

Corelations between tourism and environmental load in the „Slovak Paradise – Slovenský Raj“, E.Slovakia.

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Korelácia medzi turizmom a zaťažením prostredia v Slovenskom Raji na Východnom Slovensku

Tourism – and specially nature tourism - is an area, where the interaction between the tourists and environment is very intensive. Tourists are sensitive to the beauty and purity of the environment, but at the same time, the environmental impact of their presence in nature is marked. In order to maintain the beauty and purity of the environment a number of environmental threats are to be alleviated. Further, it seems to be necessary to decrease/regulate the number of tourists, or a set of costly cleaning and revitalising operations are to be implemented.

The paper analyses the data available on the tourism related load of one of the most beautiful areas in Slovakia – the „Slovak paradise“, located in E. Slovakia.

Key word: nature tourism, environment, number of tourists, service

Introduction

The management of tourism related human and material flow is a complex task. Tourists are to be transported, fed, lodged and entertained. It was shown (<http://www.czechtourism>) that 48 % of holiday travellers prefer a travel by car, 43 % by plane. This volume of transport alone generates a huge pollution. To give an example, we can take the CO₂ emission rate related to travel. Thus if one takes a taxi from central London to Heathrow airport, the vehicle will emit roughly seven kilograms of carbon dioxide. For a short haul return flight from London to Frankfurt, a distance of 1,300 kilometres, one needs two trees to absorb the 250 kilos of carbon dioxide which is one's share of the carbon dioxide produced. The rule of thumb is that 4.4 trees are required for every tonne of carbon dioxide one emits when travelling³ (cf. cnn.com).

Slovenský Raj - “Slovak paradise” is a region situated SW from the city of Spišská Nová Ves (Iglau) (Fig. 1,2). It is one of the nine National Parks, and enjoys legal protection since 1964. It is covered mostly by coniferous woods, and is full of picturesque, wild canyons and creeks flowing to river Hornad. The area is built of carbonate rocks and thus contains also a number of caves. It has a unique flora and an attractive spectrum of wild animals (including brown bears and chamois that were imported from the Tatra Mts.). Its total area is 13 011 ha. Its highest peaks are Havrania skala (1153 m) and Veľká Knola (1266 m). The average height of the peaks, plateaus and ridges is 800-1100 m. The most frequented tourist trails are located in narrow canyons that increase the impact of tourism on the environment.

The tourism related activities contribute to the deterioration of the environmental system by traffic related pollution, by soil erosion along the tourist trails, aesthetic damage (litter, erosion, damage to the flora) and by increased environmental load related to lodging and catering. The impact of tourism on the fauna⁴ is also said to be significant by the management of the National Park, but here we did not have data that could be evaluated. Recently, a foreign investor purchased the decommissioned uranium mines with mineable uranium ore deposits that are located near Novoveská Huta. This is in the National park buffer zone and thus in the future, mining could again become a significant source of pollution through blast related shocks, noise, dust, dumps, damage to the vegetation, chemical pollution, transport of ore, etc.

Tourists usually get to the Slovenský Raj through the Sp.N.Ves, Hrabušice or Dobšiná. There they usually spend the commencing day of stay. The Slovenský Raj area has a number of summer and winter sports centres.

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³ 4.4 trees because only one out of every four trees survives (cf. cnn.com).

⁴ Migration of animals due to noise and disturbance
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The Slovenský raj National Park

Slovenský Raj is an area, where summer and winter tourism is developed. In summer it is trekking, cyclotourism, water sports, fishing and hunting. In winter it is down-hill and cross-country skiing, as well as trekking. The visit of ice-cave and other caves and historical sites is also significant part of the tourism activities.

The lodging and catering related load correlates with 1. The lodging capacity of the city of Sp.N. Ves, then of Hrabušice and Dobšiná - 460 beds and 2. The lodging capacity of the most important centres of tourism of the Slovenský Raj area (Dobšinská ice cave, Dedinky, Mlynky, Hnilčík, Čingov and Podlesok). Presently, the hotels, family hotels and chalets have about 1 500 beds. It has to be noted though, that in Košice County the average yearly utilisation of the lodging capacity for 2004 was around 14 %.



Fig. 1. Location of the Slovenský Raj area.

Tab. 1. A review of the important recreational areas in Slovenský Raj.

District	Recreational area	Importance	Area of selected units	Type, season of utilisation	Daily number of visitors in the main season
Rožňava (Košice County)	Dobšiná ice cave	I	360,21 ha	III., SW	1 500
	Stratená	TR	698,87 ha	III., SW	400
	Dedinky - Dobšinská Maša, Biele vody – Geravy	I	n.a.	III., SW	2 000
	Dobšiná- city	TR	82,72 km ²	III., SW	200
Spišská Nová Ves	Hrabušice - Podlesok	TR	n.a.	III., SW	1 000
	Hnilčík - Mraznica	TR	n.a.	III., SW	2 500
	Mlynky - Palcmanská Maša	I	n.a.	III., SW	1 800
	Hrabušice - Podlesok	TR	n.a.	III., SW	500
	Čingov – Smižany	I	n.a.	III., SW	2 000
	Kláštorskó	TR	n.a.	III., SW	300
	Letanovský mlyn	TR	n.a.	II., SW	200
	Smižianska Maša - Smižany	TR	n.a.	II., SW	500

Explanations: I – International tourist centre
TR – transregional tourist centre
S – the summer season dominates
W – the winter season dominates

Type of tourist centres:

- I. dominant summer activities are swimming, water sports, recreation along water covered surfaces in lowland areas,
- II. tourist centres for trekking, bathing and water sports in low mountain areas,
- III. tourist centres for winter sports in mountains.

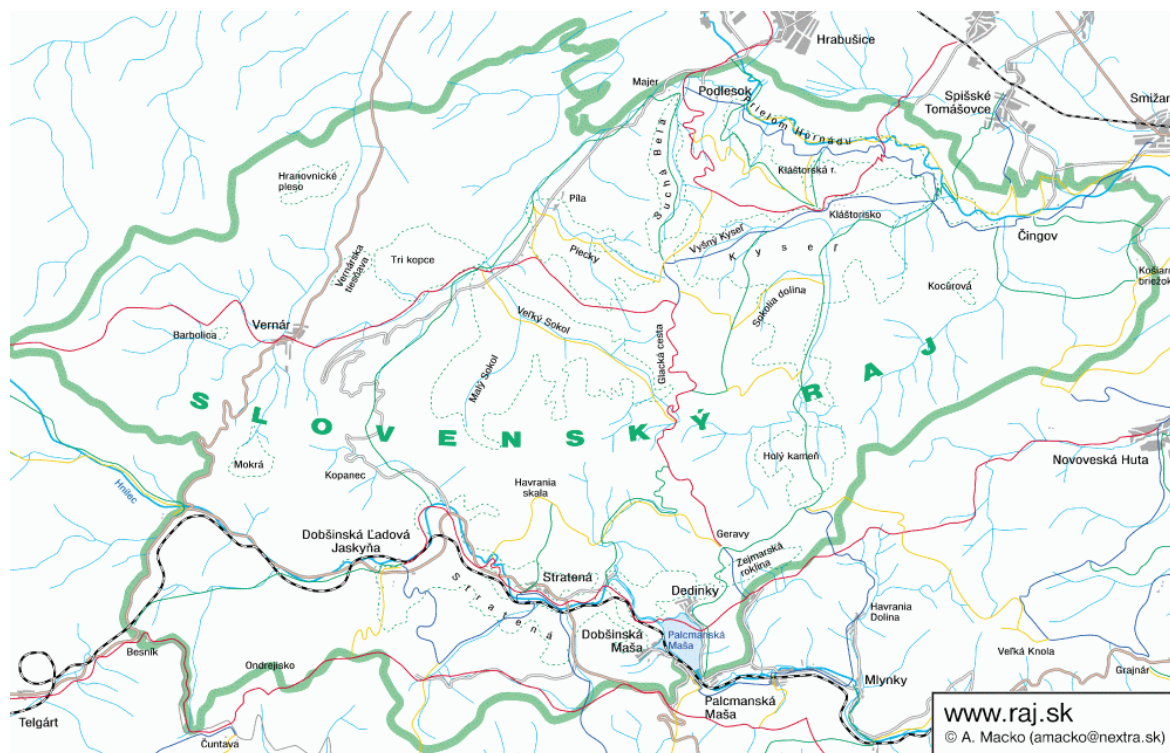


Fig. 2. The Slovenský Raj National Park.

The tourism related load

Tourism leads to a number of environmentally and socially related loads. Some of the most important ones are: increased water (and other resource) consumption, increased liquid and solid waste production, increased traffic related load, increased noise pollution, increase of the ratio of No. of beds/inhabitant, increased number of localities where active sports are performed, decrease of surface water quality, air pollution and soil erosion along tourist trails.

A number of important factors, however could not be assessed, as in Slovakia these are not available. To give an example, the water consumption is statistically assessed only for households, but not for enterprises. In case of households the data do not discriminate between water for the household and for other activities (e.g. for tourism related activities). Thus the water consumption for hotels, restaurants and the entertainment sector could not be assessed.

Liquid waste generated by tourism industry is a problem mainly in areas, where the communal sewage system and water purification plants are absent and thus the environmental management of this type of waste is questionable. This is of special importance in cases, when the hotel/restaurant is close to lakes or reservoirs. However, no statistical data are available on this issue.

Solid waste production is monitored only for hotels and restaurants, but not for other tourism related subjects. The quantity of solid waste generated by tourism related activities is not that great, but e.g. a dispersion of wastes (plastic bottles, shopping bags, tins, etc.) can significantly damage the aesthetic value

of a site or trail. Many of the waste produced by tourism related industry are classified as dangerous. Tab. 2 shows the amount of waste produced by hotels and restaurants in Slovakia (1998-2002).

Tab. 2. Waste production in hotels and restaurants in Slovakia (Source: SAŽP).

Year	1998	1999	2000	2001	2002
Quantity [t]	4900	5800	9100	8200	7800

In the area of transport, the tourism related transport intensity is growing fast. The data for the Slovenský Raj for the year 2000 are given in Tab. 3. As can be seen later, the load is considerable and thus pressures should be made on reducing individual transport and on increasing the proportion of public transport that could be easier made more ecological.

In Slovenský Raj, the most frequented road is the road I/67 on the Dobšiná – Stratená – Dobšinská ice cave – Pusté Pole – Vernár – Hranovnické Pleso segment (counting localities at 00680, 00690, 00708, 00719, 00720 a 00730). The transport is increased also in a part of the area that is under 5th degree of protection (Stratená Nature Reserve, Vernárska Tiesňava NR, Hranovnické Pleso). An additional problem is that the road spans a great difference in elevation and thus the traffic is slow and the noise and emissions are high.

High transport intensity can be seen also on road II/533 that goes next to the buffer zone of Slovenský raj in between Spišská Nová - Novoveská Huta (segment 01940) and Novoveská Huta – Hnilčík (segment 01950).

Segment 05680 shows the intensity of tourism related traffic between Arnutovce – Spišské Tomášovce and Čingov, which is one of the main tourist centres⁵.

Tab. 3. Transport intensity (Average no. of vehicles per 24h) on roads of 1st and 2nd quality in the Slovenský raj, in year 2000.

Studied road segment	Road number	Trucks (T)	Cars	Motocycles (M)	Total
1.Dobšiná – crossing at Dobšinská Maša	000067	199	962	12	1 173
2.Rázcestie Dobšinská Maša – Stratená	000067	153	849	7	1 009
3.Stratená – Dobšinská ice cave	000067	187	858	10	1 055
4.Dobšinská ice cave – Pusté Pole	000067	155	749	6	910
6.5.Pusté Pole – Vernár	000067	258	1 011	4	1 273
7.Vernár – Hranovnica	000067	312	1 110	7	1 429
8.Crossing at Dobšinská Maša – crossing at Dedinky	000535	136	678	9	823
9.Rázcestie Dedinky – Sykavka	000535	92	500	14	606
10.Spišská Nová Ves – Novoveská Huta	000533	1 403	2 747	40	4 190
11.Novoveská Huta – crossing to Hnilčík	000533	298	1 470	10	1 788
12.Rázcestie Hnilčík - Sykavka	000533	175	541	21	737
13.Sykavka – Hnilec	000533	297	441	43	781
14. Smižany village	000536	2 369	11 241	136	13 746
15.Smižany - Arnutovce	000536	1 067	3 854	8	4 929
16.Arnutovce – Spišský Štvrtok	000536	x ⁶			5 192
17.Arnutovce – Sp. Tomášovce - Čingov	536012	122	414	3	539

Source: SSC Bratislava

The intensity of tourism is evaluated by the number of *beds for rent* per inhabitant. In Slovakia 55 % of the lodging facilities are concentrated in areas with high natural value and thus also in National Parks. A comparison of the data on intensity of tourism for the various counties of Slovakia is given in Tab. 4. The average value for Slovakia is 0.01. This is a relatively low value. The EU average was 0.025 in 2002.

⁵ The data were collected assuming that the registered traffic was tourism related

⁶ Only the total number of vehicles is available

Tab. 4. The tourism intensity values for Slovakian counties for 2002 (Gajdoš 2004).

County	Bratislava	Trenčín	Trnava	Nitra	Žilina	B. Bystrica	Prešov	Košice
No. of beds per inhabitant	0.019	0.018	0.018	0.01	0.038	0.025	0.032	0.014

Source: Statistical Office of Slovakia

The number of localities for active sports situated in National Parks and of the length of tourist trails indicate one type of anthropic load in these areas. The load induced by the trails is indicated by the ratio of km of routes per sq. kilometre of the studied area. Here, the cycloroutes and tourist trails are considered. In Slovenský Raj the density of cycloroutes is 0.2 km/km². Tab. 5. shows this value for six National Parks in Slovakia. The load due to tourist trails is shown in Tab. 6. Other active sports like rock climbing were not assessed.

Tab. 5. Load due to cycloroutes in 2002 (Gajdoš 2002).

National Park (NP)	Tatra NP	Low Tatra NP	Pieniny NP	Slov. Raj NP	Slovak Karst NP	Great Fatra NP
Load in km/km ²	0.2	0.25	0.4	0.2	0.11	0.25

Source: ŠOP Slovakia

Tab. 6. Load due to tourist trails in 2002 (Gajdoš 2002).

National Park (NP)	Tatra NP	Low Tatra NP	Small Fatra NP	Pieniny NP	Slov. Raj NP	Muráň plateau NP	Poloniny NP	Slovak Karst NP	Great Fatra NP
Load in km/km ²	0.5	0.95	0.75	1.6	1.1	1.58	0.4	0.79	0.5

Source: ŠOP Slovakia

Air pollution assessment includes the quantification of solid particles, NO_x, CO and C_xH_y. Regrettably, the data on the proportion of tourism related air pollution couldn't be well separated from the overall data. Assessment carried out by Pragoprojekt Praha in 1993 show the *specific emission* values along the planned motorway D1 Hybe-Prešov (Tab. 7). It indicates the level of pollution by vehicles travelling at different speeds. If we use this table in combination with data from Tab. 3, we can estimate that in 2000, on the average, trucks and cars on the first road segment shown in Tab. 3 emitted about 15t/year of NO_x, 30t/year of CO, 3t/year of C_xH_y, and 0.1t/year of solid particles. If we link these values with those in Tab. 11, we can expect a marked increase of pollution.

Tab. 7. Specific emissions coming from road traffic (Gajdoš 2004).

Pollutant	NO _x			CO			C _x H _y			Solid particles		
	40	60	80	40	60	80	40	60	80	40	60	80
Speed [km/h]	40	60	80	40	60	80	40	60	80	40	60	80
car	2.2	2.2	2.8	11.5	8.8	8.4	1.5	1.1	1.1	0.02	0.02	0.03
Truck	9.0	13.8	15.0	16.0	14.0	13.4	0.6	0.4	0.4	0.4	0.3	0.3
Coefficient for slopes over 3%	1.5			1.15			1.3			1.15		

Soil erosion along the tourist trails is becoming a significant problem in the Slovenský Raj. Tab. 8 shows the situation for those parts of the Slovenský Raj that belong to Košice and to Prešov County. A comparison with the data for other National parts is given in Tab. 9.

Tab. 8. Proportion of tourist trail length damaged by erosion induced by tourism in Slovenský raj in 2002.

Area	Total length of damaged tourist trails in km/ % of its total length
The Slovenský Raj NP	50/18,2
Proportion of trails situated in Košice County	45/16,4
Proportion of trails situated in Prešov County	5/40,0

Source: ŠOP SR, Správa NP Slovenský raj

Tab. 9. Proportion of tourist trail length damaged by soil erosion induced by tourism in National Parks in 2002.

National Park (NP)	Tatra NP	Low Tatra NP	Small Fatra NP	Pieniny NP	Slov. Raj NP	Muráň plateau NP	Poloniny NP	Slovak Karst NP	Great Fatra NP
Proportion of eroded trails [%]	13	48	28	3	19	27	0	3	0

Small protected areas (SPA) within the National parks are suffering due to a number factors, as shown in Tab. 10. The SPAs in Slovenský raj are threatened mostly by lodging facilities which – from environmentalist point of view - are ill located.

Tab. 10. Endangered small protected areas (SPA) in Slovenský Raj due to tourism related activities in 2003 (Gajdoš 2004).

Site of the lodging facility, their number	Site of skilifts	Localities for rock climbing, mountaneering, skiplinism, paragliding	Localities with marked cycloroutes and tourist trails
42 facilities: Within the SPA are: Prielom Hornádu-1 On the border of SPA are: PR Mokrá – 1, Čingov fortress - 6, Prielom Hornádu –19 Stratená-10, Muráň-1, Zejmarská canyon-1, Kyseľ-3	1 Ski lift in Dedinky	Prielom Hornádu – Tomášovský výhľad – 1 Winter climbing on ice-walls – 3 Suchá Bela, Prielom Hornádu – Letanovce mill, Kláštoriská canyon. Kyseľ – Sokolia canyons	Marked trails -7 SPA (in canyons that are part of the National Park) Suchá Bela, Piecky, Sokol, Prielom Hornádu, Kyseľ, Zejmarská canyon, Stratená

Source: ŠOP SR, Správa NP Slovenský raj

The number of visitors is also a critical factor. Tabs 11-13 show the number of visitors in July in selected areas of the Slovenský Raj in 2000-2003 and on selected trails in a peak day in summer 2005 (Gajdoš, 2004; Špičuk, 1995; 1002; 2004a; 2004b). We can see, that the increase of the number of visitors is by up to 215 % in 4 years. This presents a great stress on the environment and also on the resources needed for the revitalisation of the visited areas. To find the necessary resources is a problem also because there is no sectorial government policy defined for the variation in fund allocation in dependence on the anthropic load of the tourist regions.

Tab. 11. Number of visitors in Slovenský Raj in the month of July in 2000-2003.

Year / Locality	Zejmarská canyon	Area [ha]	Čingov – Prielom Hornádu	Area [ha]	Podlesok – Prielom Hornádu	Area [ha]	Suchá Belá	Area [ha]
2000	4 154	73	6 510	348	12 369	290	23 498	154
2001	3 874		6 758		15 840		22 225	
2002	n.a.		8 215		n.a.		31 775	
2003	8 959		9 331		16 934		23 243	

Source: ŠOP SR, Správa NP Slovenský raj

Tab. 12. Number of tourists per day on selected trails in summer 2005.

Trail/Date	22 June 2005	21 July 2005	26 August 2005
Čingov – Biely potok	22	125	39
Čingov – Prielom Hornádu	21	156	146
Tomášovský výhľad (green trail)	11	31	11
Tomášovský výhľad (yellow trail)	29	268	164
Hrdlo Hornádu	61	666	419
Suchá Belá	115	918	543
Piecky	65	346	168
Veľký Sokol	63	167	104
Zejmarská canyon	53	410	79
Dedinky – Stratenská wood mill	13	193	28
Stratenská wood mill – Zajfý	6	62	26
Stratenský canyon (blue trail)	5	37	-
Stratenský canyon (yellow trail)	23	43	68
Podlesok - Kláštorisko	41	56	77
Total	528	3 477	1 872

Tab. 13. Number of cyclotourists on selected trails in 2005.

Trail/ Date	22 June 2005	21 July 2005	26 August 2005
Podlesok-Kláštorská	0	0	0
Kopanecká trail	3	26	18
Stratenský canyon	2	16	9
Novoveská Huta-Chotárna dolka	0	0	0
Total	5	42	27

Conclusion

The selected data on environmental load of the Slovenský Raj National Park has shown that due to an increase of number of tourists (pedestrians, cyclotourists, skiers, gliders and mountaineers) who get to the entry points of the Slovenský Raj usually by car or public transport the environmental load also increases. The number of tourist per km² is increasing both in summer and winter. The services needed by tourists necessitate also an increase of truck traffic. The waste production at the service areas increase, too and their neutralisation is usually difficult. Erosion of soil along pedestrian- and cyclo-routes is increasing.

As the government did not define a selective funding policy for revitalisation of endangered areas due to anthropic activities and thus did not earmark funds for revitalisation of these natural areas, it is feared that the situation will continue to deteriorate. The Košice County, however works on a strategic plan for tourism development, which should alleviate this problem – once it is implemented.

Education of tourists for more environment friendly behaviour (avoiding trespassing trail boundaries, avoiding littering, lowering the noise levels, etc.) and regulation of entrepreneurial activities to fully comply with environmental management standards is an important ongoing task.

References

- Archive data of the Directorate of the Slovenský Raj National Park in Sp.N. Ves, of the Slovak Agency for Environmental Protection (SAŽP) B. Bystrica and of the Statistical Office of the Slovak Republic, Bratislava.
- Gajdoš, L.: Turizmus a jeho vplyv na životné prostredie, *SAŽP B. Bystrica 2004*.
- Špičuk, J.: Turistika a turistické chodníky na území NP Slovenský raj. *Národné parky 1/1995*, pp. 4.
- Špičuk, J.: Monitoring návštevnosti NP Slovenský raj. *Ročenka Správy NP Slovenský raj 2000-2002, Spišská Nová Ves*, pp. 44 – 48.
- Špičuk, J.: Výsledky sčítania návštevníkov počas letnej turistickej sezóny 2003. *Ročenka Správy NP Slovenský raj 2003, Spišská Nová Ves, 2004a*, pp. 64 – 68.
- Špičuk, J.: Výsledky sčítania návštevníkov v NP Slovenský raj. *TATRY 6/2004*, pp. 4.
- Timčák, G.M.: Tourism development strategies in E. Slovakia, *Abstracts: GEOTOUR 2005, AGH Kraków*.
- www.cnn.com : Travel with environment in mind - Sep 12, 2005
- www.czechtourism.cz/files/statistiky/analyza/motivace_turistu.pdf
- www.safeclimate.net/calculator/
- www.sazp.sk