

## **LOGISTICS WASTE MANAGEMENT IN CZESTOCHOWA CITY**

PAULA BAJDOR<sup>1</sup>–JANUSZ K. GRABARA<sup>2</sup>

**Abstract:** In present days, the waste management, especially municipal waste, becomes more important than before. Together with the economy development, higher numbers of products offered and bigger customer's demand, the level of waste generated by humans are getting higher as well. Non-used waste are directed to the landfills and there, have a negative impact not only on the ecological environment but also on social environment – the landfills may have a significant impact on social living conditions as well. Presented article describes how introducing the logistics aspects into municipal waste management may cause its re-use, and at the same time, has impact on landfill decreased and its negative impact on the environment. This article describes the options used in the presented Czestochowa city to manage the waste, created by households and industry.

**Keywords:** municipal waste management, waste, logistics, reverse logistics, recycling, composting

### **1. Introduction**

Beginning the considerations on logistics aspects in municipal waste management, it is worth to present the traditional logistics definition. The most common logistics definition is the term defined by the Council of Logistic Management in USA: “Logistics management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements. Logistics management activities typically include inbound and outbound transportation management, fleet management, warehousing, materials handling, order fulfilment, logistics network design, inventory management, supply/demand planning, and management of third party logistics services providers” [4].

The main logistics' task is to looping after the production process, Basic operations such as transfers and preparation to start the production process. All these activities have a significant share in the next phases – like offering the products to the clients [6]. For many years, the above definition has been treated as the best term and the most appropriate to describe the logistics. But, over the years, have been many changes on the market economy, which caused that the traditional meaning of the logistics has been proved to be insufficient. Today, enterprises are forced to activities, which are far away from the area described by the traditional definition. All these activities are connected with products management, which have been already used by the customers, and, meantime, the logistics process, directed from the source to the customer, has been reversed, and is directed from the customer to the source. It caused that new logistics concept has been developed, called reverse logistics.

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<sup>1</sup> assistant, Czestochowa University of Technology  
Paula.bajdor@gmail.com

<sup>2</sup> university professor, Czestochowa University of Technology  
janusz@grabara.eu  
42-200 Czestochowa, ul. Armii Krajowej 19b, Poland

## 2. Logistics waste management conception

The most common definition of reverse logistics, is the term formulated by the Council of Logistics Management: “A specialized segment of logistics focusing on the movement and management of products and resources after the sale and after delivery to the customer. Includes product returns for repair and/or credit” [5]. Reverse logistics can be, also, considered as a logistics waste management, logistics utilization or logistics management of waste streams.

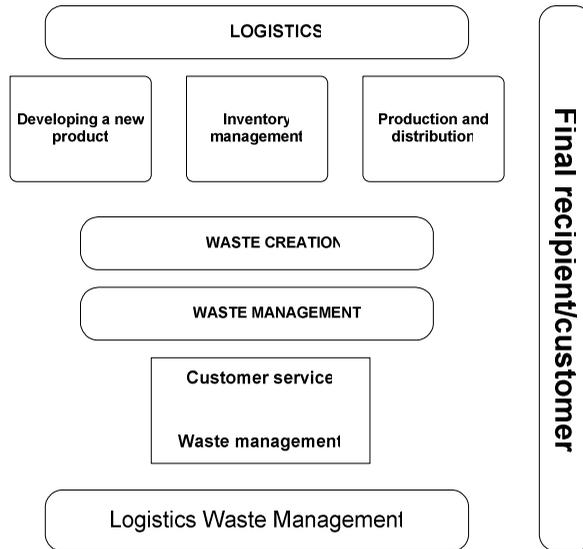


Figure 1. Logistics and Waste management

The above figure clearly illustrates that the logistics waste management is somewhat in opposite to the traditional logistics. Only some elements are similar, as transport and storage, but even they are slightly different. The main difference is an aim – the traditional logistics includes all processes that are creating and delivering the finished product to the customer, that it fully satisfies his needs, and logistics waste management involves supporting the finished product, as well as dealing with the remnants of it. From the Figure 1 is possible to extract the elements of the traditional logistics relate to processes such as:

- Developing a new products covers design, technology, materials and creating prototypes,
- Inventory management includes: relations with the recipients, planning, supply, creating components,
- Production and distribution covers: technology processes, integration, configuration, controlling and testing, packaging and transport.

Defining the logistics waste management conception, it is necessary to put in a right place its processes according to traditional logistics and supply chain. The logistics waste management conception is an opposite to traditional logistics. Only, transport and inventory are similar processes, but even between them are some differences – especially in regards to the goods or products. But the biggest difference taking place here is the main goal – in

traditional logistics is about to create and provide the products to the clients and in logistics waste management – the main goal is service in regards to products and in regards to waste after it. In logistics waste management, the following elements take place: recycling, recovery, re-use, which are not appear in traditional logistics [16].

The logistics waste management conception is mainly concentrated on the collection and processing the waste in an effective way, both, for waste not available to re-use and for waste which can be re-used and some additional value can be generated from them [9]. With the first waste, the waste management concerns on its ecological disposal. And the waste having some value are managed to be introduced to supply chain again.

### **3. The waste characteristics and its types of processing**

The subject of logistics waste management are the waste, generated from the production and consumption processes. The legal act describes the waste as: all products and solids, non-municipal liquids generated from the market activity or human living and which are unsuitable in the place and time, where and when have been generated, sewage sludge are also considered as a waste [15].

The waste is an every material generated from the human or environment activity, as a unintended but difficult to avoid, results. Waste is a product not suitable to use or to use with its original purpose at the certain place and time [1]. Due to the location of waste generation, we can select waste into [16]:

- Municipal – caused by human activity,
- Industrial – caused by economy activity,
- Dangerous – most of them are the industrial waste but they cause a danger for the human life and environment condition.

The sources of waste are the households and the infrastructure objects operating in trading, service, education and tourist sector [13]. Analyzing the waste according to technology possibilities connected with its recovery, it is possible to select the following waste streams [2]:

- Organic waste – from house, garden and parks,
- Green waste – flowers, plants, fruits and vegetables,
- Papers and cartons – packaging,
- Plastics – packaging,
- Textiles,
- Glass,
- Metals,
- Mineral waste – ground, stones, sand,
- Ashes – waste from the fire processing,
- Building waste – from building areas,
- Large waste,
- Dangerous waste

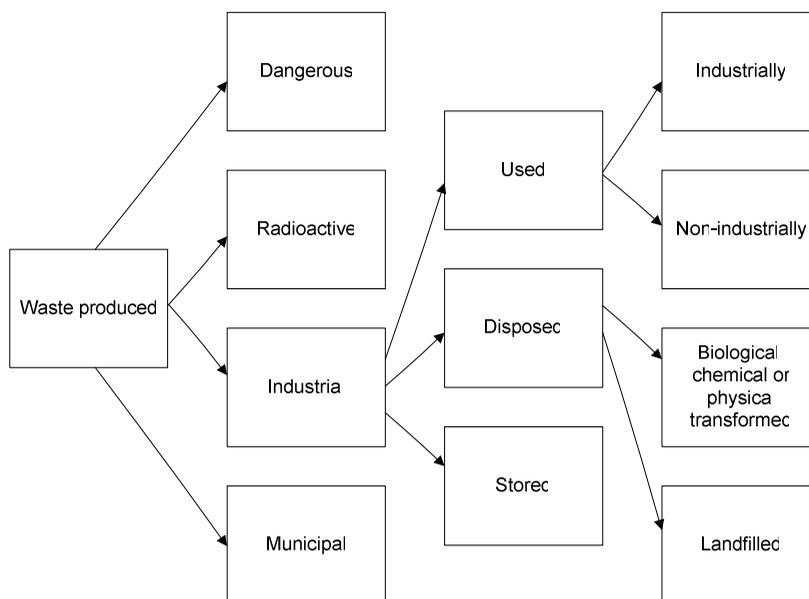


Figure 2. Waste selection scheme

According to the logistics waste management conception, these wastes are not only useless products, but as a result of some markets activity, they can be valuable again. Most of the waste described above, as a result of transformation processes, such as recycling, thermal treatment, composting and storage, can become a product having some significant value.

#### 4. Waste management in Czestochowa city

In Czestochowa city the Policy of waste management are consistent with the regulation of Waste Act: it specifies the rules for waste management in a manner to ensure the protection of the life and health of people and the environment in accordance with the principle of sustainable development, in particular the principle of waste prevention or reduction of waste and their environmental impact, as well as the recovery or disposal of waste [3].

The waste management in the city is primarily perceived by specialized companies collecting unsorted municipal waste (mixed). In the housing area the unsorted municipal waste collection is carried by using the containers with a capacity of  $7\text{m}^3$  and containers with a capacity of  $1100\text{ dm}^3$ , while in the single-family housing area the waste collection is carried by using the a container with a capacity of  $120\text{ dm}^3$  and  $240\text{ dm}^3$ .

Currently in the city, from the initiative of some export companies and the City Hall, is carried out a selective waste collection. From the year 2002, 78 containers of selective collection were deployed. Each set of these containers includes 3 boxes for the paper, glass and plastics collection with a capacity of  $1100\text{ dm}^3$ . Containers for separate waste collection are located in areas of housing area. Assuming that one set can handle about 500 people, it might be said that 28% of the population of housing area have access to the separate collection.

In the year 2010 the volume of selective waste collection was 297,0 Mg, in which:

- Paper – 156,4 Mg,
- Glass – 111,7 Mg,
- Plastics – 28,9 Mg,

All these waste were directed to the specialized processing factories.

Table 1

*The amount of municipal waste collected in the year 2010*

<b>The source of waste</b>	<b>The amount of municipal waste (Mg)</b>
Mixed municipal waste	85 551,5
Waste from cleaning the streets	10 375,6
Waste from parks and gardens (biodegradation waste)	211,6
Large waste	576,2
Soil, ground and stones	211,3
Selected municipal waste	279,0
<b>TOTAL</b>	<b>97 205,2</b>

In Czestochowa city lives around 254 000 citizens, having in mind the in the year 2010, 97 205,2 Mg municipal waste were collected, it can be assumed that for each citizen there is 371 kg/M/a municipal waste.

Waste generated by the city, are collected by the municipal organization, the collection used the process of selection at the place of waste generation. First wastes are selected into dry and wet fractions. The dry fraction makes it possible to further dry separation in order to separate recyclables which include paper, plastics, metals and glass. The municipal organization also collects waste from sites specifically dedicated to the storage of bulky waste of repairs, waste electrical and electronic equipment, hazardous waste and biodegradable. Then waste, both “dry” and “wet” are transported to a place where they are subjected to the processes of recycling, composting and landfill to recover extracting secondary raw material and organic matter

Recycling – the main purpose of this process is the recovery of waste materials which are suitable for re-use, and thus the amount of waste is greatly reduced. Some importance here is the fact that the beginning of this process is a selective collection of waste for recycling. Separate collection is always used because it is an important element that affects the efficiency of the recycling process.

Recycling materials can be done by [12]:

- Reuse of materials without changing their status and composition to produce new products;
- Re-use of waste materials or products;
- Reprocessing of materials combined with the change of their status and composition.

As a result of the recycling process are obtained all kinds of materials, from compost to the alternative fuels that are used as fuel in industrial furnaces (the recipient of this type of fuel are two large industrial plants operating in the city). The first step of this process is further peeled segregation of waste, already pre-segregated. Re-sorting is done manually or mechanically. Re-segregation are required by the customers who accept only waste characterized by high technical parameters. For example, the glassworks requires only uncontaminated glass. If recycling is the end product of the fuel, the production itself is not time-consuming process and it is mainly connected to the fragmentation of the waste they received the appropriate chemical composition.

Composting – is a oxygen process, biochemical decomposition of organic plant and animal origin contained in the waste, which under certain conditions are transformed into humus mass sallow high-value fertilizer called compost [8]. The process of obtaining compost is relatively long, and during that period hydrogen and other gases are precipitated. In addition, the reduction of the composting process is the increasing lack of demand for compost.

Storage – landfills are one of the key elements of any waste management system and is the ultimate place to deposit it. At present, produced in Poland municipal waste in 99% are deposited in landfills. The main reason is financial considerations. At the site, in addition to municipal waste, among others reach similar to municipal waste, construction debris, soil from the excavation, dehydrated sewage sludge and waste from industrial processes [11]. Until 2008 it was the cheapest method of waste management, and thus have a deterrent effect on the use of other waste treatment processes. The city having a large area of the site has paid more attention to the introduction of new waste treatment methods, such as not planning to introduce thermal waste treatment method because its cost is several times higher than depositing waste in landfills. But in early 2008 [10] introduced an increase in charges for the storage of waste in landfills and introduced a law to change the distribution of competence and tasks of local administration. The purpose of this Act is to improve and sealing the waste management system, the elimination of wild landfills and reduce the amount of waste incinerated in the home. The high increase in fees for waste disposal from 14 to 75 plz is dictated by encouraging companies to implement solutions to the disposal and recovery of waste. From year to year, this fee is steadily increasing, which should result in a decrease in the volume of waste deposited in landfills.

## **5. Conclusion**

The city operates on waste market has complied with the requirements of the market, and is a local leader among companies operating in the same area. The processes of data collection and waste disposal have been organizing the efficient system and generate specific benefits. These gains are entirely devoted to the development and investment, as the city plans to make the process of thermal treatment of waste in 2012. The introduction of heat treatment significantly affect the change in the organization of logistics processes

throughout the city. First of all, have a positive impact on the efficiency in the field of waste management. However, this kind of action will have a significant impact on improving the environment. In addition, the introduction of this solution will significantly strengthen the position of the city in the region, since the use of innovative solutions resulting in immediate or slightly distant time benefits. In the case of waste management, the solution (thermal treatment of waste) will allow the re-use of waste in the production of heat or energy which, due to the constant search for cheap sources of heat and power, today is a very important issue.

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