie – 35.15 thousand Mg (12.92%) and mazowieckie – 34.06 thousand Mg (12.52%).

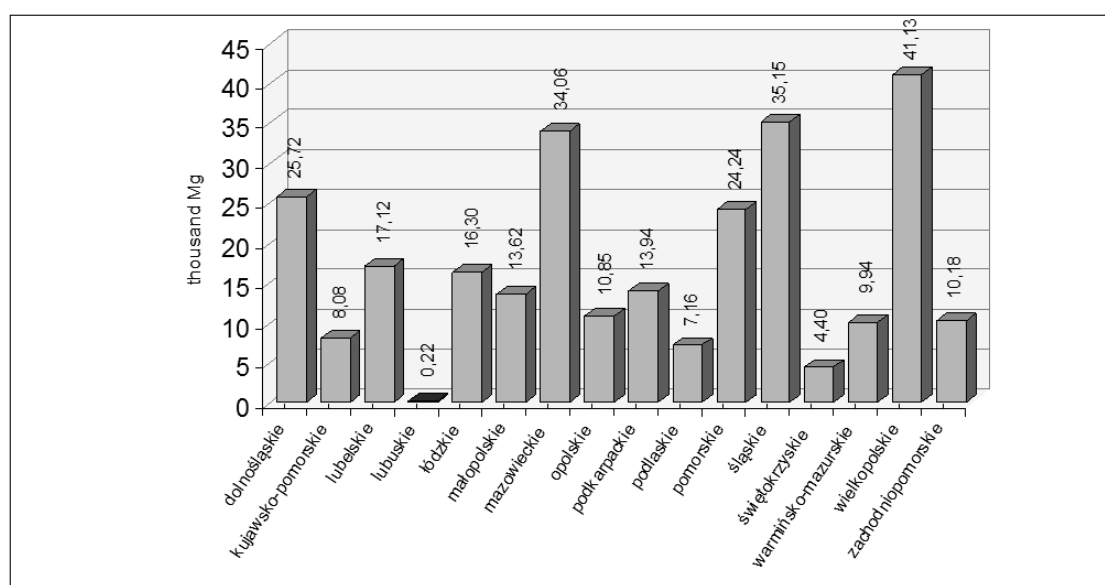


Fig. 26.4 Bulk of packaging wastes transferred to recovery and recycling by municipalities in individual provinces in 2010 [20]

According to the Ministry of Environment such a low percentage of transferred packaging wastes by Lubuskie for recovery and recycling (3.5% of collected packaging), probably is due to the fact that in the region as the mass of packaging waste sent for recovery and recycling indicated in the report was only that has been confirmed by documentary evidence of recovery and recycling. It can generally be said that on a national scale, a high percentage of collected packaging waste, which have been transferred to the recovery and recycling – was an average of 85.09%. Among transferred packaging waste for recovery and recycling of the most was:

- 47.42% - glass (except ampoules 129.03 thousand Mg),
- 26.16% - paper and cardboard - 71.18 thousand Mg,
- 23.40% - plastic - 63.66 thousand Mg,

- 1.76% - of steel, including steel sheet - 4.78 thousand Mg,
- 0.66% - composite - 1.79 thousand Mg,
- 0.33% - from natural materials (wood and textiles) - 0.88 thousand Mg,
- 0.28% - aluminum - 0.76 thousand Mg.

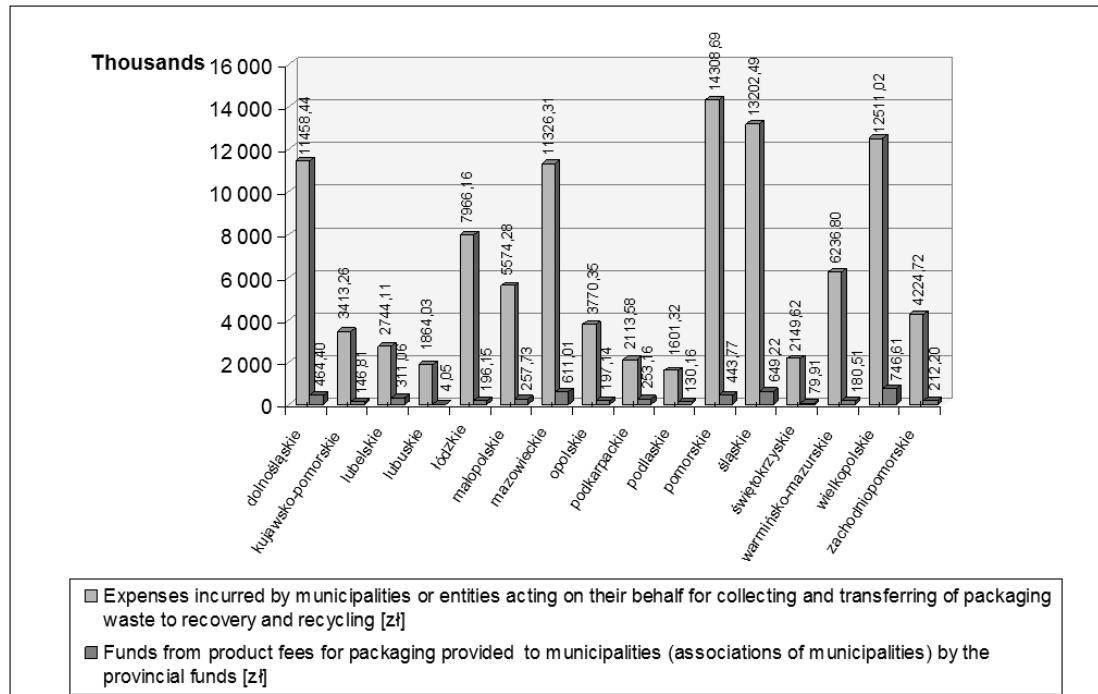


Fig. 26.5 Comparison of expenses incurred by the municipalities in each province for the collection and transfer to the recovery and recycling of packaging waste and resources from the product fees for packaging transferred to municipalities (associations of municipalities) by the provincial funds [20]

Fig. 26.5 shows the comparison of expenses incurred by municipalities in the individual provinces to collect and transfer of packaging wastes to the recovery and recycling and resources from the product fees for packaging transferred to municipalities (associations of municipalities) by the provincial funds. Expenses in Lubuskie to collect packaging waste and transfer of wastes for recovery and recycling were the least of all the provinces – 1864030 zł. Similarly, funds arising from product fees for packaging transferred to municipalities (associations of municipalities) by the provincial funds were the least was Lubuskie with 4048.85 zł (for comparison, in the province opolskie – 197140 zł and largest in the śląskie province – 649216.78 zł). According to Sosnowski municipalities incurred the largest expenditures in 2010 for collecting and transferring to the recovery and recycling of: composite packaging waste – 51.16% of all incurred costs in the country, from a glass – except ampoules (19.06%), plastic (17.3%), paper and cardboard (10.75%), steel – including steel sheets (0.97%), aluminum (0.63%), natural materials (wood and textiles) – (0.12%).

26.4 Summary

Waste Management in Lubuskie is oriented to prevent and reduce the negative impact of wastes on the environment and human health. In accordance with EU policies and objec-

tives of sustainable development management Lubuskie aims to provide a rational and integrated development of municipal waste management system (including packaging waste).

Unfortunately, assessing the status of tasks implementation defined in the Waste Management Plan for Lubuskie for years 2009-2012 including perspective for the years 2013-2020 and other documents related to the region's development plans, it should be noted that the process of construction, expansion or modernization of waste management are too slow and processing capacity for biodegradable wastes are far too small. There is a danger that in 2013 Lubuskie will also fail to meet targets for reducing this group of waste disposed by landfilling. Moreover, it should also be accelerated as soon as possible regarding the collection, source separation, recovery and recycling of packaging wastes because in these asks Lubuskie is in disgraceful last place.

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