

Recycling Today: Comparison and Analysis of the Waste Recycling Management in Macedonia and Germany

Ana Karamandi¹, Stojance Nusev¹, Ilios Vilos¹, and Cvetanka Mitrevska²

1. University "St. Kliment Ohridski", Faculty of Technical Sciences, Republic of Macedonia

2. Internacional Slavic University Gavrilo Romanovic Derzavin, Faculty for Safety Engineering, Republic of Macedonia

Abstract: Waste is an integral part of everyday life and the habit of dealing with waste is taught from childhood and becomes routine and unconscious behavior. Treating waste covers all social categories. Success in dealing with waste and its reduction within one state seeks to engage more entities — the legislature, legal entities for waste management and the educational system. Also, success in dealing with waste and its reduction depends on technological development and availability of modern technologies, chemical and thermal processes for treatment of the waste. The efforts made for treatment of the waste are because we gain great benefits such as reduction of waste, savings on raw materials, minimizing the pollution, protection of the environment and our own health.

Key words: waste management, recycling

1. Introduction: Meaning, Short History and Importance of the Recycling

The word Recycling (lat. Recycle: re - again, cycle - round) means repeating the cycle.

To design an object, certain materials and techniques are used by which that object gets its final form. The objects or items can be made from multiple parts of different materials. When the object has no longer value it becomes waste, but the elements and materials of which it is made can be reused or recycled. The re-use or recycling can be done by:

(1) Diversion of the object or the parts of which it is composed

(2) Processing of materials for obtaining materials in pure raw form from which can later be developed new items. Recycling is not a new activity for the humanity, people make conversion and reuse of the materials already a long time ago. For example, as it is known, first recycled paper is produced in Japan 1031, the "new paper" produced from old and already used paper; 1776 during the Fight for independence, America has gathered various metals and melt them to obtain raw materials for making weapons; 1904 in Chicago, Cleveland, the first plant for recycling aluminium was opened. With the beginning of the industrialization and mass production, recycling gets more organized form — waste is selected and the materials are recycled for reuse. Here are several reasons for recycling:

- Reducing waste
- Savings on raw materials
- Biodegradability
- Environmental protection

With recycling of the used materials (waste) raw materials are obtained much more easily than they can be obtained from ores that are in the earth. Also the

Corresponding author: Ana Karamandi, Assistant Professor, research areas/interests: materials for packaging and emballage, recycling of materials. E-mail: anakaramandi@gmail.com.

process of recycling uses less power and raw materials (coal, oil, gas, water, electricity) for its issuance than if the materials are derived from ore or other resources. It should be mentioned that the Earth is not an infinite source of materials, so it is good if the materials are re-used.

Nowadays we have a production of materials that are not biodegradable or cannot be decomposed in a natural way with the sun, water and bacteria. Their simple disposal, as is the case with the waste of organic origin, would cause encumbering the parts of land that could be used more appropriate.

Also, some of the materials that are produced, can have a harmful impact on wildlife with their decomposition and cause pollution and destruction of the living organisms (animals and plants) in nature, and they can cause damage to human health. Given that, for protection of the environment, such materials is better to be recycled. In terms of environmental protection, it should be mentioned that the pollution of water, air and soil in the process of recycling is much smaller than in the process of the initially obtaining of materials.

2. Comparison of the Recycling Rates in Macedonia and Germany

From the analysis of waste recycling in European countries in 2004 and 2012, according to European Environment Agency and Eurostat, Macedonia has the lowest rate of recycling in 2004 (2008) and 2012 (2011), compared with Germany which has the highest recycling rate in approximately the same periods (see Fig. 1).

Note for Fig. 1: The recycling rate is calculated as the percentage of municipal waste generated that is recycled and composted. Changes in reporting methodology means that 2012 data are not fully comparable with 2004 data for Austria, Cyprus, Malta, Slovakia and Spain. 2005 data used instead of 2004 for Poland due to changes in methodology. Due to data availability instead of 2004 data, 2003 data were used for Iceland; 2007 data used for Croatia; 2006 data used for Serbia. For the Republic of Macedonia, 2008 data were used for 2004, and 2011 used for 2012.

Macedonia has recycled a very small part of its waste, only 11.75% in 2011 (Table 1) and 18.86% in 2012 (Table 2) while Germany has level of recycling 63.0% in 2011 and 65.2% in 2012 (Eurostat).



Fig. 1 Municipal waste recycling rates in European countries, 2004 and 2012 (Source: Eurostat Data Centre on Waste).

Table 1Waste by material, placed on the market (tons)and recycled (tons) in 2011 (Source: Ministry ofEnvironment and Physical Planning in R.M.).

gg				
Type of material	Placed on the market	Recycled (or exported for recycling)	Recycling rate (%)	
Glass	9 241.36	29.00	0.31	
Plastic	13 963.12	2 657.06	19.03	
Paper and cardboard	16 660.45	2 927.32	17.57	
Metal	1 691.37	66.96	3.96	
Wood	2 973.93			
Composite materials	2 808.09			
Other/ packaging not selected by type	1 002.51			
Total	48 340.83	5 680.34	11.75	

Recycling Today: Comparison and Analysis of the Waste Recycling Management in Macedonia and Germany

Table 2Waste by material, placed on the market (tons)and recycled (tons) in 2012; (Source: Ministry ofEnvironment and Physical Planning in R.M.).

Type of material	Placed on the market	Recycled (or exported for recycling)	Recycling rate (%)
Glass	42 515.62	-	-
Plastic	8 712.39	4 147.31	31.00
Paper and cardboard	13 379.35	3 853.31	28.65
Metal	13 448.45	2.63	0.17
Wood	1 528.69	15.00	0.54
Composite materials	2 759.27	-	-
Other/ packaging not selected by type	2 687.48	-	-
TOTAL	42 515.62	8 018.24	18.86

The percentage of recycled waste in Macedonia for a period of one year has increased by 7.11% while the percentage of recycled waste in Germany for one year has increased by 2.2%.

3. Analysis of the Waste Management in Macedonia and Germany

Macedonia has shorter history of recycling compared with Germany. The "Law on Waste Management" was adopted in 2004 and the "Law on management of packaging and waste from packaging" in Macedonia was adopted in 2009.

The non-profit organization for waste management "Pakomak" was founded on 3 December 2010 by the 11 leading manufacturing companies in Macedonia. "Pakomak" is working to ensure responsible, efficient and most economically affordable management of the customers packaging waste in accordance with the legal obligations.

Since 20 May 2011 "Pakomak" joins the international network of packaging waste management Pro Europe and receives the license to use the symbol "Green Dot" which is a financial symbol. This symbol signifies that for the packaging that has this symbol a fee has been paid for handling the waste after its use. The fee is calculated by weight of the waste material,

and not all Macedonian companies are aware for reducing the weight of their packaging.

Another facing problem is absence of companies for recycling glass, wood and composite materials so the waste should be exported or treated in different ways.

Macedonia has many "wild" landfills and is working to close them, so in 2011 "Closure Plan for non-compliant landfill in Macedonia" is prepared.

Also, psychological and sociological behaviour of the people on managing their waste and make separation of the waste for recycling should be changed. Therefore, a lot of educational campaigns are made.

Unlike Macedonia, Germany has established the non-profit organization "Duales System Deutschland" GmbH (DSD) on 28 September 1990 by 95 companies, 20 years earlier than Macedonia. In 1991, Germany adopted the "Packaging Ordinance", which requires all manufacturers to collect and then recycle or reuse the packaging after its disposal by the consumers. DSD is a founding member of the "European Grüner Punkt" ("Green Dot") and umbrella organization "Pro Europe".

Making corporations responsible for their packaging to the end of its life cycle, by paying a fee for handling the waste, encourages them to package goods with fewer and lighter materials in order to minimize recycling and disposal costs.

For minimizing the landfills in 1996 Germany adopted "Closed Substance Cycle and Waste Management Act", which requires businesses to eliminate waste production by implementing one or more of the three management strategies: waste avoidance, waste recovery and environmentally compatible disposal.

Germany today is not facing problems with technologies and capacities for recycling any kind of waste materials, which is not case with Macedonia.

People in Germany are introduced with separation of the waste much earlier, so separation of the waste for recycling today is a part of the everyday life.

4. Conclusion

This comparison and analysis are made to see why Macedonia has so low rate in recycling of its own waste and why Germany is so efficient in handling with waste. A comparison of these two systems for dealing with waste in both countries showed no big difference in the elements that are parts of the system for implementing and managing the waste. The differences consist in the time difference to implement the system and the time required to make a detailed and comprehensive implementation of the system.

It takes time for more detailed organization and management and it takes time to develop the concept and awareness of the people on this topic as well as acquiring new habits for dealing with the waste and recycling.

References

 European Environment Agency, The European environment — State and outlook 2015: Synthesis report, Copenhagen, 2015.

- [2] Cvetkovska M. and Rushiti A., Municipal waste management in the R. Macedonia, Ministry of Environment and Physical Planning of R. Macedonia, Skopje, Macedonia, 2013.
- [3] Fischer C., Municipal waste management in Germany, Copenhagen Resource Institute, Copenhagen, Germany, 2013.
- [4] Pro-Europe, *Uniformity in Diversity*, Brussels, Belgium, 2010.
- [5] Report on the state of the environment in the Republic of Macedonia 2013, Macedonian Information Centre of Environment - Ministry of Environment and Physical Planning Republic of R. Macedonia, Skopje, R. Macedonia, 2014.
- [6] Available online at: http://www.pakomak.com.mk/ PakomakSite/en-index.html, accessed 15 September 2015.
- [7] Available online at: http://www.motorcityfreegeek.net, accessed 15 September 2015.
- [8] Available online at: http://www.gruener-punkt.de/ en/group/der-gruene-punkt.html, accessed 15 September 2015.
- [9] Available online at: http://ec.europa.eu/eurostat, accessed 15 September 2015.