

## SOCIAL AWARENESS ON WASTE PRODUCTION IN RURAL AREAS

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**Abstract.** The research focuses on the waste management system in seven rural municipalities of the Czech Republic. First, assessment of different legislation instruments which regulate and control waste management (also on the municipality level) has been done. In this respect the situation is the following: the Czech legislation allows the local governments to opt for one of the three systems of payment for waste. The three options imply: Local Fee, Fee by Act on Waste and Contractual form by Act on Waste. But not all of these systems motivate people to reduce, reuse and recycle. The article compares the above systems of payment for waste and their influence on the behaviour of the inhabitants. The analysis of the quantity of different types of waste per capita during the years 2007-2011 was conducted in relation with the demographic factors, location, types of legislation applied and attitude of the municipality management toward the environment. The survey also shows diverse attitudes of specific social groups toward the waste disposal.

**Keywords:** waste, rural, recycling.

### Introduction

Waste management is one of the key concerns in the modern ecology. The consumption of disposable goods is extremely high and the durability of the long term goods is quickly decreasing. Customers buy the bargains in sales without considering the environmental impact of buying cheap and so usually low-quality goods. This causes different amounts of produced waste in each household.

The main objective of the experiment was to find out whether the influence of the existing legislation has a positive impact on waste management at the municipality level. The article concludes by proving that the waste management system by Act on Waste is the most efficient (among other two alternatives) and positively motivates the inhabitants. Another goal of the research was to analyze the amount of payment for the waste management and to study the behaviour and the recycling habits of the rural inhabitants. The research particularly monitors the current situation in small municipalities in the Czech Republic via analysing the data of the collected waste. The attitude of different social groups was examined by public questionnaire.

Czech legislation offers a range of options how to handle with municipal waste. Especially, each municipality is responsible for its own system of gathering and recycling of waste as well as for motivation of its inhabitants to behave environmentally friendly [1]. The municipalities with extended powers perform the state administration of the highest level in terms of education, agriculture, culture, finances etc. and also environmental protection. These municipalities are in charge of the waste management, quality of the water in the area, define and monitor local ecologic stability, supervise the nature and landscape protection, fine the environmental offences, apply opinions on the zoning and regulation plans. This level of local government has the most important influence in environmental protection [2].

The municipalities choose from three systems of financing their waste management. These are the Local tax, Fee by Act on Waste and the Contractual form by Act on Waste and sets the height of the municipal fee which is produced within its area. The advantage of local tax for municipal waste according to § 10b of the Act on Local Fees is that it clearly defines a person taxpayer, as a natural person who is residing in the municipality pursuant to Act No. 133/2000 Coll. The fact that the Act on Local Fees defines a person taxpayer may be also its biggest drawback, since the criterion of permanent residence is a formal criterion that may ultimately fail in many cases reflecting the actual state [3].

The fee for municipal waste according to § 17a of the Act on waste compared to the local tax, much more closely reflects the actual state of things- production of municipal waste by individuals in the municipality. The payer of the fee is any natural person whose activities created municipal waste. Flip side of this benefit is that the community in the administration and collection of this fee can get into a situation where people will need in the fee proceedings prove that municipal waste is actually produced and in what quantities [4].

The review also targets the social motivation of the inhabitants toward environmental protection and waste management. Active involvement of key groups and citizens is one of the fundamental principles of sustainable development [2].

The possibility and the degree of involvement of the public are given by two factors- the interest of the inhabitants in the activities in the given area and the willingness of the local autonomy to cooperate with the inhabitants. The main principle in the local cooperation is the awareness based on the joint dialogue and communication [5]. "To involve consumers entails placing a responsibility on them in terms of the 'product'. This may include aspects of education and publicity, more take-back schemes and proposals to incentivise households to reduce and recycle their waste" [6]. The projects which support the public motivation are demonstrated as examples of a partial solution.

Implementation of the system PAYT (pay as you throw) – a fairer system of waste charges than currently used – can be shown as a motivation tool [7]. This system should offer a choice from different sizes of the dust bins as well as a choice of the periodicity of collection. An example of the towns- Hustopeče nad Bečvou or Rozsochy - shows that special tokens which are hung out on the dust bin when the household wish to collect it can be employed. People buy the tokens for CZK 68 and so they can regulate how often the dust bin will be emptied [8].

Arranging containers for organic waste or the composting units in the housing estates is another great step of local waste managers toward clean municipality. Several Czech towns participate in programmes of spreading the composting units. A great example of local government distributing composting units into 36 % of households is the town Brumov- Bylnice. The amount of the mixed municipal waste lowered by 1000 t in the given year [8].

## Materials and methods

The data regarding the waste generation and collection were collected in the years 2012-2013. The research included seven municipalities of different sizes. The time period of the collected data included the years 2007-2011. The results were divided as: mixed municipal waste, plastics, glass, tetra packs, organic, bulk, and dangerous or other waste separated in the given area.

Each municipality keeps records about waste management in different administrative ways. Some of the municipalities did not keep records older than 5 years as the previous local government threw them away. Waste managers choose their own way how to handle the waste data, so some of the records were written in hand, some were obligatory basic numbers which are sent to the Ministry of Environment and to the Czech Statistical Office, some elaborate tables with all precise data. The missing information or data from former years were obtained due to the companies EKOKOM, a.s. and other service companies.

The social motivation and general meaning about waste management was surveyed by the public questionnaire "Production of waste in households". The questionnaire was responded by 145 volunteers in February and March 2013.

The main criteria compared included demographic details as population growth in 5 years, prevailing education and the age as well as the housing development of the area, the applied waste law and the height of the waste fee. Three municipalities apply the system of waste management by the Act on Waste and four municipalities by Local Tax.

Next criteria focused on the system of waste gathering. The main details collected compared the distance between the recycling nests; number of the nests, types of the containers and how many inhabitants of the given municipality use 1 recycling nest. Another factor which plays a big role in the municipality waste gathering is the service company and the distance to the landfill or the sorting unit.

The data were processed by statistical tabular and graphical methods. The data regarding the waste generation were compared and formed into graphs to show the development in time. The growth and decline of the ratio of different types of waste were contrasted by the trend lines count for each municipality.

## Results and discussion

The overall results showed that the villages which apply Local Tax system produce 47 % more of mixed municipal waste. This fact is reflected in the results of the sorted waste. In all categories of the sorted waste the average production is higher in villages which apply Fee by Act on Waste.

The collected information about the population in the selected municipalities, applied waste law as well as the height of the waste fee and the distance to the landfill is presented in Table 1.

Table 1

**Waste management system in given municipalities**

Municipality	Population (2011)	Applied waste law (2011)	Fee per person or dustbin	Distance to landfill, km
Horažďovice	5 578	Local Tax	CZK 600/person	43
Horoměřice	3 335	Local Tax	CZK 480/person	6
Jílové u Prahy	4 222	Local Tax	CZK 500/person	1
Mnichovice	3 069	fee by Act on Waste	CZK 1750/ 120 l	35
Psáry	3 331	fee by Act on Waste	CZK 2145/120 l	53
Říčany	13 499	contractual form by Act on Waste	CZK 2520/ 120 l	36
Statenice	1 261	Local Tax	CZK 600/person	6

The research results on the mixed municipal waste production in seven target municipalities and its development in time is shown in Figure 1.

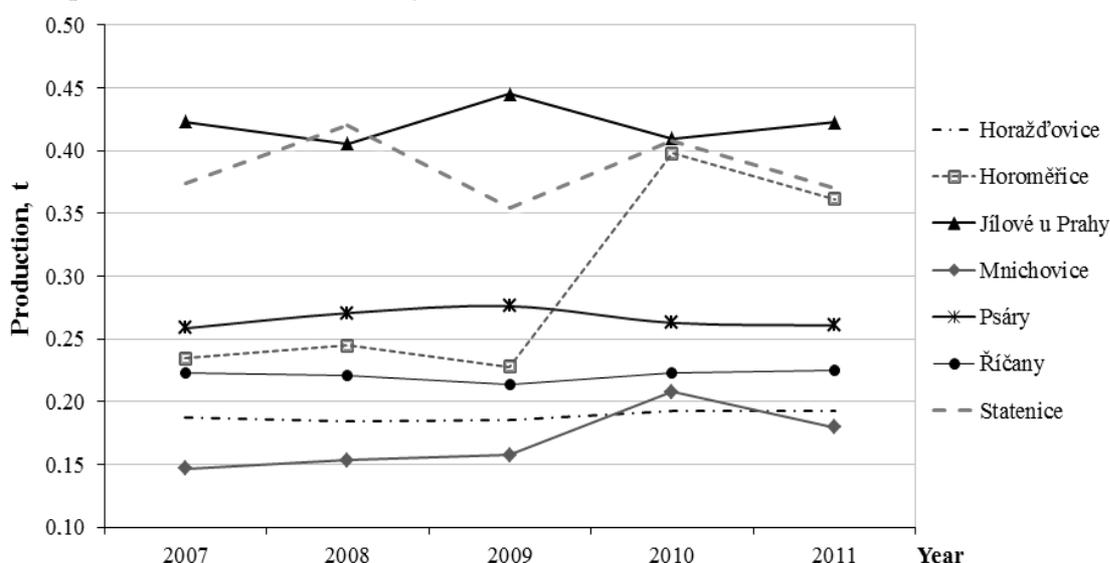


Fig. 1. Comparison of mixed municipal waste production in municipalities per 1 inhabitant

The villages which apply Local Tax generated in average by 0.52 t of mixed municipal waste per 5 years more than the villages which apply the Fee by Act on Waste.

It should be mentioned that most of the villages hire just one company which deals with all waste types. These municipalities which run their own scrap yard contract more companies which specialize in the exact type of the waste, e.g., hazardous waste, electro waste, tires, organic waste etc.

When comparing the nation-wide data (count from the data of the Czech Statistical Office from 2011) with two groups of municipalities it was found that municipalities using Fee by Act on Waste - generate less communal waste and also the ratio of the sorted waste (32.2 %) is higher. The Group of municipalities using Local Tax generate by 118 kg of communal waste more than the nation-wide average from year 2011 and the ratio of the sorted waste is 26.5 % of the communal waste.

Group 1 – municipalities with Local Tax - produced in average (per capita per year):

- 438 kg of communal waste (vs. national average of 320kg)

- 322 kg of mixed municipal waste (vs. national average of 233 kg)
- 116 kg of sorted waste (vs. national average of 46 kg)

Group 2 – municipalities with the Fee by Act on Waste - produced in average (per capita per year):

- 323 kg of communal waste (vs. national average of 320 kg)
- 219 kg of mixed municipal waste (vs. national average of 233 kg)
- kg of the sorted waste (vs. national average of 46 kg)

The results of waste sorting and recycling including the number of recycling nests and the number of inhabitants using one recycling nest are presented in Table 2.

Table 2

### Types of waste sorted in municipalities, recycling nests

Municipality	Sorting units							Recycling nests	Inhabitants using 1 recycling nest
	Glass	Electro	Paper	Pet	Plastic	Organic	Tetra pack		
Horazd'ovice	x	–	x	x	x	x	x	27	207
Horoměřice	x	–	x	x	x	–	x	13 (53 bins)	257
Jílové u Prahy	x	x	x	x	x	–	x	35 (141 bins)	121
Mnichovice	x	–	x	x	–	–	–	5	614
Psáry	x	x	x	x	x	–	x	15 (87 bins)	222
Říčany	x	–	x	x	x	–	x	72	187
Statenice	x	–	x	x	–	–	–	7 (31 bins)	180

The social survey showed interesting ratios. First of all, the general knowledge information about the respondents was collected and compared. Approximately three quarters of the respondents were women (75.86 %) and a quarter – men (24.14 %). Most of the respondents (51.72 %) belonged to the age group 16-31 years. The other age groups (32-47, 48-63, 64+ years) were divided equally (15.86 % each).

The question regarding residency showed the ratio of 52.41 % of people living in blocks of flats and 45.52 % living in family houses. Most of the respondents finished university education (51.72 %), the second group of 32.41 % finished secondary education with graduation.

134 respondents (92.41 %) sort the household waste and only 11 respondents (7.59 %) do not recycle. Only 32.64 % of all respondents sort organic waste.

Most of the respondents were surprised by the questions regarding the payment for waste and the system of payment in their municipality. The results showed that a third of the respondents did not know how much and by which system they pay for the waste. 26 % of the respondents did not have any general idea about the amount of the waste produced by their household per year. 30 % of the people were not interested in what happens with the waste after collection.

Differences in sorting habits were not found between people living in family houses and those living in the blocks of flats. People living in the family houses are more aware of how much they pay for the waste management and sort organic waste by 40 % more than the residents of the blocks of flats. People living in flats have in general a shorter way to the recycling nest (up to 100 m).

When comparing male and female population, it is seen that women are generally more interested in sorting and in the further procedures done with waste after collection.

Men possess better estimation of the amount of waste generated per year.

### Conclusions

The average results proved that the inhabitants of municipalities which apply the fee by Act on Waste produce less of mixed municipal waste and more of sorted waste.

From the financial point of view, the system of the fee by Act on Waste or contractual form is favourable when there are four and more people living together in a household, otherwise the fee by

Act on Waste gets too expensive (unless the village offers different sizes of dust bins and a choice of regularity of waste collection). The system of the Local Tax requires more administrative work as the fee is paid per capita and it depends on the good will of the inhabitants that they come forward with the payment; on the other hand, it is more lenient to sales for, e.g., disabled people.

There is no dependence between the price of the waste service and the distance to the land fill.

It was monitored that the waste management on the municipal level is not well advertised as a third of the queried people did not know how much they pay for waste and by which system (Local Tax, Fee by Act on Waste or Contractual form).

When comparing the good will to sort waste it was found that female population sort by 6 % more than male. The type of finished education did not show any dependence on the sorting habits. Women showed more interest in the waste treatment than men.

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