

20. POLAND

20.1 Legal Framework – Waste Management Plans and Strategies

20.1.1 National Legislation concerning CDW

In contrast to the term “waste”, the term CDW is not defined in the Act of Waste. The only mentioning of the term is in the national WMP; it says that CDW is the “construction and demolition waste from buildings and road infrastructure generated in residential and industrial construction, as well as in railway industry and road industry, at the construction development and modernization stage and at the dismantling stage” [226]. Poland adopted the European waste catalogue, meaning CDW falls within the group number 17.

The responsibilities of local authorities regarding waste management are set forth primarily by the provisions of three acts of parliament - Act on waste (2001); Act on packaging and packaging of waste (2005) and Act on maintaining cleanliness and order in municipalities (2011).

European Directives concerning waste management are implemented in Poland through the Act on Waste 2012. Previously the regulations concerning waste management were set forth in the Act on Environmental Protection and Development of 31 January 1980. The Waste Act adopted in December 2012 is the third in a series of laws wholly devoted to the issue of waste management in Poland.

This Act defines terminology associated with waste management – it defines terms such as waste producer, owner of waste, waste broker, waste dealer and others. According to Article 27, a waste producer is obliged to manage waste that his or her actions generated. Nevertheless, a waste producer can choose to transfer his obligation to manage the waste to a company which has a permit to collect waste. This transfer must be documented a confirmation a waste was either recovered or disposed [227].

Under the Act on Waste, municipalities have been obliged to the following [228]:

- To include the whole population in the organized system of municipal waste collection and the system of separate collection of waste by 2015 the latest
- To create conditions for the operation of a system of separate gathering and collection of municipal waste
- To ensure proper conditions for the construction, maintenance and operation of installations and equipment for the recovery and disposal of municipal waste
- To initiate and facilitate the creation of points for the collection of waste arising from electric and electronic equipment.

Furthermore, under the Act on packaging and packaging of waste, each entity that releases packaged products on the market is obliged to ensure the appropriate level of recovery and

recycling of packaging waste. The Act sets the required annual recovery levels for packaging, recycling in general, and for individual packaging. Companies that fail to meet the required goals might face financial sanctions.

20.1.2 Waste management plans (WMP) and Strategies

The national WMP is devised by the MoE in cooperation with the Ministry dealing with water management regulations. Regional WMPs are developed by the region authority – the Marshall Office. All WMPs aim to achieve the objectives of the environment policy, meaning, contribute to improved environment. These plans contain the analysis of CDW management situation, forecast change in waste management, targets and objectives of waste management and strategies to prevent waste generation.

The national WMP currently in force is called the National Waste Management Plan 2022 [226]. In July 2016, the Council of Ministers adopted the resolution on this plan making it legal in the period 2016-2022. The WMP 2022 represents the update of the national WMP 2014 which was binding in the period 2011-2016. The WMP 2022 contains waste prevention program.

Regarding the CDW, the WMP 2022 states the following objectives:

- 1) increasing awareness among investors and companies producing waste from construction and demolition of buildings and infrastructure road on the proper handling of abovementioned waste, in particular in the field of selective collection and recycling;
- 2) maintain the level of preparation for reuse, recycling and other forms of recycling construction and demolition waste at a minimum of 70% by weight.

The WMP also sets several courses of actions – these are:

- Information and education activities to raise awareness among investors and CDW producing entities to create streams to deal with CDW
- Introduction of a system of incentives to promote the selective collection of CDW waste
- Introduction of a system of incentives to promote the use of recovered CDW
- Continue to monitor CDW generated and its treatment
- Develop technical infrastructure for selective collection, recovery and re-use of CDW.

The Plan assumes that Poland's modern waste management system should embrace the following range of services [228]:

- Mechanical-biological conversion of mixed municipal waste, storage of mixed and recycled waste and composting of green waste in regions > 150,000 residents
- Thermal conversion of mixed municipal waste in regions > 300,000 residents.

Moreover, local governments are obliged to arrange min. 5 / max. 15 waste management plants per region by 2014. As for landfill sites, their absorptive capacity should be sufficient for a period of min. 15 years of utilization.

Poland employs the national WPP published by the MoE in 2014. The WPP sets number of objectives regarding the waste prevention. In regards to the CDW, it provides an example of possible measure which obliges materials' suppliers to accept returns of surplus materials within a certain period at the price of purchase. It does not further specify any measures dealing with CDW, however, few principles are recommended: (1) optimisation of use of construction materials; (2) use of modern equipment that apply zero-waste or low-waste technologies; (3) compliance with the parameters of technological processes; and (4) analysis and verification of applied technologies and standards of material use in terms of waste reduction [229].

Companies in charge of collecting waste are forced to produce collection contract and permit from the Marshall Office. The permit and contract are to follow the guidelines and be in correlation to the list of waste. The amount of waste that is collected by the company will be mentioned in a reporting document produced by the developer monthly. Once a year, the developer will forward the justification to the Marshall office. The report must include all construction sites that are worked with. A simplified inventory of waste also known as waste transfer declaration is expected from construction sites that generate less than 5 tonnes of non-hazardous waste or 100kg of hazardous waste per year. Generated waste is disposed by the waste collection company through contracts with small construction sites while the latter are not required to produce other report than the aforementioned contract. Collected data are then used for preparation of reports to the MoE by Marshall Offices.

20.1.3 Legal framework for sustainable management of CDW

Though provisions on separation of waste in general exist in Poland, they do not specify any provisions on the CDW in particular. Only from 2012, there is an obligation to sort hazardous waste both while collecting it and managing it. The special focus is put on asbestos. While there is no obligation to separate CDW during private construction activities (with an exception of hazardous waste), it is mandatory to sort CDW that is municipal waste. Furthermore, there is a public procurement law which states that special requirements must be fulfilled during public construction work. Preparing the information on waste generated, methods used to generate the CDW and its management are few of these requirements. In case the contractor neglects this obligation, he or she might face penalties.

20.1.4 Targets

Polish targets regarding the preparation for re-use, recycling and recovery are identical to those of the EU, meaning, Poland aims to achieve level of 70% by weight in re-use, recycling and other forms of CDW recovery.

20.1.5 End of Waste (EoW) status

The Act on Waste defines criteria and status of End-of-Waste. Individual type of waste is no longer seen as waste in case it fulfils specific criteria. The criteria are as follows:

- The substance or object is commonly used for specific purposes
- There is an existing market or demand for the substance or object
- The use is legal – meets technical and legal requirements
- The use of it will have no negative environmental or human health impact
- The waste meets requirements defined by EU legislation.

There are no criteria established especially for CDW in Poland.

20.2 Non legislative instruments (best practices, guidelines, recommendations...)

The non-legislative instruments that are dealt with in Poland can be divided into three main topics that together include all the various instruments. The first main topic relates to the two key sustainability initiatives. Those initiatives serve as an instrument by putting together certain standards that must be met in order to earn the initiatives certification. They are BREEAM, DGNB and LEED.

Over 400 buildings had such certification in 2015.

The second topic is a set of guidelines for various actors. Among those belong:

- Guidelines for municipalities regarding implementation of municipal waste
- Guidelines on waste management for households
- Guidelines on backfilling operations

The last topic revolves around the objectives and requirements set in national WMP and the development of Program for Asbestos Abatement in Poland 2009-2032. The main goals of this program are to get rid of and dispose asbestos containing products, minimize negative health effects cause by asbestos and to eliminate effects of asbestos on the environment.

The Programme objectives will be implemented progressively until 2032 when the country is expected to be free of asbestos. Of the 14.5 million tonnes of asbestos containing waste estimated as in 2008, it was planned to dispose [229]:

- about 28%, i.e. 4 million tonnes, by the end of 2012
- about 35% of waste, i.e. 5.1 million tons, between 2013-2022
- about 37% of waste, i.e. 5.4 million tons between 2023-2032

20.3 CDW management performance – CDW data

20.3.1 CDW generation data

According to data from the Central Statistical Office, in 2011, 8.236.900 tons of waste from construction and demolition was generated. In subsequent years, the amount of waste

generated decreased significantly to 5.756.200 tons in 2012 and 5.741.600 tons in 2013. The change in the amount of generated CDW constitute a 30% change in comparison. Significant differences in the amount of waste generated in 2011-2012 were caused due to extensive construction projects, such as the organization of EURO 2012. By 2020, the Polish authorities expect to witness a drop of 1-2% annually of CDW generation.

After 2020, it is forecasted that the amount of CDW will stabilize, meaning, the generation of CDW will range from about 6,8 million tons to 7,3 million tons. It was mentioned in the report on implementation of the national WMP that in the period 2011-2013, there was over 730 facilities for CDW treatment which when combined can process over 59 million tons a year[228].

The Table 70 illustrates the amount of CDW generated in the period 2011-2013 by type of CDW. The amounts are stated in thousand tons. Figure 16 shows the generation of CDW in period 2004 to 2012.

Table 70. Amount of CDW generated in the period 2011-2013 by type

EWC	Waste	2011	2012	2013
1701	Concrete, Bricks, tiles and ceramics	679,1	481,9	608,6
1702	Wood, glass and plastics	15,7	16,0	23,1
1703	Bituminous mixtures, coal tar and tarred products	24,5	14,7	67,0
1704	Metals (including their alloys)	635,7	568,8	545,5
1705	Soil (including excavated soil from contaminated sites), stones and dredging spoil	6859,4	4349,3	4475,5
1706	Insulation materials and asbestos-containing construction materials	5,8	4,4	2,8
1708	Gypsum-based construction material	0,1	0	0
1709	Other construction demolition waste	16,6	321,1	19,1
	Total	8 236,9	5756,2	5741,6

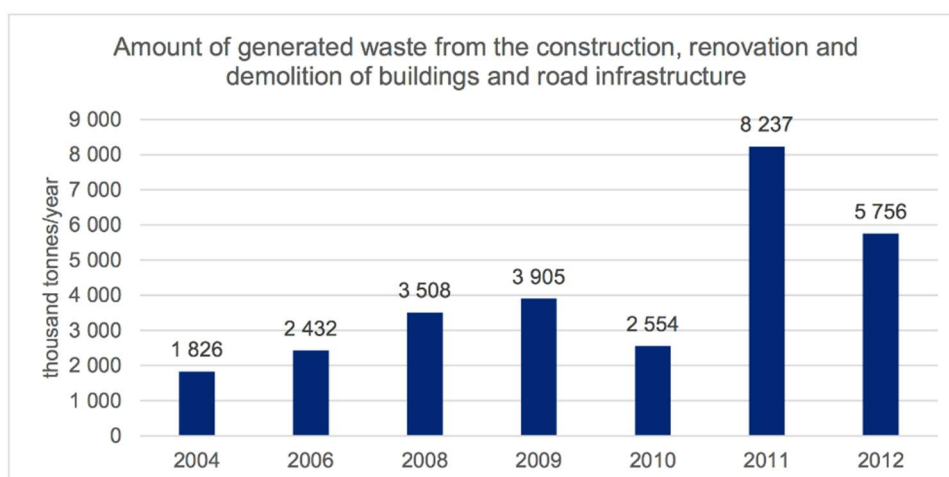


Figure 16. Generation of CDW in period 2004 to 2012 [229]

20.3.2 CDW treatment data

According to the WMP 2022, in 2011-2013, more than 70% construction and demolition waste generated underwent preparation for reuse, recycling and other forms of recovery. Nevertheless, the up to date data are not available. In 2013, 5.616.800 tonnes of CDW underwent recovery processes – this amount constitutes more than 97,8% of the CDW. The recovered waste is mainly used in the construction of new road and rail infrastructure. They are also used for backfilling and hardening of construction sites and road technology. Asphalt waste containing hazardous substances are used to pave roads, roadsides and squares. The Table 71 illustrates mineral CDW generation and treatment [229].

Table 71. Mineral CDW generation and treatment [229]

	Generation	Treatment						
		TOTAL	Energy recovery	Incineration	Recovery other than energy recovery		Landfilling	Other forms of disposal
					Recycling	Backfilling		
Hazardous	29 215	3 558	0	2 381	827	0	350	0
Non-hazardous	3 481 085	3 012 801	2 749	32	2 043 436	733 703	232 881	0

Source: Study "Environment 2014" of Central Statistical Office based on data provided by the Ministry of Environment

20.3.3 CDW exports/imports data

According to a study *Environment 2014* conducted by Central Statistical Office Inspectorate of Environmental Protection, import of CDW reached level of 2000 tons in 2013. The CDW imported within the EU accounted for 50%. Polish export of CDW was identical to its import, i.e. 2000 tons.

20.3.4 CDW treatment facilities data

The Marshall Offices are the authority responsible for administrative management dealing with CDW treatment facilities. Local governments are obliged to arrange min. 5 / max. 15 waste management plants per region by 2014. As for landfill sites, their absorptive capacity should be sufficient for a period of min. 15 years of utilization [228]. Companies working with waste recovery must obtain a permit for waste treatment activities.

A company or an individual who requires waste collection services has a right to examine how the waste was treated after the collection. The amount of collection companies is assumed to be sufficient, on the other hand, treatment facilities might be lacking in particular regions. Poland still struggles with an insufficiently developed network of plants due to a limited number of sites. There is also a dire need for treatment facilities as currently the majority of facilities focuses on mixed waste. The most common method of disposal of CDW in Poland is landfilling. The recovered CDW is then often used for road and railroad construction.

20.3.5 Future projections of CDW generation and treatment

During 2010 and 2011, Poland invested heavily in major road infrastructure as well as in other constructions. These projects were responsible for generating extraordinary amounts of CDW. The national WMP 2014 forecasted that after the economic crisis, the construction and demolition activity will increase in Poland. The projections were that by the year 2022, the amount of generated CDW per year will revolve around 5,6 million tons [229]. According to the national WMP 2022, the Polish authorities expect to witness a drop of 1-2% annually of CDW generation compared to years 2010-2011. After 2020, it is forecasted that the amount of CDW will stabilize, meaning, the generation of CDW will range from about 6,8 million tons to 7,3 million tons [226].

20.3.6 Methodology for CDW statistics

The Marshall Offices are responsible, among other activities, for collecting information regarding the waste generation in their respective region. Waste holders submit their data to the Marshall Office which uses the data to prepare a report on implementation of the regional WMP. The reports are covering a period of 3 years and the last deadline for submission was on December 31, 2014 – meaning the next report is due in December 2017. The MoE developed guidelines for reporting the implementation of regional WMP. Regarding the CDW, the Marshall Offices should quantify in the report the amounts of CDW generated, recovered, recycled and disposed. The methodology used to gather data on CDW in Poland is in compliance with EUROSTAT guidelines on waste statistics [229].

20.4 C&D waste management in practice

20.4.1 CDW management initiatives

The initiatives to improve CDW management in Poland are rather rare. There were attempts [230] to collect plastic packaging waste generated during the construction work; however, the initiative did not bear fruit. The reason behind the lack of CDW management initiatives might be the unwillingness of construction companies to try recovered materials. The Polish Green Building Council aims to encourage sustainable development in construction field by promoting BREEAM and LEED certification. In Poland, there is no obligation to separate CDW (with an exception of hazardous waste) and thus the majority of construction companies does not want to pay additional costs for sorting of the waste and its proper recovery.

20.4.2 Drivers / barriers to increase CDW recycling

It is not surprising that the high standards in Poland are justified by several measures. When it comes to general public, people seem to demand recovered materials more than they did in past. Simultaneously, construction companies use recovered materials for road construction, railway infrastructure, land levelling and backfilling. In case of construction of a new building, building companies might increase their level of competitiveness by preventing the generation of waste and by separating waste at the construction as investors are often concerned with certification of a building such as BREEAM or LEED. From the legislative perspective, Poland set waste recycling targets identical to those of the EU. It also provides financial and human resources to fight illegal landfilling and strengthen CDW management by conducting frequent inspections [229].

It is true that official statistics illustrate high level of compliance with WMP and high rates of CDW recycling. Nevertheless, these statistics might not be perfectly reliable since there are still difficulties in tracking the CDW data – mainly reporting them to the authorities. At the moment, cases of abandoning waste represent 142.000 tons of waste. Even though Poland recognizes an issue of insufficient enforcement and monitoring and aims to prevent it by enlarged resources, the insufficient controls and insufficient financial penalties for non-compliance prevail. A measure to improve efficient CDW management would be to employ mandatory regulations dealing with recovery of CDW, however, there are neither obligations to recycle CDW nor obligation to use recovered CDW in Poland. Consequently, the use of recovered CDW or recycling is not a priority for construction companies. Most of the construction companies do not consider CDW management and its related costs to the financial plan of the project. The costs of CDW management are seen as costly and the priority is to keep the budget at the lowest possible cost. Last, there are no extended producer responsibility scheme related to construction materials is implemented in Poland.

20.5 CDW sector characterization

20.5.1 CDW materials (CONCRETE, BRICKS, TILES AND CERAMIC, ASPHALT, WOOD, GYPSUM)

Product description and applications

Concrete is a composite material composed of coarse aggregate bonded together with a fluid cement that hardens over time. Most concretes used are lime-based concretes such as Portland cement concrete or concretes made with other hydraulic cements. It is used for construction of buildings, roads and infrastructure.

A brick is building material used to make walls, pavements and other elements in masonry construction. Traditionally, the term brick referred to a unit composed of clay, but it is now used to denote any rectangular units laid in mortar. A brick can be composed of clay-bearing soil, sand, and lime, or concrete materials. Bricks are produced in numerous classes, types, materials, and sizes.

A tile is a manufactured piece of hard-wearing material such as ceramic, stone, metal, or even glass, generally used for covering roofs, floors, walls, showers, or other objects such as tabletops. Tiles are often used to form wall and floor coverings, and can range from simple square tiles to complex mosaics. Tiles are most often made of ceramic, typically glazed for internal uses and unglazed for roofing.

Asphalt is a sticky, black and highly viscous liquid or semi-solid form of petroleum. It may be found in natural deposits or may be a refined product; it is a substance classed as a pitch. The primary use (70%) of asphalt/bitumen is in road construction, where it is used as the glue or binder mixed with aggregate particles to create asphalt concrete.

Wood is a porous and fibrous structural tissue found in the stems and roots of trees, and other woody plants. It is an organic material, a natural composite of cellulose fibers which are strong in tension embedded in a matrix of lignin which resists compression. Wood has been used for thousands of years for fuel, as a construction material, for making tools and weapons, furniture and paper, and as a feedstock for the production of purified cellulose and its derivatives, such as cellophane and cellulose acetate.

Gypsum is a soft sulfate mineral composed of calcium sulfate bihydrate. It is widely mined and is used as a fertilizer, and as the main constituent in many forms of plaster, blackboard chalk and wallboard. Among other uses, gypsum is used in buildings construction.

Quantitative analysis

The quantitative data concerning the production in Poland are available only for concrete, gypsum, and asphalt [231]. The tables Table 72 Table 73 Table 74 illustrate this production.

Table 72. Concrete production in Poland

	Concrete production (million m ³)		Growth rate 2006/2008	Population (million inhabitants)		Production per capita		Cement consumption (million tons)		Growth rate 2006/2008
	2006	2008		2006	2008	2006	2008	2006	2008	
PL	14.2	15.8	11.27%	38.16	38.12	0.37	0.41	14.5	16.8	15.86%

Table 73. Gypsum production in Poland

	2005 (tons)		2008 (tons)	Population in 2008		Production per capita		Share to the EU production		Growth rate 2005/2008
	1.048.000	1.499.901		0.0393	5.2%	43.1%	1.048.000	1.499.901	38.115.641	
PL	1.048.000	1.499.901	38.115.641	0.0393	5.2%	43.1%	1.048.000	1.499.901	38.115.641	0.0393

Table 74. Asphalt production in Poland

	2005 (million tons)		2008 (million tons)	Population in 2008		Production per capita		Share to the EU production		Growth rate 2005/2008
	15	15		0.4	5.2%	0%	15	15	38.115.641	
PL	15	15	38.115.641	0.4	5.2%	0%	15	15	38.115.641	0.4

Recovery techniques

- **Concrete:** Landfill, recycling into aggregates for road construction or backfilling, recycling into aggregates for concrete production, re-use of precast elements
- **Brick:** Landfill, recycling, re-use
- **Tile:** Landfill, recycling, re-use
- **Asphalt:** Landfill, recycling in a stationary plant, in-site recycling, material recovery
- **Wood:** Landfill, recycling into derived timber products, energy recovery
- **Gypsum:** Landfill, recycling into new plasterboards (in substitution of natural or synthetic gypsum)

Environmental and economic impacts of CDW waste management

In many EU countries (Poland included), landfilling remains preferred method of non-hazardous CDW disposal. Nevertheless, landfilling might have severe negative impacts on environment in general and human health in particular. Though landfilled concrete, bricks and tiles prove to have negligible impact on groundwater pollution, asphalt, gypsum and wood from construction and demolition sides leave footprints on the environment. As the surface of wood used in construction is often treated with chemicals, its landfill is associated with release of methane emissions which is a greenhouse gas. Landfilling of gypsum poses a threat to environment due to the fact that it releases dangerous hydrogen sulphide gas if in contact with organic waste and exposed to rain. In some cases, asphalt landfill might prove

problematic due to the use of tar in the past. If asphalt contains tar, it is hazardous waste and must be treated as such. Tar-free asphalt is not a significant risk to the environment if landfilled. The important issue at hand is not only the focus on CDW impact on groundwater pollution but also the fact that landfills cover considerable area of land which could be used otherwise.

Regarding the treatment of CDW, the preparation for re-use of nearly all CDW does not come without cost. The majority of CDW must be crushed in order to be recycled and it causes several issues – first, it creates dust which might cause serious health problems for workers and second, noise production can have negative consequences for both humans and fauna surrounding the treatment facility.

The clear benefit of re-use of CDW is that there is no need for virgin aggregates to be extracted and be processed. Resources of wood and gypsum are becoming scarce and price of them is increasing significantly. In these two cases, recycling might become encouraged due to financial aspects. For instance, due to a limited amount of raw gypsum, the price of raw gypsum increased more than 50% in the last 3 years [231]. On the other hand, in case of bricks, tiles, cement and asphalt, cost of production from recycled materials does not differ significantly from cost of production from virgin materials.

The re-use of recovered CDW avoids the manufacturing processes which are usually associated with high energy consumption and emissions. For instance, the most negative environmental impacts of concrete derive from cement production. The direct re-use of concrete blocks avoids the production of concrete and potentially also the cement production. Moreover, the carbon footprint for recycled asphalt is lower than for asphalt made of raw materials.

Drivers / barriers to increase recycling

Provided in section 20.4.2

20.5.2 Recycled materials from CDW

As previously mentioned, recycled CDW aggregates are mainly used for construction of roads, railroad infrastructure and for backfilling. Widely recycled CDW include polystyrene, shredded glass, paper and mineral wool shredded with paper.

20.5.3 Market conditions / costs and benefits

The Decree of the MoE on fees for use of the environment defines the fees for landfilling. The Decree specify rates for each waste code; fees for CDW landfilling range from 11.67 PLN to 165.54 PLN (about 2.7 EUR to 38.7 EUR) for tonne of waste [229].