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THE IMPACT ASSESSMENT OF DIFFERENT FEE SYSTEMS ON THE MUNICIPAL WASTE MANAGEMENT EFFECTIVENESS

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The most widespread monetary motivation in the municipal waste management is a pay-as-you-throw (PAYT) or unit-based pricing scheme when fees are directly based on the volume of waste produced by a household. This approach forces the households to carry the full social costs of their waste disposal decisions, inducing more efficient choices. Volume-based schemes usually require households to purchase waste bags or stickers (tokens) that they can attach to their waste containers. The aim of our research was to assess the waste management system in the municipality of Dolný Ohaj, where different payment systems for municipal solid waste (MSW) charges were introduced during the monitored period (2012–2016). While a lump sum had been used in the municipality up to the end of 2014, a volume-based scheme in a form of the token system was introduced and applied in the municipality from the beginning of 2015 onwards. The main focus was to analyse the waste management of the municipality during the studied period 2012–2016 with the emphasis on municipal solid waste fees, the generation of MSW and residual fraction, municipal waste management revenues and expenditures as well as evaluation of economic results. The production of MSW in kilograms per person had decreasing tendency during the monitored period. The highest MSW production was observed in 2012 (262.68 kg.capita^{-1}.year^{-1}) and the lowest in 2016 (175.85 kg.capita^{-1}.year^{-1}). During the monitored period, also the amount of landfilled residual waste was decreasing. In 2016, the lowest quantity of landfilled MSW (237,150 kg) was recorded. The municipality reached noticeably better economic results in waste management during the period under the volume-based waste collection scheme.

Keywords: municipal solid waste, waste management, municipal solid waste fees, Dolný Ohaj municipality

Proper legal implementation and practical enforcement of EU waste legislation are the key priorities of the EU environmental policy. In particular, major discrepancies exist in the implementation of the Waste Framework Directive (2008), defining the basic principles of environmentally sound waste management. The Report on the Thematic Strategy on the Prevention and Recycling of Waste, published by the European Commission in 2011, stipulates that the proper implementation and enforcement of the EU acquis remains a priority and related monitoring at Member States (MS) level will be performed. One of the main recommendations for the Slovak Republic (SR) was to extend and enforce the PAYT scheme (also known as unit pricing (Dijkgraaf and Gradus, 2004) and differential and variable rate or variable fee charge systems (Van Beukering et al., 2009)) and to provide incentives and support for households to participate in separate collection (European Commission, 2013). Slovak legislation has not supported PAYT schemes yet and Slovak municipalities only rarely co-opt economic incentives to develop separate collection.

According to the current legislation, the collection of residual MSW generated on the territory of a municipality should be financed solely by local fees for MSW, collected annually from the individual waste producers. The means of waste collection depends mainly on whether a lump sum for its transport is levied by the municipality authority or the fee amount is directly proportional to the volume, respectively the mass of produced residual MSW. We focused on comparison of two different payment methods of fees for MSW collection in the Dolný Ohaj municipality (Nitra Region, Slovakia) during the studied period from 2012 up to 2016. While a lump sum scheme had been used in the municipality up to the end of 2014, a volume-based scheme in a form of the token system was introduced and applied in the municipality from the beginning of 2015 onwards. The main aim of the paper was to find out which of these fee methods was more efficient for the purposes of municipal waste management.

Material and methods

The municipality of Dolný Ohaj is situated in the Nové Zámky district and has got a population of 1,554 citizens and with its cadastral area of 17.03 km^2 it can be classified as a medium-sized municipality in this specific district. Up to the end of 2014, the citizens had paid the local community fee for MSW collection in the form of a lump sum per household member (Table 1). In January 2015, the method of MSW fee payment changed to volume-based scheme in the form of a token system. Under this scheme,

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Table 1 Lump sum rate for residual MSW at Dolný Ohaj municipality during 2012 - 2014

Year	Lump sum rate in €.person^{-1}.day^{-1}	Lump sum rate in €.person^{-1}.year^{-1}
2012	0.03836	14
2013	0.03836	14
2014	0.07672	28

Table 2 Lump sum rate for single waste disposal according to the collection container volume at Dolný Ohaj municipality in 2015 and 2016

Type of container	Token price in 2015	Token price in 2016
0.110 m^3 container	1.70 €	1.85 €
0.120 m^3 container	1.85 €	2.00 €
1.100 m^3 container	17.00 €	18.50 €

the household pays its fee for residual MSW by purchasing tokens at the local authority, price being dependant on the volume of the waste container (Table 2). Only containers marked with a purchased token are emptied when the residual MSW is collected. If the household does not participate to volume-based scheme during the first half of the year, the municipality has the right to levy a lump sum of 20 € per year per each person in a household. The monitored municipality participates in separated waste collection of glass, plastics, paper, metals, electric household waste, edible oils and fats from households, used portable batteries and accumulators, automobile batteries and accumulators, and biodegradable waste. Specific sacks and collecting containers are designated for separated waste. If necessary, every citizen can deliver separated MSW components also to the collection yard free of charge.

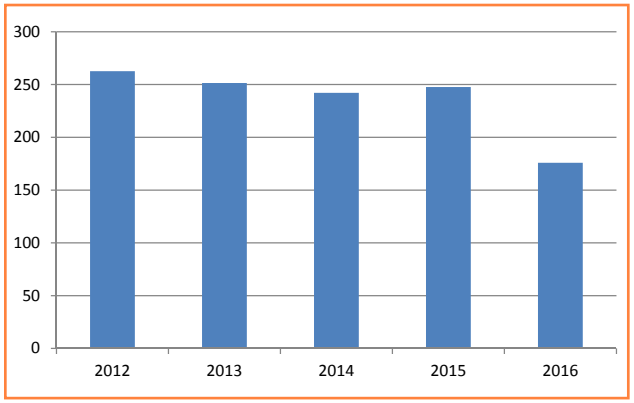

Fig. 1 MSW production in Dolný Ohaj during the period of years 2012–2016 (kg per capita per year)

Results and discussion

According to the data analysis from the Annual reports on MSW in the Dolný Ohaj municipality and the number of citizens for the period of the years 2012–2016, the following results were obtained. The lowest quantity of MSW was produced under the established volume-based scheme in 2016. In the same year, the most significant decrease in the amount of produced MSW by 112,870 kg was recorded in comparison to the previous year. Also, the waste production per capita had a declining trend over the whole studied period. The highest waste production rate (262.68 kg.capita^{-1}.year^{-1}) was observed in 2012, while the lowest one (175.85 kg.capita^{-1}.year^{-1}) was recorded in 2016 (Figure 1). Regarding the residual MSW which was deposited at landfills, the same trend in gradual decrease of produced waste quantity with time was observed. While there were 383,120 kg of residual MSW disposed at landfills in 2012, the amount dropped to 237,150 kg in 2016. After the shift from the lump sum waste collection scheme to the volume-based scheme, no increase in occurrence of illegal landfills in municipality proximity was recorded.

The municipality achieved a better economic result in waste management after introduction of the volume-based scheme (Table 3). In 2015, the municipality gained a profit of 1,096 €, which nearly tripled in 2016 (2,792 €). Under the lump sum scheme, the municipality was profitable only in 2012. In 2013 and 2014, the municipality incurred losses that had to be paid out of its budget (Table 3).

Table 3 Income and expenditure in the waste management division at Dolný Ohaj municipality for the period of years 2012–2016

Year	2012	2013	2014	2015	2016
Income in €	23,955	22,405	22,730	19,537	20,595
Expenditure in €	23,250	24,500	22,800	18,441	17,803
Expenditure per capita in €	14.54	15.57	14.51	11.87	11.51
Net income in €	705	-2,095	-70	1,096	2,792

In some of the front-running EU Member States such as Germany and the Netherlands, PAYT has very often been called for in the past as an instrument to address citizens' concerns and demands for fair treatment in response to ever increasing charge burdens. Higher transparency as to the individual cost allocation for waste management services provided may also be a crucial driver for a wider dispersion of the PAYT approach in Europe in the future (Reichenbach, 2008). Numerous communities nationwide have found it beneficial to adopt various forms of the PAYT scheme to reduce solid waste output, promote greater equity, and increase recycling by residents (Skumatz and Freeman, 2006; Lee and Paik, 2011; Park and Lah, 2015) as well as their environmental awareness (Adamcová et al., 2016).

Conclusion

Based on the comparison of the periods when different fee methods for waste collection were applied, it can be concluded that the introduction of the volume-based scheme in a form of the token system was the right decision made by the authority of the Dolný Ohaj municipality. The waste management is more effective and the municipality gained better results in the area of waste disposal.

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