

Impacts of policy decision on municipal solid waste composition in Croatia

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Keywords: municipal solid waste (MSW), waste management, policy making decision.

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Population growth, technological development and unsustainable consumption habits has led to an increasing production of waste over the last century. Due to that, it was necessary to develop an integrated management of municipal solid waste (MSW). Nowadays, waste management is addressed in all developed countries that have developed and implemented environmental policies (Belo Pascoal, 2012). Since that Croatia actively conducts the waste management policy, the purpose of this paper was to assess the impacts of MSW legislation on the waste management system evolution and MSW composition in Croatia during the period from 1990 to 2014.

Overview of policy decision making in Croatia

According to the written documents, Croatians had started early to take care about waste management. According to the Statute of the city of Dubrovnik, which dates from 13th century, a certain system of waste disposal was formed as well as the penalty for disrespecting of the given orders. Furthermore, from 15th century dates the Statute of the city of Gradec (a part of the city of Zagreb today), which had an order about the necessity of keeping the city streets clean (Runko Luttenberg, 2011). The modern approach to waste management in Croatia was applied in 1904 when first waste incineration had started with its work in the city of Rijeka (Fundurulja, 2009).

The 21st century was characterized with the poor waste management solutions, as the disposal of waste to abandoned excavations, pits or caves. By the end of 21st century, during the 1980's, the relevant state institutions had actively involved in finding the waste management solutions through orders of the laws that can be applied to waste management area like Construction law, Water law etc. (Fundurulja, 2009).

During the 1990's with the formation of the Republic of Croatia, a waste legislation was formed. First Waste Act (OG No. 34/95) was issued on March 27th, 1995 and it was not in accordance with the EU regulations. The stated law gave the first law definition of waste. The municipal solid waste was defined as 'the waste from households, waste which is generated by cleaning the public streets and waste which is similar to the waste from households but it is generated in industry, institutions and public services'. The highlight of the law was on the separate collection of packaging waste.

The second Waste Act (OG No. 151/03) was issued on January 1st, 2004 with one subordinated regulation. It was the first Croatian waste law that was in accordance with the EU regulations. It was in accordance with the Council Regulation (EEC) No 259/93 of 1 February 1993 on the supervision and control of shipments of waste within, into and out of the European Community; Council Directive 75/442/EEC of 15 July 1975 on waste; Council Directive 91/689/EEC of 12 December 1991 on hazardous waste; Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste and Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE). The highlight of this waste law along the packing waste management was the construction waste management, WEEE management, end-of-life vehicles management and waste tires management.

The third Waste Act (OG No. 178/04) was issued on December 24th, 2004 and it was in accordance with the 18 European regulations. It was issued shortly after the second waste law, due to gained Croatian official status of the country candidate for EU membership. The law definition of municipal waste is shorten to 'waste from households and waste from production and / or service activity that it is similar by its properties and composition to waste from households'. This waste law introduced the term of special waste categories that had to be collected separately; packing waste, WEEE, end-of-life vehicles, waste batteries and accumulators, waste tires, medical waste, coal and mineral waste and waste oils. Over the years, the law had 4 amendments (2005, 2006, 2008 and 2009) and 27 subordinated regulations of which 12 are no longer in force (Central Government Portal, 2017).

The fourth, Act on Sustainable Waste Management (OG No 94/13) that is currently on force, was issued on July 23rd, 2013 after that the Republic of Croatia has become the 28th member state of European Union. The law is in accordance with 12 European regulations. The following special waste categories were defined by the law: bio-waste, textile and footwear waste, packaging waste, end-of-life tires, waste oils, waste batteries and accumulators, end-of-life vehicles, asbestos-containing waste, clinical waste, WEEE, end-of-life ships, marine waste, construction waste, wastewater treatment sludge, wastes from titanium dioxide production, polychlorinated biphenyls waste and polychlorinated terphenyls waste. So far, the law had one amendment (2017) and 26 subordinated regulations.

Municipal solid waste composition in Croatia

Waste composition is influenced by many factors, such as level of economic development, cultural norms, geographical location, energy sources, and climate. As a country urbanizes and populations become wealthier, consumption of inorganic materials (such as plastics, paper, and aluminum) increases, while the relative organic fraction decreases. Generally, low- and middle-income countries have a high percentage of organic matter in the urban waste stream, ranging from 40 to 85% of the total. Paper, plastic, glass, and metal fractions increase in the waste stream of middle- and high-income countries (World Bank, 2012). Therefore, for the purpose of this work, provided data were analysed according to the following MSW components, bio-waste, waste leather and bones, waste wood, waste textile, waste paper, waste plastic, waste glass, waste metal, waste rubber and other waste.

Certain differences in bio-waste percentage composition by weight of MSW over the last 24 years are noticeable. The most significant difference in percentage composition is noticeable in 1991 and it is due to the war (25.7%, wt. of MSW). Decrease that is noticeable in 1997 (54.3% wt. to 42.5% wt. of MSW) can be interrelated with the entering into force of the first Ordinance on waste categories (OG No. 27/96) and Ordinance on waste treatment conditions (OG No. 123/97). Over the 2000's it is noticeable a slight decrease in percentage by weight of bio-waste in MSW. Even though that bio-waste is a special waste category which should be managed separately from MSW and according to a special regulations, the Ordinance on bio-waste management in Croatia has not been issued yet.

Waste leather and bones as a MSW component can be observed as a bio-waste or as a separate MSW component. It is interesting to observe the percentage composition of waste leather and bones by weight of MSW because it is noticeable up to 2000 that percentage composition is dependable on economic activities (it is above 1% wt. of MSW), while afterwards there is a significant decrease of percentage composition (under 1% by weight) due to the entering into force of the Ordinance on way of treatment with byproducts of animal origin that are not for human diet (OG No. 56/06).

Waste wood as a component of MSW also can be observed as a bio-waste. When it is observed separately, it is noticeable that in Croatia the percentage composition of waste wood by weight of MSW is dependable on the area of sampling, whether it is a rural or urban area, continental or Adriatic region.

When the waste paper percentage composition as a component of MSW is observed, in overall, it is not possible to conclude that policy making decision had an impact on percentage composition of waste paper by weight in MSW.

In order to prevent disposal of packaging waste (plastic, glass, metal) on landfills, separate collection of packaging waste was proscribed with the first waste law and it was prolonged with other waste laws and ordinances. Nevertheless, it is evident that economic activities and tourism have a greater impact on the percentage composition of packaging waste by weight of MSW than policy making decisions.

First Ordinance on textile and footwear waste management (OG No. 99/15) was issued in 2015, so fluctuations in percentage composition of waste textile by weight of MSW are the consequence of economic activities.

With the first Ordinance on waste tire management (OG No. 40/06) and its amendments which had brought an order of a separate collection of waste tires, a significant decrease of percentage composition of waste rubber by weight of MSW is noticeable after 2006.

Conclusion

EU policy and regulations have had an impact on Croatian legislative, since that Croatia has gone through the process of becoming a member state of EU. Regarding to the waste management policy, the impact is visible in special waste categories management. Furthermore, it is possible to determine the direct impact of legislative on certain MSW component composition, like a decrease in percentage composition of waste leather and bones and waste rubber by weight of MSW. On the other hand, it is noticeable that legislative order cannot compete with the technological advancement, which is evident for packaging waste percentage composition.

Acknowledgments

For the purpose of this paper, data from municipal solid waste characterisation sampling were provided by the company IPZ Uniprojekt Terra Zagreb Ltd, Croatia.

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