

Industrial waste in the European Union – new challenges

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Introduction

Human-generated waste has become a problem that people will soon need to handle. The effects of human activities aimed predominantly at satisfying the consumption wants of people can be seen in the amount of pollution produced. The gravity of the problem is best illustrated by the concept of the so-called ecological footprint [1] which is the human demand for the natural resources present in the biosphere (the estimated total surface area of land and sea, weighed according to the biological productivity of the different forms of use) which has been exceeded by 40%.

What this means is that the Earth needs seventeen months to restore its resources. Moderate scenarios by the United Nations indicate that if the priorities of consumption are not changed, then by the middle of the third decade of the 21st century people will need not one but two planets to cover the demand for the resources used for consumption and absorption of waste (Fig. 1).

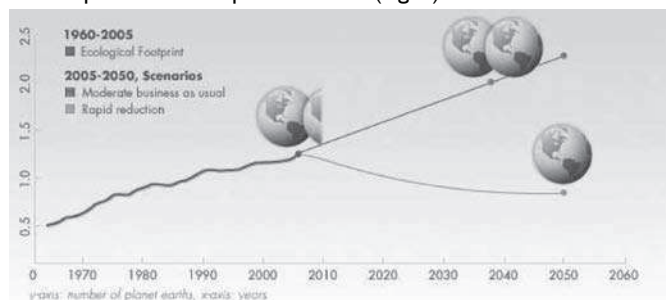


Fig. 1. The world's ecological footprint, 1960-2050 [1]

The facts clearly show that we must depart from our current perception of the Earth and adopt solutions that aim not only at the needs of people, but also at limiting the use of non-renewable resources and restricting waste disposed into the environment to amounts that the Earth can absorb.

Also Poland is a debtor to the planet; our ecological footprint by far exceeds the biological potential of the country's land. According

to the Global Footprint Network (<http://www.footprintnetwork.org/en/>), Poland's ecological footprint twice exceeds the country's biological potential. To change it, Poland's development plans must take into account the available ecological limits so as to restore an ecological balance.

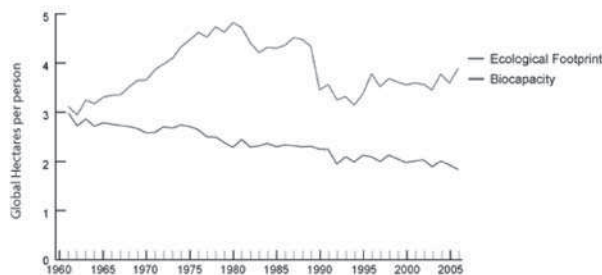


Fig. 2. Changes in the biological potential and the ecological footprint of Poland in the years 1961-2005 [1]

One of the reasons for the deterioration of the natural environment is waste generated by people. In 2006 the inhabitants of the European Union (EU27) generated nearly 3 billion tons of waste, of which approximately 90 million tons are considered hazardous waste [2]. The amount of waste per capita is over 6 tons of waste generated by households, the commerce, the industry, the agriculture, the construction sector, the mining industry, and the power generation sector.

Industrial waste in the EU

Waste is generated in the process of economic activities in four important sectors of the economy, namely agriculture, industry, construction, and services. In 2006, on average in the whole EU, waste generated by the industry and the construction sector amounted to 82.7% of all waste generated in the process of economic activity, while the amount for services was 11.6% and for agriculture – 5.8% [2].

Industrial waste is generated in three major sectors of the industry: mining, industrial processing, and production and distribution of electricity, gas, and steam. An important part of this waste is waste generated by the mining industry – in 2006, it constituted 54.4% of all waste.

This information is based on data submitted by the member states of the EU; the data is processed by Eurostat, the Statistical Office of the European Commission [3]. The significant differences in the data are not always due to the real status, but may result from interpretations of the definitions of waste types and waste collection systems. The data pertains not only to the amount of waste generated in different sectors of the economy, but also to the distribution according to the type of economic activity conducted. Fig. 3 shows the proportions of waste generated in different types of economic activity described in Table 1 (data as of 2006).

The data available on the web site of Eurostat (<http://ec.europa.eu/eurostat>) shows that the largest amount of waste generated in the course of industrial activities in the EU is related to the metal industry (DJ) – 31%. A significant amount of waste, 17%, is generated in the process of manufacturing food products. Activities related to the wood and paper industry amount to a total of 23% of all waste, while the production of chemicals, chemical products and chemical fibers, rubber and plastic products is responsible for approx. 11% of total waste.

Table 1

List of industrial activity codes

CODE acc. to NACE rev. 1.1.	Economic activity
DA	Manufacture of food products, beverages and tobacco
DB-DC	Manufacture of textiles, textile products, leather, and leather products
DD	Manufacture of wood and wood products
DE	Manufacture of pulp, paper and paper products; publishing and printing
DF	Manufacture of coke, refined petroleum products and nuclear fuel
DG-DH	Manufacture of chemicals, chemical products and man-made fibers, rubber and plastic products
DI	Manufacture of other non-metallic mineral products
DJ	Manufacture of basic metals and fabricated metal products
DK-DM	Manufacture of machinery and equipment n.e.c., electrical and optical equipment, and transport equipment
DN36	Manufacture of furniture; manufacturing n.e.c.

Quantities of waste generated in the process of production of chemicals, chemical products, rubber and plastic products in Poland and in the EU in 2006. [3]

Type of waste	Code	Location	Production of chemicals, chemical products, rubber and plastic products DG+DH, thousand tons		
			hazardous	non-hazardous	total
			used solvents	01.1	EU27
		Poland	2.27	:	2.27
waste acids, bases, and salts	01.2	EU27	:	1608.8	:
		Poland	84.53	53.86	138.39
used oils	01.3	EU27	:	:	:
		Poland	0.157	:	0.157
used chemical catalytic converters	01.4	EU27	36.7	23.0	59.8
		Poland	0.46	0.23	0.69
chemical and medical waste	01-05	EU27	7343.4	:	:
		Poland	215.1	2192.8	2407.9
waste chemical preparations	02	EU27	641.5	1626.7	2268.2
		Poland	13.44	153.42	166.86
chemical deposits and residues	03.1	EU27	:	4126.6	:
		Poland	39.46	1568.07	1607.54
industrial sewage sludge	03.2	EU27	414.7	1277.8	1692.5
		Poland	72.014	417.15	489.17
medical and biological waste	05	EU27	:	:	:
		Poland	2.76	0.05	2.82
waste — total	01-13	EU27	8074.7	31510.6	39585.4
		Poland	217.75	5979.22	6196.97

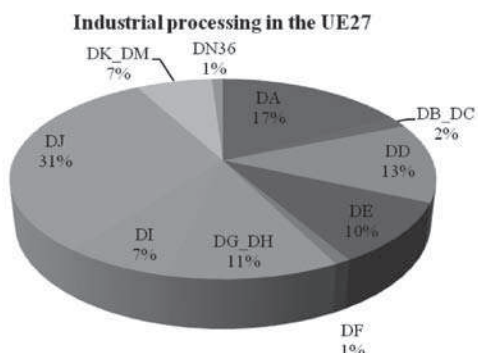


Fig. 3. Proportions of waste generated in different sectors of industrial processing in the EU in 2006. [3]

The proportions of waste generated by the industry in Poland are a little different. Similar to the data for the EU, the largest proportion of waste is generated by the metal industry, but the value is much larger – 67%. Waste generated in the process of production of food products is another 13%. Manufacture of chemicals, chemical products and man-made fibers, rubber and plastic products is about 10%, which is comparable with the value in the EU. The proportions of waste generated in the remaining sectors are equal to only 10%.

Chemical waste in Poland

By analyzing the information submitted to the European Commission on waste generated in Poland, one can also identify the types of waste generated by the chemical industry (Table 2).

The information shown in the table can be used to determine the quantities of chemical waste identified as: used solvents; waste acids, bases, and salts; used oils; used chemical catalytic converters; waste chemical preparations; chemical deposits and residues; and industrial sewage sludge. The total amount of chemical waste generated in Poland in 2006 is 2.4 million tons, of which 66.8% is chemical deposits and residues. Waste acids, bases, and salts constitute 5.7%, waste chemical preparations – 6.9%.

Chemical waste is not generated by the chemical sector only. It is also generated in other areas of human activity, as can be shown by analyzing the data on the waste generated in Poland. The amount of

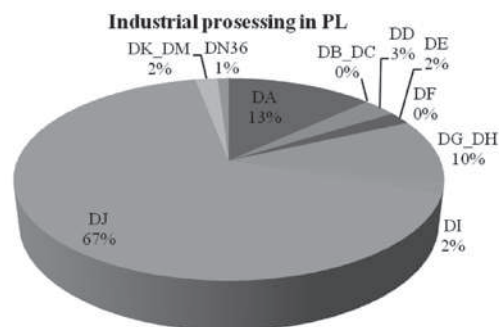


Fig. 4. Proportions of waste generated in different sectors of industrial processing in Poland in 2006. [3]

waste with codes 01-03 is approximately 5 million tons, which means it is twice as large (Table 3). The largest difference in the amount of waste is in industrial sewage sludge and is equal to 1 million tons.

Even though the chemical waste generated in Poland amounts to only 2% of all waste generated in Poland per year, its substantial amount makes it necessary to take steps to reduce its generation. Chemical waste can be a valuable source of raw materials and replace the shrinking deposits of natural resources. Most chemical waste is classified as non-hazardous, but approximately 10% is considered to be hazardous.

Chemical waste is both organic and inorganic waste of different properties, such as biodegradability or combustibility. Inorganic waste is not biodegradable and not combustible, which is important when determining the methods of handling them. The statistical data gathered by Eurostat is not adequate for determining the amounts of different types of waste. Stocktaking of waste aimed at identifying inorganic waste generated by Poland's chemical industry will be conducted as part of one of the tasks of the project titled "Inorganic waste generated by the chemical industry – technology foresight" performed by the IChN-IOŚ-PBF consortium.

Industrial waste – new challenges

The information presented above refers only to waste generated in the current production process, which is collected mostly on exist-

The amount of chemical waste generated in Poland and in the EU in 2006. [3]

Type of waste	Code	Location	total by NACE + households, thousand tons		
			hazardous	non-hazardous	total
used solvents	01.1	EU27	2858.2	:	2858.2
		Poland	14.19	:	14.19
waste acids, bases, and salts	01.2	EU27	5004.6	3020.5	8025.2
		Poland	249.6	60.85	310.49
used oils	01.3	EU27	6457.3	:	6457.3
		Poland	33.9	:	33.9
used chemical catalytic converters	01.4	EU27	:	84.5	:
		Poland	5.67	0.45	6.12
chemical and medical waste	01-05	EU27	:	24010.5	:
		Poland	1810.2	3312.5	5122.7
waste chemical preparations	02	EU27	3732.7	3434.7	7167.5
		Poland	46.42	204.55	250.94
chemical deposits and residues	03.1	EU27	11931.2	8573.2	20504.5
		Poland	926.52	2103.83	3030.3
industrial sewage sludge	03.2	EU27	3276.4	7691.5	10968.0
		Poland	508.62	938.25	1446.8
medical and biological waste	05	EU27	1168.2	1205.7	2374.0
		Poland	25.25	4.56	29.81
waste - total	01-13	EU27	88731.3	2864356	2953087.4
		Poland	2380.67	264359.86	266740.5

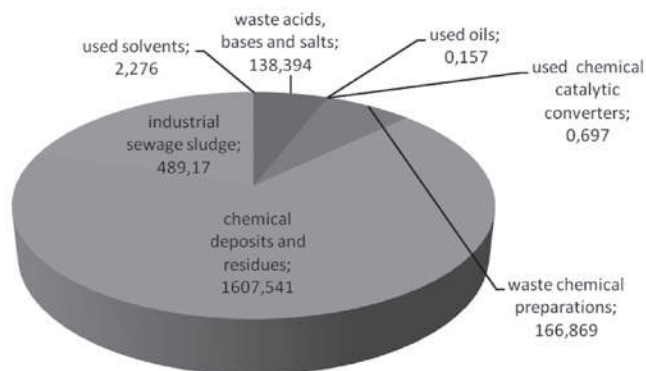


Fig. 5. Chemical waste in Poland in 2006 in thousand tons [3]

ing landfills. This is why the problem of industrial waste must be considered taking into account both the waste which is produced currently and the waste which is already in landfills.

For many years, European countries have made efforts to limit the amount of generated waste. Despite these efforts, the amount of waste has been growing in line with the economic growth. Economic growth leads to the exhaustion of natural resources. The way that natural resources are currently used, namely the fact that at the end of the life cycle they become waste, negatively affects the natural environment. The EU is facing the problem of how to stimulate economic growth without causing further degradation of the natural environment. To overcome this problem, the European Commission has proposed two long-term strategies: the strategy of preventing the generation of waste and of recycling it and the strategy of a sustainable use of natural resources [4]. Both strategies are closely tied to one another, since natural resources become waste after they are used and waste may be the source of resources and energy. A central role in the achievement of these goals will be played by the production industry which must analyze the life cycle of its products as early as the design stage, use production processes that reduce the use of energy and materials, and eliminate or limit the use of substances that are hazardous to people and the environment in order to manufacture products that can be used longer and be recycled after their life cycle ends.

Nevertheless, there are many barriers to the achievement of these goals. Also, people assign different priorities to the problems that need to be solved. The barriers are mostly socioeconomic factors that affect

the consumers, the manufacturers, as well as economic, market-related, legal, and technical issues. They will not be overcome without changes both in the legal sphere and in the approach to waste on the part of both manufacturers and consumers.

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