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Mihai, Florin-Constantin

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## **TOURISM IMPLICATIONS ON LOCAL WASTE MANAGEMENT. CASE STUDY: NEAMŢ COUNTY, ROMANIA**

**Florin-Constantin Mihai<sup>1</sup>**

**Key words:** tourists, waste generation, local scale, disparities

**Abstract.** The paper examines tourism as potential source of waste generation in urban and rural areas from Neamţ County. An assessment method is proposed and the final result is mapping the process at local scale. In order to analyze the tourism impact on local waste management system, the waste generated by tourists (estimated values) is related to local household waste generation. This paper outlines the disparities within cities and communes and it also analyses the bad practices of tourists supported by field observations.

### **Introduction**

Tourism development increase the amounts of waste generated in various touristic destinations (Taseli et al., 2007; Smaranda, 2008; Jiang et al.,2009; Cierjacksa et al, 2012), threatening the local environment due to improper waste management facilities. New concepts such as “waste hierarchy” or “zero waste“ developed on 3R policy propose to change the current traditional options of waste management based on mixed waste collection, poor treatment and landfilling (Dileep, 2007; Memon, 2010; Zaman and Lehmann, 2011). Sustainable waste management systems should be already operational in most popular touristic destinations. Tourism pressure may be significant even for national, regional or local touristic areas in the context of poor waste management systems. This paper aims to determine the environmental pressure of tourists at local scale. Neamţ county's rural territory has a high touristic potential, including protected areas (national & natural parks, SCI & SPA protected areas), spa resorts, monastic complex, monasteries and churches as historical monuments.

The promotion of Neamţ county as sustainable tourist region at national and international scale requires the improvement of waste management sector from urban and rural areas.

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<sup>1</sup> Ph.D. stud. "Alexandru Ioan Cuza" University, mihai.florin86@yahoo.com

### 1. Materials and methods

In order to estimate the amounts of waste generated by tourists in urban and rural areas ( $Q_{wt}$ ) firstly it was calculated the average duration (length) of stay in accommodation units for city and commune using the following formulas:

$$(1). D_s = N_n / N_a$$

$N_n$  = number of overnights

$N_a$  = nr of arrivals

$$(2) Q_{wt} = N_t * I_{twg} * D_s / 1000 \text{ (t/yr)}$$

$Q_{wt}$  = amounts of waste generated by tourists

$I_{twg}$  = tourist waste generation rate (kg/per capita/day)

$N_t$  = number of tourists

$I_{twg}$  = 0.5 kg/day, intermediate value compared to rural (0.4) and urban areas (0.9) provided in regional and local waste management plans.

Note that the data presented refers to the waste generation by tourist at an accommodation unit and does not necessarily reflect the waste generated for all tourists or on the other side the waste generate by a tourist for an entire day in the same locality. The data ( $N_n$ ,  $N_a$ ,  $N_t$ ,  $C_{ap}$ ) were provided by National Statistics Institute, County Agency for 2010. Quantities of waste generated by tourists *per year* from urban areas ( $Q_{wt}$ ) have been compared with household waste generated by the local population ( $Q_{hw}$ ) *in a day* according to the relation:

$Q_{hw/day} = Nr. \text{ Inhab.} * I_g / 1000 \text{ (tons /day)}$ ,  $I_g$  – **generation of household waste**, 0.9 kg/per capita/ day in urban areas, considered to be a more relevant value than the ones analyzed based on waste statistics provided by waste operators (except Piatra Neamț). This correlation is intended to reveal if the amounts of waste generated by tourists have a significant role in waste management services at urban scale. Also,  $Q_{wt}$  indicator was calculated for each tourist accommodation unit in a city, adding their values to total sum (t/yr). As regarding the rural tourism, was calculated on the one hand the amounts of waste generated by tourists ( $Q_{wt}$ ) at commune level using the same procedure as for urban areas but applying a different value of  $I_g$  (respectively 0.4 kg/per capita/day) and on the on the other hand, the net use index of accommodation capacity in operation of tourist accommodation units ( $In$ ) as follows:

$$In = (N_n / C_o) * 100,$$

$C_o$  = the tourist operational accommodation capacity, (thousands-places /days)

$$C_o = C_{ap} * N_{od},$$

$C_{ap}$  - nr. of available bed-places

$N_{od}$  - nr. of operational days for accommodation capacity.

In order to establish the  $N_{op}$  for Neamț County were considered the summer months that frequently overlap on holidays (92 days) adding 14 days to December

(corresponding to winter holidays) plus 7 days (Easter holyday ) three-official days (1May, Nov 30. and Dec.1) and two weekend days period (February 1 to June 1, Sept 1 – Nov 1, resulting approx 54 days) accumulating a total of 170 days. The impact of tourism on local waste management is highlighted by the share of  $Q_{wt}$  from  $Q_{hw}$  at ATU level as follows:  $S (\%) Q_{wt} = Q_{wt} * 100 / Q_{hw}$ . These weightings are mapped using thematic cartography.

## 2. Results and discussion

The promotion of sustainable tourism also implies the existence of a waste management infrastructure. This infrastructure has improved in the last years in urban areas such as Piatra Neamț. Although the rural population is dominant and tourist attractions are found mostly in rural areas, waste management facilities are still lacking or rudimentary in some touristic localities. Uncollected household waste is disposed without any control, polluting rivers and damaging the local landscape (Mihai et al.2012a, Mihai, 2012; Apostol and Mihai, 2012). On the other side, Neamț County has an attractive natural and cultural heritage but tourist flows usually do not cover more than half of touristic accommodation capacity in operation. In urban areas, Bicaz has a diversity of accommodation types with a total capacity of 776 bed-places, more than in Piatra Neamț (680), followed by Târgu Neamț (234), Roman (99) and Roznov (10).

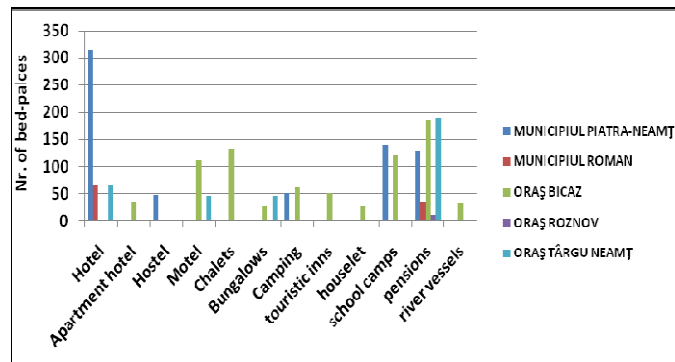


Fig.1 Touristic accommodation capacity from urban areas (2010)

It should be noted that Bicaz has within its administrative territorial unit several touristic villages where accommodation infrastructure is developed, such as Izvoru Muntelui, located at the foot of Ceahlău mountain (it is an important starting point on tourist routes within the national park) or Potoci village located in the proximity of Bistrița dam (an important recreation area near the lake).

Also, villages Secu and Pârâul Alb (at the foot of Ceahlău National Park) and Capșa (located near the national road to Piatra Neamț) are points of interest in setting up of tourist accommodation structures. The most important accommodation types from urban areas are the hotels (314 bed-places in Piatra Neamț, 65 places in Roman) and touristic pensions (190 bed-places in Târgu Neamț, 184 - Bicaz and 130 for Piatra Neamț).

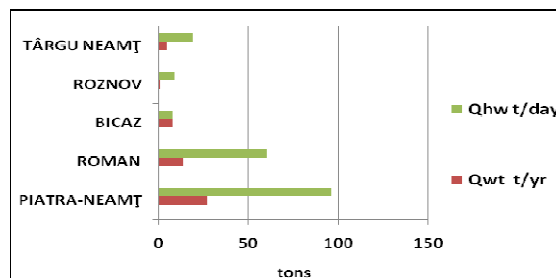


Fig.2 Qwt vs Qhw from urban areas (2010)

Fig.1 reveals that the estimated amounts of waste generated by tourists ( $Q_{wt}$ ) in a year (2010) are much smaller than those generated by urban population in a single day (Piatra Neamț, Roman, Târgu Neamț, Roznov) being almost equal in the case of Bicaz. In this context, tourism implications on local waste management from urban areas are limited but may contribute to illegal dumping in the absence of a proper waste management services. In rural territory, this impact is more visible due to a rudimentary waste management infrastructure in most of communes where tourism may be an alternative option for a sustainable local development. The proper education of both sides (tourist & inhabitants) and a more accountability of local decision-makers are necessary steps to achieve this goal. Development of waste collection services from rural areas is accelerated in last years due to EU regulations.

The net use index of accommodation capacity in operation of tourist accommodation units ( $I_n$ ) from rural territory has the highest values (over 60%) in localities near the city of Piatra Neamț, Săvinești and Alexandru cel Bun but also for the spa resort of Bălțătești where is recorded the highest value in the county for the average stay of a tourist (15 days), while in the rest of the municipalities values are ranging between 1-3 days. In this context, rural tourism of transit for short periods prevails in Neamț County except the tourism from spa resorts. Values over 40% of the  $I_n$  indicator are recorded for villages near Vânători Natural Park (Agapia, Vânători-Neamț) including a monastic complex frequently visited by tourists and pilgrims (Agapia-Văratice-Sihăstria-Sihla-Neamț monasteries) or

communes in the proximity of popular mountains and protected areas such as Bicz-Chei, Ceahlău (including Durău mountain resort) or other spa resort of Oglinzi (Răucești commune). Low values of  $I_n$  prevail for Bistrita (Borca, Farcașa, Poiana Teiului, Hangu) and Tarcău valleys, these areas being poorly promoted, or for communes in the proximity of Roman city (Horia, Dulcești).

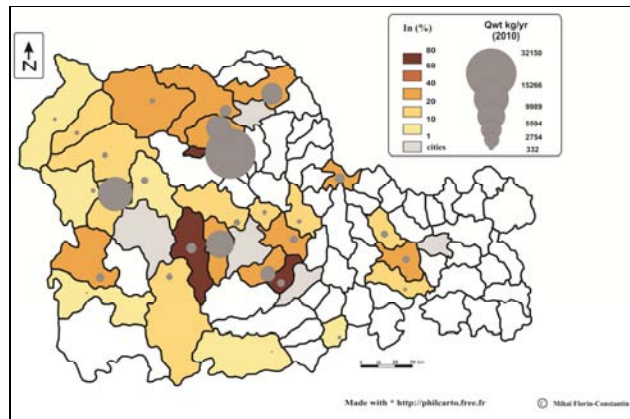


Fig. 3 Distribution of  $Q_{wt}$  from touristic accommodation units

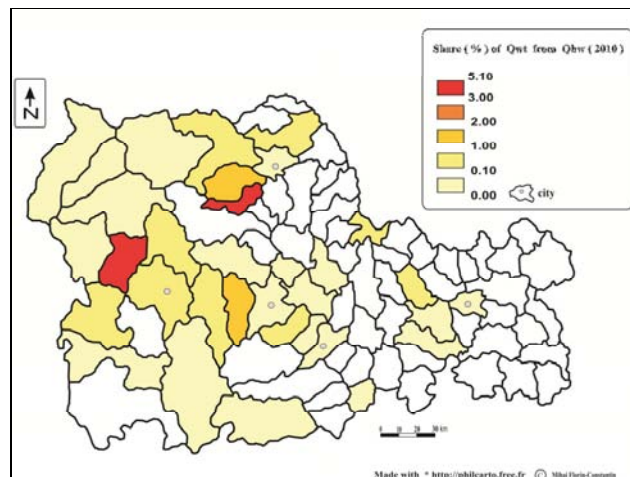


Fig. 3 The share of  $Q_{wt}$  from  $Q_{hw}$  at ATU level

In what regards the  $Q_{wt}$  indicator expressed in absolute values (kg / year) values are higher in Bălătești (32150 kg /yr) where the longest duration of stay for

a tourist is registered, but which also has a smaller number of total tourists (4105) than others communes (Ceahlău, Agapia, Alexandru cel Bun) but having a shorter duration of stay per tourist. Thus, it explains the differences between Bălățești and others touristic communes. Otherwise, values are frequently lower as same for  $I_n$ . Insignificant amounts of waste generated by tourists may be recorded in the proximity of Roman city and in the Carpathian and Subcarpathian region of the county.

The current impact of tourism on waste generation is insignificant in most urban areas and also for touristic localities from rural areas, but it is expected to increase in the following years. Estimated quantities of  $Q_{wt}$  are less than 1% of the household waste generated by rural communities in a year. This share exceeds the threshold of 1% and 1-2% only for four communes as follows Alexandru cel Bun, Agapia, Ceahlău (4.2%) and Bălățești (5.1%). Although these values are low, tourists and local population contribute to uncontrolled waste disposal in the absence of organized collection services.



Fig.4. Waste dumping in various touristic areas

This is a real impediment to local tourist attraction but efforts made by local authorities under the EU acquis pressure led to some improvements in current waste management systems. Piatra Neamț has a modern integrated waste management system since 2007 and also new waste management facilities are operational since 2011 in others localities such as Târgu Neamț, Bicaș and Roznov. Separate collection was also implemented in the area of Vânători Natural Park

serving the complex monastic. Weekend tourism and leisure travel have negative visible effects on tourist destinations of the county.

The poor environmental education of tourists and inhabitants leads to the transformation of landscapes into dumpsites, threatening the tourism development at local or regional scale. Bistrița Valley is popular throughout the county as recreational area particularly in mountain area, but it is also significantly vulnerable to illegal dumping of waste (Mihai et al., 2012b).

Waste dumped by tourists is a frequently bad practice in the surroundings of Izvoru Muntelui lake or in downstream sector of Bistrita river between Tarcău and Alexandru cel Bun. Others areas vulnerable to waste dumping due to touristic and leisure activities are the surroundings of Almaș monastery (Gârcina commune), Cuiejdel Lake (Gârcina & Crăcăoani communes) , Bâta Doamnei lake, Doamna and Borzoghean streams (Piatra Neamț city), Cut (Dumbrava Roșie commune), Negulești (Piatra Șoimului commune). Floodplains of major rivers (Moldova, Siret, Ozana, Cracău) forest edge or lakes are leisure destinations for local people in others areas of county.

### Conclusions

The paper performs an assessment of tourism implications on waste management at ATU level, outlining the local disparities between urban and rural localities. The share of  $Q_{wt}$  from  $Q_{hw}$  reveals that current impact of tourism on waste generation is not significant in the county, but the poor waste management facilities from rural areas lead to illegal dumping of waste. However, this impact may increase in the following years and a proper infrastructure should be provided by local authorities in order to mitigate the potential threats to local environment. Spatial analysis of waste indicators should be taken into account for any EIA or SEA studies.

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