Tourism management perception for use of renewable energy sources; a case study from the National Park Slovensky Raj, Slovakia

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Abstract
Greater utilization of renewable energy sources is closely related to increased environmental feeling of population and economic stimulation. The paper analyses a potential utilization of the geothermal energy source for lodging facilities in region of the National Park Slovenský Raj. Based on research, only two facilities use renewable energy sources so far even if the most of the responders are apt to introduce new technologies based on this principle. Geothermal conditions in the region of the national park are not suitable for economic use of this type of source, however, the conditions rapidly improves at the eastern margin of the park that has a suitable geologic structure.

Key words: renewable source, geothermal energy, tourism, National Park Slovenský Raj

INTRODUCTION

A major tendency of the tourism market to follow sustainable practices (United Nations Environment Programme, 2011) has been increasingly reflected in the accommodation sector by, among other, implementing environmental policies. These inevitably include energy-saving management that arguably also improves service quality and brings cost savings (Ministry of Environment of the Slovak Republic, 2008). The benefits streaming from the overall green image should be in interest of every tourism destination management. However, two key preconditions for renewable energy use in the study area remain questioned. Firstly, the potential of the country to provide economically plausible renewable energy and, secondly, the interest of the accommodation-facilities to use renewable energy.

The question of renewable energy utilization is even more actual in the tourist regions with severe climate with higher demands on energy use. To this type or regions belongs the National Park Slovenský Raj located in the Eastern Slovakia (Janočková and Jablonská, 2013, Fig. 1), known by its spectacual geologic and geomorphologic structure (Cimermanová, 2010). The heat season lasts 7 to 8 months in the year and heat expenses in hotels and other lodging facilities make a significant item in the management budget of the owners. This fact, together with the recent development of new technologies for renewable energy source utilizations results in growing interest of lodging management to use heating technologies based on renewable sources. In addition, this tendency is significantly stimulated by governmental policy to support financially green energy users.

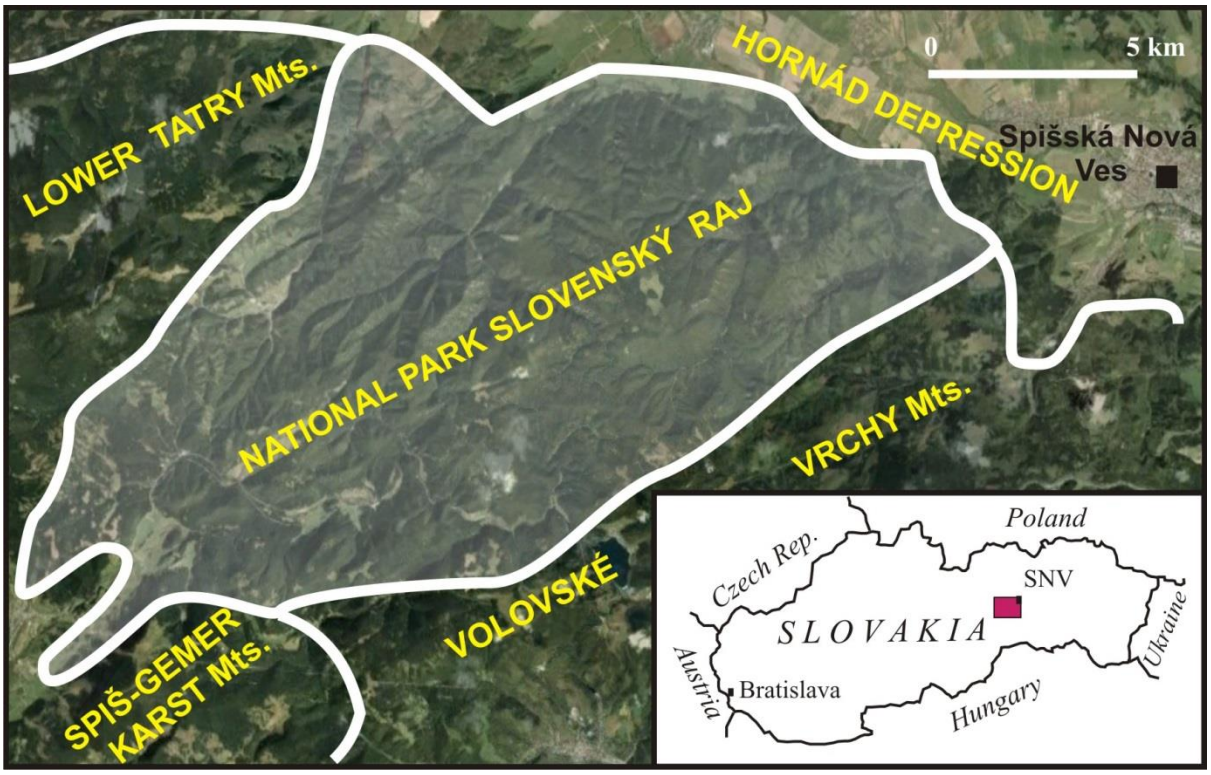

Fig. 1 Location of the National Park Slovenský Raj.

There are several kinds of renewable energy sources having high potential in relation to their utilization for heating purpose in such regions. The most common are wind, solar, biomass and geothermal energies. In this study we focused on the evaluation of the potential of geothermal energy as a local renewable energy source.

METHODS

The area of the National Park Slovenský Raj and its protection zone currently offers more than 150 accommodation facilities, from which accommodation in guest houses and cottages prevails (Administration of NP Slovenský raj, 2011). According to list of accommodation provided by the Administration of NP Slovenský raj (2011), 22 pensions and hotels were registered in the study area. Self-administered survey was distributed on-site during the month of August 2011 to operators and employees of 18 lodgings (hotels and pensions) in the NP, all of the facilities that were available at the time. The questionnaire consisted of two main parts. In the first section, the respondents reported the level of energy use from renewable sources while in the second section of the questionnaire, the respondents expressed their views on barriers to renewable energy use.

The area was investigated from the point view of its potential to use the geothermal energy. It was evaluated the geological structure of the national park region and close surroundings of the national park where an alternative geothermal sources were evaluated.

NATURAL PRECONDITIONS OF THE AREA FOR USE OF RENEWABLE ENERGY SOURCES

The area of the National Park Slovenský Raj (NP Slovenský Raj) extents in the homonymous geological unit (Slovenský Raj) that is a part of Gemericum as a higher-order geological unit (Vass et al., 1989, Fig. 2). To the south the region is bounded to Spišsko-Gemerské Rudohorie Mts., in the east it passes to the Galmus Mts. and the western zone is built up by units of the Vepor Belt. The northern

boundary is practically given by the river Hornád, which separates Mesozoic rocks of the NP Slovenský Raj from the Tertiary sedimentary fill (Sub-Tatric Group) of the Inner Carpathian Paleogene Basin (Vass et al., 1989).

From the tectonic and structural viewpoint we can distinguish several tectonic units forming the studied area (Mello et al., 2000b, Fig. 2). The major part of the area is formed by the Silicicum unit containing Vernár and Stratená nappes, The Stratená nappes is composed of three main partial nappes – Glac, Geravy and Galmus nappes of which the last one does not occur in the area of the NP Slovenský Raj. Only the minor part of the national park, occurring in its boundary zone, is formed by other tectonic units. In the north, the core part of the national park is bounded to the Sub_Tatric Group of the Inner Carpathian Paleogene Basin, which is a part of the Western Carpathian post-nappe structure. In the northwest and west, the Silicicum unit of the NP Slovenský raj is bounded to the Hronicum and Veporicum units. Along the southern boundary of the NP the Silicicum passes to the Gemericum with its subunits. In the southwest and northeast, rocks belonging to the post-nappe Gossau unit cropp out on the surface (Fig. 2).

The Vernár nappe consists of sediments stratigraphically assigned to the interval Lower Triassic – Lower Jurassic. The Lower Triassic successions are represented by quartz porphyries and their tuffs (Scythian), clayey shales, sandstones and evaporites of Bodvaszilas Member (Griesbachian – Early Nammalian) and variegated clayey shales, marlstones and argillaceous limestones (Late Namalian – Spathian).

The Middle and Late Triassic sediments consist of Guttenstein limestones and dolomites originated in the carbonate platform environment. These are superimposed by basinal limestones (Reifling, Nádaska and Raming limestones), which are, in turn, overlain by Wetterstein limestones and dolomites, Lunz Bed, Main dolomites and limestones.

Fig. 2 Tectonic scheme of the wider area of the NP Slovenský raj (after Mello et al., 2000b, modified). The central part of the national park is formed by partial nappes of the Silicicum. Glac and Geravy nappes belong to the Stratená nappe of the Silicicum. The marginal parts of the national park extend into Hronicum, Veporicum, Gemericum units and Subtatric Group, which represents the fill of the Inner Carpathian Paleogene Basin. The national park boundary is marked by black dashed line. Location of Spišská Nová Ves (SNV) is also shown.

The Glac and Geravy partial nappes are a part of the Stratena nappe of the Silicicum. The sediments of the Glac nappe are of Lower to Upper Triassic age (Mello et al., 2000a). The Geravy unit is composed of sediments having Lower Triassic to Upper Jurassic age. The sedimentary succession starts with Werfen Member, shales and sandstones of Bodvaszilas Member and shales, marlstones and limestones of Szin Member. The Middle Triassic is characteristic by several types of limestones and dolomites (e.g. Guttenstein, Steinalm, Reifling, Nádaska, Wetterstein). Carbonates are also typical for the Upper Triassic, where several types can also be defined.

The Jurassic sediments are represented by dark limestones, shales and marlstones and variegated crinoidal limestones (Mello et al., 2000a).

From the geothermal point of view the area of the NP Slovenský Raj belongs to the low-temperature regions. The heat density flow in the area ranges from 50 to 70 mW^{-2} (Remšík et al., 2000). The entire area represents an active infiltration zone for precipitation water resulting in cold water in underground circulation. The temperature in depth of 1000 m below surface is assumed to be 30°C, while in the depth of 2000 m it is about 40°C - 50°C (After Franko et al., 1995). The temperatures in depth levels of 500, 1000 and 1500 m are similar to temperatures measured in wells close to the NP Slovenský Raj (Tab. 1).

The outlined geothermal conditions do not favour the use of the geothermal sources directly in the area of the NP Slovenský Raj. The more potential are areas bordering the national park from the eastern side belonging to the Hornád Depression (Fig. 1). This area is built by the Paleogene mudstones and sandstones with the conglomerates at the base. This is underlain by the carbonate rocks submerging from the region of the NP Slovenský Raj with groundwater infiltrated from this area. The groundwater, circulating in greater depths below the thick column of the Paleogene rocks, has better geothermal parameters and may be potentially used as a geothermal source.

Tab. 1 Temperatures in depth levels of 500, 1000 and 1500 m below surface from the wells drilled to the Paleozoic rocks close to the NP Slovenský Raj. The wells in Smižany and Arnutovce were drilled in the Sub-Tatric Group in Hornádska Depression. After Franko et al., 1995, modified.

Location	Well	T 500 m (in °C)	T 1000 (in °C)	T 1500 (in °C)
Hnilec	HD-41	17	28	38
Novoveská Huta	V-861	18	28	38
Rudňany	RH-4	17	24	
Rudňany	RH-7	18	29	
Rudňany-Bindt	RB-5	15	26	37
Smižany	SM-2	20	26	42
Arnutovce	HKJ-3	23	34	44

STATE OF USE AND PERCEPTION TOWARDS ALTERNATIVE ENERGY SOURCES BY THE ACCOMODATION PROVIDERS

Despite arguments for several benefits of renewable energy sources, only two of the questioned lodgings use such energy (Tab. 2). The primary reason for not using energy from renewable sources is, according to the respondents, an insufficient infrastructure in the area to support such development. Many localities of the NP Slovenský raj lack a basic technical infastructure, therefore investments for facilites based on renewable energy sources only represent the second rank of importance.

Tab. 2 Overview of environmental practices in selected lodgings.

	ENERGY				WATER	
LODGING	Energy saving light bulbs	Energy saving appliances	Use of energy from renewable sources	Thermal insulation	Low-flow showerheads, water /saving tabs	Water recycling
Lodging A	✓	✗	✗	✗	✓	✗
Lodging B	✓	✓	✗	✓	✓	✓
Lodging C	✓	✓	✗	✓	✓	✗
Lodging D	✓	✓	✗	✓	✓	?
Lodging E	✓	✓	✗	✗	✓	✓
Lodging F	✓	✓	✗	✓	✓	✗
Lodging G	✓	✓	✗	✗	✓	?
Lodging H	✓	✓	✗	✓	✓	✗
Lodging I	✓	✗	✗	✓	✗	?
Lodging J	✓	✓	✓	?	✓	✗
Lodging K	✓	✓	✓	✗	✓	✗
Lodging L	✓	✓	✗	✓	✓	✗
Lodging M	✓	✓	✗	✓	✓	✗
Lodging N	✓	✗	✗	✗	✓	✗
Lodging O	✓	✗	✗	✓	✓	✗
Lodging P	✓	✓	✗	✓	✓	✗
Lodging R	✓	✓	✗	✓	✓	✗
Lodging S	✓	✓	✗	✗	✓	✗

Further perceived barriers to use renewable energy sources were clarified by the provided views of the respondents. Principally, the hotel management lack information about the possibilities of energy savings or/and benefits of the certifications. Providing information about advantage of the renewable energy use, demands fur such a use and generating suitable conditions for environmental practices is, according to the respondents, in competency of authorities as e.g. Ministry of Environment and Ministry of Transport, Construction and Regional Development. The respondents feel uninformed and lack support from these authorities.

The introduction of alternative energy sources were also seen as over-demanding in terms of maintenance and professional care. All of the respondents agreed that the benefits of implementing technology for using alternative energy are unclear compared to the high initial investment needed for such technologies.

CONCLUSION

Increased environmental feeling and economic stimulations are main factors influencing the willingnes of owners to introduce new technologies based on the renewable energy sources in their lodging facilities. The basic condition for this are suitable natural conditions. In case of geothermal energy it means a suitable geologic structure determining such parameters of the groundwater that fulfil economic and environmental requirements. The region of the NP Slovenský Raj belongs to relatively cold geothermal regions where the geological structure does not show much potential for its use. Much better conditions can be found in the marginal parts of the national park, where carbonate rocks from the Slovenský Raj region submerge beneath a thick cover of Paleogene rocks. The increased depth of these rocks, which are a good groundwater

aquifer, suggests a good geothermal potential that may be used by tourist facilities located at the entrance to the national park. A rising trend of environmental awareness has been shown in the plans for the future, where the lodgings intend to introduce several environmental measures - of the total 18 surveyed, only two do not intend to change the current state of operation. However, none of the measures concerned use of alternative energy sources, yet rather instalment of energy-saving appliances (50%), or considering a thermal insulation of the property (22%).

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