

The impact of tourism on separate waste collection in Zadar County, Republic of Croatia

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Introduction

The Zadar County is tourist attractive region with over 8,200,000 tourist overnights annually with high increasing rate of tourists overnights, therefore the tourist season runs throughout the whole year in all municipalities and cities. There is a growing number of people who travel to vacation for a number of times on a year (New Year, Easter, Christmas, Holidays, etc.) which affects all environment elements (-, 2009) and generates intense amounts of municipal solid waste (Ministry of Tourism, 2015). Extra sources of waste such as hotel complexes, auto-camps, apartment resorts, marinas, private domestic tourism activities, burdens the waste collection system with new waste quantities due to the import of waste into the country.

The Zadar County has 34 municipality units with a total of 170,017 inhabitants that are expected to remain relatively stable over the next decade. Not all the municipalities are separately collecting all recyclables but rather they collect either a one or two waste types (paper and plastic or bio-waste and paper etc.). The practice of separate collection of waste is at the beginning. It is planned in the near future to start with separate collection of bio-waste, recyclables and the remaining amounts of municipal solid waste in all municipalities. Until now, only 71 % of municipalities and cities are currently separating paper, 80 % of municipalities and cities separate plastics, 22 % separates metal, 29 % glass, 11 % bio-waste, 5 % textile and 43 % bulky waste. Because of that, is determined how tourism effects on region's waste generation so that later the recyclables quantities could be evaluated for separate waste collection.

Economy in that area is dominated by the service sector; they are focused on attracting non-resident overnight visitors. It is expected that the same will continue with the expected further development of tourism, which will reach the peak (saturation point) and stabilization in the next decade as well as in the construction sector. This is important because the development of the construction sector implicate increasing of the accommodation capacity, whether it is modernization or improvement of existing or new accommodations. The possibility of a greater number of tourists increases the number of arrivals and overnight stays, and more tourist overnights will produce larger waste quantities.

Material and methods

The research was conducted by reviewing the data of waste quantities generated by the local inhabitants of Zadar County area from the Croatian Agency for Environmental Protection (2015). This data summarise both tourists and local inhabitant municipal solid waste quantities. The amount of waste generated by tourists was calculated separately according to the manual Methodological work on measuring the sustainable development of tourism, Part 2: Manual on Sustainable Development Indicators of Tourism, European Commission, (2006).

The data on accommodation capacities, arrivals and overnights of foreign and domestic tourists were downloaded from the Central Bureau of Statistics (CBS) and from the official Croatian National Tourist Board web sites, as there were large deviations of official and unofficial tourist information (estimated by 20 % of undocumented tourists). By comparing the data, it is noticed that some municipalities realize over 100 % more overnights, some even over 200 % because of unregistered tourist overnights so far. The introduction of e-Visitor and e-Crew, systems for electronic application of tourists, have provided more detail insight in real data.

The composition analysis of the municipal solid waste was carried out for the winter and summer periods of 2009 and 2014. The data analysis has shown when to expect the largest quantities of certain types of waste and how it effects on the increase of recyclables.

Results and discussion

The sudden leap and flourishing of the region occurred through the introduction of low-fare flights, which greatly changed the tourist image of the region. Also, in recent years, the introduction of e-Visitor and e-Crew in Croatia (2016) combined with the introduction of low-fare flights in the Zadar County has disrupted a continuous trend of arrivals and overnight stays with a sudden tourists arrival increasement. Already high tourist arrival number has been significantly enlarged due to higher number of applied tourists in the digital system, which consequently has enabled this research. The accuracy of tourist data and waste composition in the winter and summer were the key factors.

Since the most visited months are June, July, August and September with an emphasis on July and August, one can expect a high rate of waste generation in these months. The percentage of tourist overnights spent in the first five and last three months of the year is less than 5 %, whereas June (10.5 %), July (33.9 %), August (37.8 %) and September (10.0 %) point out as important months in which the largest increase in overnights is taking place. That means the nearly increasement of the total collected municipal solid waste for approximately 15 % for all recyclables. The share of municipal solid waste generated by the tourism overnight stays is 12.8 %, according to CBS and according

to the additional data (unofficial data), it is 17.0 %, so the average is 14.9 %. In some municipalities, the difference between the least amount of waste in the late autumn-winter period and the largest amount of waste in August, both in the composition and in the amount of municipal solid waste, can be triple or even quadruple, depending on the area (coastal areas or islands), type of waste and number of tourists.

In Croatia, with regard to the specific structure of tourist accommodation capacities, the highest accommodation rate takes the most poorly organized one, which is housing. Tourists mainly stay in households (54 %) which have an increasing rate and the small percentage of tourists stay in hotel accommodation (19 %), which is slowly decreasing (Croatian National Tourist Board, 2016). That implies, that the largest quantities of waste for separate collection are generated in households, therefore successful separate waste collection system depends on the separate waste collection organization of households.

In general, during the researched period, the amount of bio-waste has increased as well as the quantities of other waste generated by tourists. The assumption is that the volumes will be higher over the years as the number of overnights increases each year with fewer negative outcomes in smaller places, and significantly greater positive deviations in more orientated tourist areas.

The largest quantities of waste paper and plastic can be expected in July and August. The increase in volume follows the gradual development of tourist arrivals and overnight stays. Waste quantities suddenly decline in September and by the end of the year, they returned to normal or average volume generated by the local population. The quantities of waste glass are changing as well as of waste paper with a small difference in the first and last quarter of the year, since the amount of waste paper and waste glass is uniform. The mid-year has shown equal increasement and decrease of waste glass as well as of waste paper, but with slightly larger initial delay of waste glass in quantities at the beginning of April. The reason may be tourist activities during Easter holidays. Bio-waste, somehow, records equal amounts during the year with the expected increase and peak reached in August during the tourist season.

Conclusions

The new digitized system for the registration of arrivals and overnights of domestic and foreign tourists has provided an instant overview of the increase of tourists in municipalities. Therefore, in real-time it can be quickly predicted how much and where the most generated waste will be due to tourist arrival. This will prevent past accumulations of waste in the region during the peak tourist season, as it has been established by research which types of waste are the most generated and when they are expected in the largest quantities.

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