

THE TOURISM IMPACT ON THE ENVIRONMENT IN CENTRAL DEVELOPMENT REGION OF THE REPUBLIC OF MOLDOVA

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***Abstract:** This paper presents the results about the impact of tourism on environment in the Center Development Region from the Republic of Moldova. The Center Development Region is situated in the central part of the republic. It consists of 13 districts. Due to its proximity with Chisinau, the republic's capital and diversity on touristic attractions, it is the most visited region by tourist. As a result, the impact of tourism on environment in the region is significant. In our study, we have used the indicators proposed by the European Environment Agency to assess the tourism impact on environment in the region. We have calculated and analyzed the indicators for: reducing transport impact, climate change, solid waste management and landscape and biodiversity protection.*

***Keywords:** criteria, environmental impact, protected areas, region, tourism*

Introduction

The Center Development Regions is situated in the central part of Republic of Moldova. It has a surface of 10 636 km² or 32% from the republic's surface. The region comprises 13 districts: Anenii Noi, Călărași, Criuleni, Dubăsari, Hîncești, Ialoveni, Nisporeni, Orhei, Rezina, Strășeni, Șoldănești, Telenești and Ungheni [4]. Due to its proximity with Chisinau, the capital of Republic of Moldova, the region is the most visited from the country. This means, that the impact of touristic activities are higher than in other regions.

Being in the central part of the republic, it is the connection between north and south. There are some of the most spectacular touristic attractions from the republic. Due to its proximity to republic's capital, natural and atrophic attractions, it is visited by a significant number of tourists. We would like to remind some of the natural sightseeing of the region: the river Răut defile near village Trebujeni, district Orhei. The magnificent landscapes with waterfalls in the landscape reservations Saharna and Țâpova, district Rezina and others. From atrophic attractions we nominate the monasteries Curchi, district Orhei and Căpriană, district Strășeni, and the well known wine cellars

from Milesti, district Nisporeni, registered in the Guinness Book as the cellars with the biggest number of wine bottles. In order to harness more efficiently the touristic resources from the region, in the Development Strategy for Central Development Region [4] are listed some steps to improve the tourism in the region. The actions are based on development the touristic offer, creating new investment opportunities in tourism, improvement of infrastructure, services, marketing and human resources quality involved in this field. They and the touristic enterprises (hotels, restaurants, transport, etc.) have a relevant impact on environment. In this paper, we had the aim to determine and assess the tourism impact on environment from the region.

Materials and methods

Materials for our study were statistical data offered by National Bureau of Statistics [8], data from Development Strategy of DRC [4] and Law 1538 from 16.07.1998 about fund of natural areas protected by state [2]. For assessment of tourism impact on environment, we have used the criteria and indicators elaborated by European Environment Agency. They were published in the Report on Feasibility for Regular Assessment of Environmental Impacts and Sustainable Tourism in Europe [6]. The same criteria and indicators were used in a guide elaborated in Romania, “Îndrumar privind sistemul european de indicatori de turism pentru destinații durabile” [3]. The same indicators are mentioned by Cismaru L. and Brătucu G., in a paper about development of euro regions and border areas like macro touristic destinations [1]. Also, the criteria and indicators were used by Marinov V., Assenova M. and others for assessing the Danube region of Bulgaria [8].

There are two types of indicators for each criterion: Core (main) and optional (used only for eco-friendly zones). In our study, we have assessed and analyzed only the Core (main) indicators for each criterion. Criteria for assessment of tourism impact on environment (Table 1) are: D.1 Reducing Transport Impact, D.2 Climate Change, D.3 Solid Waste Management, D.4 Sewage Treatment, D.5 Water Management, D.6 Energy Usage, D.7 Landscape and Biodiversity Protection, D.8 Light and Noise Management and D.9 Bathing Water Quality (analyzed only if the studied area has bathing waters, it is not applicable for our area of study).

Table 1 The criteria and CORE indicators for assessment of tourism impact on environment

Criteria	CORE (the main) indicators	Analysis
D.1 Reducing Transport Impact	D.1.1 Percentage of tourists and same day visitors using different modes of transport to arrive at the destination (public/private and type).	The indicator reflects the percentage of tourists who use public or private transport to get to the destination and back.
	D. 1.2 Average travel (km) by tourists to and from home or average travel (km) from the previous destination to the current destination	The indicator indicates the average distance done by tourists which is direct proportional with the environmental impact.
D.2 Climate Change	D.2.1 Percentage of tourism enterprises involved in climate change mitigation schemes—such as: CO2 offset, low energy systems, etc.—and “adaptation” responses and actions.	The indicator denotes the use by tourism enterprises (hotels, restaurants, , etc.) of less polaute technologies (energy saving lamps and electronics. use of renewable energy).
D.3 Solid Waste Management	D.3.1 Waste volume produced by destination (tonnes per resident per year or per month).	The indicator reflects the volume of waste produced per resident in the destination, calculated for one year.
	D.3.2 Volume of waste recycled (percent or per resident per year).	The indicator calculates the volume of recycled waste of the destination, calculated for one year. The higher the indicator, the higher is the impact of waste on the environment and vice versa.
D.4 Sewage Treatment	D.4.1 Percentage of sewage from the destination treated to at least secondary level prior to discharge.	The indicator calculates the percentage of treated water before being discharged.
D.5 Water Management	D.5.1 Fresh water consumption per tourist night compared to general population water consumption per person night.	Indicator shows the water consumption of the tourist, in relation to water consumption of the resident. As is known, the tourist use more water, than the resident.
D.6 Energy Usage	D.6.1 Energy consumption per tourist night compared to general population energy consumption per person night.	Indicator shows the energy consumption of the tourist, in relation to water consumption of the resident. As is known, the tourist consume more energy, than the resident.

D.7 Landscape and Biodiversity Protection	D.7.1 Percentage of destination (area in km ²) that is designated for protection.	The indicator calculates the percentage of destination (area in km ²) designated to protect and preserve the wildlife, habitats and natural landscapes. The higher is the indicator, the less is the human impact on biodiversity, habitats and natural landscapes.
D.8 Light and Noise Management	D.8.1 The destination has policies in place that require tourism enterprises to minimise light and noise pollution.	The indicator denotes the existence and use of policies to reduce noise and light pollution, the existence of standards that reglementates the light and sound intensity outdoor and indoor.
D.9 Bathing Water Quality	D.9.1 Level of contamination per 100 ml (faecal coliforms, campylobacter).	The indicator shows the state and level of contamination of bathing waters.

Source: developed by authors based on [6]

According to them, the *indicators* are: D.1.1 Percentage of tourists and same day visitors using different modes of transport to arrive at the destination (public/private and type), D. 1.2 Average travel (km) by tourists to and from home or average travel (km) from the previous destination to the current destination; D.2.1 Percentage of tourism enterprises involved in climate change mitigation schemes—such as: CO₂ offset, low energy systems, etc.—and “adaptation” responses and actions; D.3.1 Waste volume produced by destination (tones per resident per year or per month), D.3.2 Volume of waste recycled (percent or per resident per year); D.4.1 Percentage of sewage from the destination treated to at least secondary level prior to discharge; D.5.1 Fresh water consumption per tourist night compared to general population water consumption per person night; D.6.1 Energy consumption per tourist night compared to general population energy consumption per person night; D.7.1 Percentage of destination (area in km²) that is designated for protection; D.8.1 The destination has policies in place that require tourism enterprises to minimize light and noise pollution; D.9.1 Level of contamination per 100 ml (fecal coliforms, campylobacter) (Table 1).

Results and discussions

Criteria and indicators for evaluation of tourism impact on environment

From all criteria mentioned above and in the Table 1, we have analyzed a few due to lack of statistical data. They were: *impact of transport, solid waste management, landscape and biodiversity protection and management of light and noise*.

The first criterion used for assessment of tourism impact on environment is the *impact of transport*. The first indicator for it, (D.1.1) is 100 % as every tourist use private or public transport during their stay. For the second indicator, (D.1.2), we considered two localities hosts for tourists 1. Chişinău (capital of the republic, situated near the DRC and 2. Trebujeni village, district Orhei (the place is used as host for many tourists thanks to boarding houses located there). Distances till the most visited localities and the main attractions are:

Chişinău-Lozova (scientific reservation “Codrii”) – 53 km
 Chişinău-Rădenii Vechi (scientific reservation “Plaiul Fagului”) – 43 km
 Chişinău-Saharna (landscape reservation Saharna) – 106 km
 Chişinău-Țâpova (landscape reservation Țâpova) – 101 km
 Chişinău-Căpriană (monastery Căpriană) – 37 km
 Chişinău-Orhei (wine cellar Chateau Vartely) – 52 km
 Chişinău-Trebujeni (archeological complex “Orheiul Vechi”) – 53 km
 Trebujeni-Lozova (scientific reservation “Codrii”) – 71 km
 Trebujeni Rădenii Vechi (scientific reservation “Plaiul Fagului”) – 153 km
 Trebujeni-Saharna (landscape reservation Saharna) – 86 km
 Trebujeni-Țâpova (landscape reservation Țâpova) – 77 km
 Trebujeni-Căpriană (monastery Căpriană) – 64 km
 Trebujeni-Orhei (wine cellars Chateau Vartely) – 22 km

Using this data, we calculated the indicator D.1.2: $(53 \text{ km} + 43 \text{ km} + 106 \text{ km} + 101 \text{ km} + 37 \text{ km} + 52 \text{ km} + 53 \text{ km} + 71 \text{ km} + 153 \text{ km} + 86 \text{ km} + 77 \text{ km} + 64 \text{ km} + 22 \text{ km} / 13) \times 2 = 71 \text{ km}$ (roundtrip) = 142 km.

The second criterion used for assessment of tourism impact on environment is *solid waste management*. The indicator for it (D.3.1) was calculated for each district (Table 1). For statistics data was used information from Report “Territorial Statistics 2015“of National Statistics Bureau [7]. All results are listed in the Table 2.

Table 2 The indicator for criterion D.3 Solid Waste Management

Nr	District	Population	Quantity of waste (t, total)	Indicator D.3.1 (t/year)
1	Anenii Noi	83429	144094,9	1,73 <i>Maximum</i>
2	Călărași	78482	2232,6	0,03
3	Criuleni	73700	125297,8	1,7
4	Dubăsari	35196	-	-
5	Hîncești	121218	140736,8	1,16
6	Ialoveni	100676	1916,6	0,02
7	Nisporeni	66094	312,9	0,005 <i>Minimum</i>
8	Orhei	125376	72395,4	0,58
9	Rezina	51212	5358,3	0,1
10	Strășeni	92098	13699	0,14
11	Șoldănești	42440	1103,2	0,03
12	Telenești	73102	10699,1	0,15
13	Ungheni	117386	20483,3	0,17
	Total	1060409	538329,8	0,51

Source: elaborated by the authors after data from [2, 7]

From the results, we noted that the average value of the indicator D.3.1 per region is 0, 51 t/year. Close to regional average is district Orhei with 0, 58 t/year. The maximum value of the indicator was registered in district Anenii-Noi – 1, 73 t/year and minimum – 0,005 t/year in district Nisporeni. The high value of the indicator for Anenii-Noi is caused by the large number of enterprises that are located in the district and generate large quantities of waste. For district Nisporeni, we assume that waste collection is reluctant because other districts with a slightly higher population have a higher value for the indicator D.3.1. For example, in Telenești with 73102 inhabitants, were collected 10669, 1 t of waste and the indicator is 0, 15 t / year or Criuleni with population of 73700 inhabitants, 125297, 8 t of waste and indicator D.3. 1–1, 7 t /year. The third criterion used for assessment of tourism on environment is *landscape and biodiversity protection*. The indicator for it (D.7.1) was calculated using statistical data for the surface of the districts from the CDR [6] and the surface of protected areas from the districts [2]. The obtained data are listed in the Table 3.

Table 3 The indicator for criterion D.7 Landscape and Biodiversity Protection

Nr	District	Surface (km ²)	Surface of protected areas (km ²)	Indicator D.7.1
1	Anenii Noi	887	24,26	2,74
2	Călărași	754	63,6476	8,44
3	Criuleni	688	8,599847	1,25
4	Dubăsari	309,22	12,94	0,04 Minimum
5	Hîncești	1472	63,189	4,29
6	Ialoveni	784	1,222	0,16
7	Nisporeni	629	56,336	8,96 Maximum
8	Orhei	1288	28,55624	8,96 Maximum
9	Rezina	622	8,97	1,44
10	Strășeni	730	30,922	4,24
11	Șoldănești	598	38,20	6,39
12	Telenești	849	2,57	0,3
13	Ungheni	1083	61,697	5,7
	Total	10693,2	401,10969	3,75

Source: elaborated by the authors after data from [7]

Analyzing the obtained data, we conclude that the average value of the indicator D.7.1 per region is 3, 75 km². Close to the region average value are the indicators for Strășeni and Hîncești districts, 4, 24 km² and 4, 29 km². The maximum value of the indicator was recorded in two districts: Nisporeni and Orhei 8, 96 km². This is due to the presence of the National Park “Orhei” on the territory of these districts. The district Călărași has a high indicator, 8, 44 km², also, due the National Park “Orhei”. The lowest value for the indicator was registered in districts: Dubăsari – 0, 04 km², Ialoveni – 0, 16 km² and Telenești – 0, 3 km². The recorded indicators show the small size of protected areas in these districts, so the districts need a policy to increase the surface of protected areas for conservation the habitats and species.

The fourth criterion used in the study is *management of light and noise*. It is well-known that neon lights as well as late parties during nights are disturbing. Human beings and animals are influenced negatively by them, so the management of light and noise is important. In particular, CDR has not policies to reduce noise and light pollution. However, in the republic, and therefore in the region are standards relating to these areas. For light management are 26 standards (all are new standards, SM type) in the category 91.160 Lighting [7]. For noise, there are 30 standards (14 are old standards,

GOST type, and 16 are new standards, SM type), in category 13.40 Noise and its effects on human beings [8]. The predominance of new standards in these categories indicates the connection to the international standards.

Conclusions

Due to lack of statistical data, we could not calculate and assess all indicators that reflect the tourism impact on environment. The impact of transport is significant as 100% of tourists use the public or private transport during their journey in the region. Also, the average travel (km) by tourists to and from home is 142 km;

The indicator for solid waste management in the region, varies from 0.005 t/per resident/year till 1, 73 t/per resident/per year, but the average per region is 0, 51 t/per resident/year. This fact, indicates significant difference in the management of solid waste in the districts of the region;

The indicator for biodiversity and landscape protection varies from 0, 16 to 8, 96, the average value for region is 3, 75. The obtained data, indicates that the surface of protected areas in the region, differs from one district to another.

In order to reduce the impact of noise and light pollution, we have reordered standards that regulate the intensity of sound and light and are applied in the region.

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