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## - methods, applications and interdisciplinary approach

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# LANDSCAPE CHANGES AS A CONSEQUENCE OF TRANSFORMATIONAL PROCESSES IN THE MODEL AREAS OF THE TATRA NATIONAL PARK (SLOVAKIA) AND THE PRIELBRUSIE STATE NATIONAL PARK (RUSSIA)

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**Abstract**
This paper focuses on the dynamics of landscape changes in the context of social transformation processes of two model areas: the Tatra National Park in the Western Carpathians in Slovakia and the Prielbrusie State National Park in the Caucasus Mountains in Russia. In both model areas transformation processes, which have been especially operating in Slovakia since 1989 and in Russia since 1992, are analysed and the key driving forces of landscape changes are revealed. The paper identifies specific weaknesses (problem issues), strong points (positive examples) and conflicts of interests for both model areas. The main activities influencing the vulnerability of natural values and also limitations affecting the location of tourist facilities in both national parks are discussed and compared.

***Key words**: landscape change, national park, Tatra National Park, Prielbrusie State National Park, transformation processes*

## Introduction

Changes in a landscape reflect the dynamics and evolution of a territory, with each change having a cause and genesis. Landscape changes either result from natural processes or they are due to anthropogenic activities. Man-made changes were monitored to evaluate the consequences of the transformation processes on a landscape.

The transformation processes influencing landscapes especially from social and environmental point of view are important for national park management. These comprise a complex of processes resulting in changes (transformations) in a landscape (Khoroshev et al., 2009).

In 2008 and 2009, special research activities on the identification of land use, land use conflicts, evaluation of the current system of national park management and measures supporting sustainable development were undertaken in two national parks: the Tatra National Park in Slovakia and the Prielbrusie State National Park in Russia (Fig. 1).

These national parks were chosen as model regions because of their well-developed system of altitudinal belts, their high potential for natural disasters and heavy recreational load. The Tatra National Park (TANAP) is located in the highest part of the Western Carpathians and the Prielbrusie State National Park is located within the highest areas of the Caucasus. Research herein is connected with previous projects and expertise in which the authors of the paper were involved in previous years. The Russian team members participated in preparation of the basis for the "Prielbrusie", National Park, in creating the Atlas of this Park, and several scientific projects including "Assessment of grazing impact and industrial pollution on landscapes" in 1992-1994 (Khoroshev, 1998), and the "Investigation of spatial-time organisation in zones of the debris flow and avalanche activity" in 2003-2008 (Petrushina, 2008). The Slovak team members participated in elaboration of the strategic study "Towards sustainable development of the Tatra region (Huba et al., 2005); and in the study "Landscape ecological spatial optimisation and functional land use of the Tatra Bioshpere Reserve in 2005-2006" (Izakovičová et al., 2008).

The aim of this paper is to present a comparison of development of the TANAP and Prielbrusie National Park areas based on the transformation processes causing changes in landscapes and to compare these two model areas to limit further location of tourist facilities.

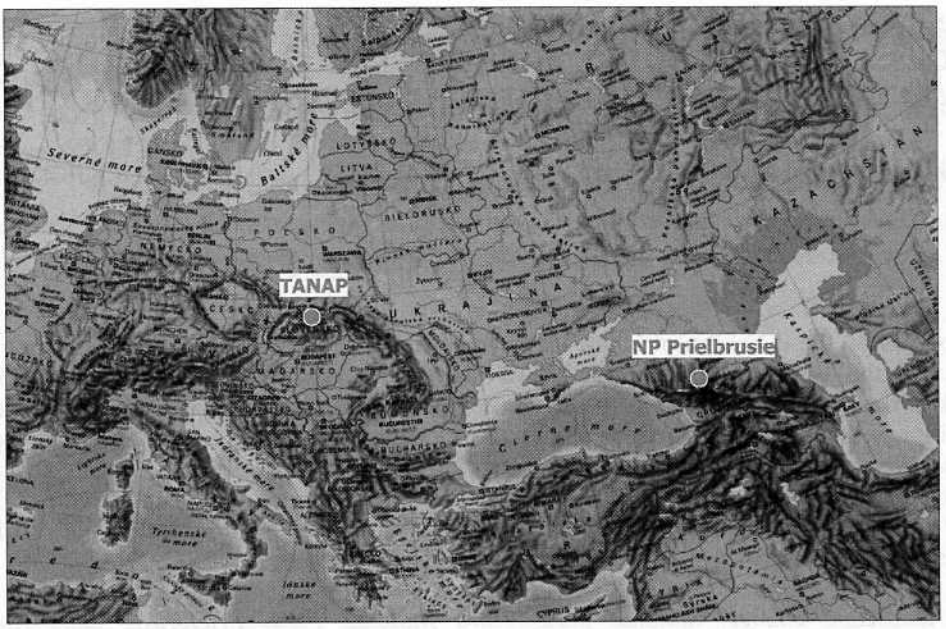


Fig. 1. Location of the Tatra National Park in Slovakia and the Prielbrusie State National Park in Russia (source: http://www.mapyeuropy.eu/fotogaleria/59.jpg)

## Methods

For evaluation and comparison of landscape changes as consequences of transformation processes of the national parks we decided to use the DPSIR model (OECD, 1991) as a method of evaluating a situation in the environment via environmental indicators (EEA, 1999, Wascher et al., 2005). Thus, the methodology is principally derived from steps identifying the following indicators:

- **D**riving force (social, demographic and economic development of society and related changes in lifestyle and demands on the environment)
- **P**ressure (pressure on the environment caused by human activities)
- **S**tate (data on environmental quality of particular environmental elements and other qualitative-quantitative parameters of natural sources)
- **I**mpact (data documenting environmental damage)
- **R**esponse (information and data pointing to measures by which society reacts to negative changes in the environment).

This methodology is often specifically modified in practice (e.g. Spilanis et al., 2009; Glekas et al., 2008). E.g. it is used as a sequence of the steps: **D**riving force – **P**ressure – **S**tate – **R**esponse (DPSR).

Since this paper refers to the work of Khoroshev et al. (2009), dealing with management of the TANAP in Slovakia and the Prielbrusie NP in Russia national parks in the context of the social transformation processes, the methodology was adapted. Transformation processes determined in the work of Khoroshev et al. (2009) present the main driving forces accepted in this paper.

Although the methodological steps are principally derived from DPSIR methodology they are modified as follows:

- 1st step: Characterization of the two model areas.
- 2nd step: Characteristics of tourism and its interaction with nature protection in both national parks.

- 3rd step: Identification of driving forces and pressures on the natural environment. The influence of transformation processes on landscapes and the resultant impacts causing changes in the landscape.
- 4th step: Evaluation and comparison of spatial limits and other limiting factors for alternative tourist facility locations in both national parks.

The results obtained were based on existing research, expertise, planning documentation, field research and consultation with responsible persons, e.g. from administrative bodies of the national parks and other collaborating organisations and institutions.

## Characteristics of the model areas

Both the model national parks, the TANAP and Prielbrusie NP have areal, linear and point sources of anthropogenic activities. The landscapes in various altitudinal belts differ in plant cover structure, biomass, soil thickness and humidity. These, together with various azonal factors, result in the high heterogeneity of landscape reactions to similar anthropogenic loads. Both areas are particularly occupied by legally protected natural areas with limited use of natural resources. Table 1 gives a summary of the basic characteristics of these national parks.

Table 1. Selected characteristics of the national parks: the Tatra National Park and the Prielbrusie State National Park

| Characteristics of the national parks | The Tatra National Park (Slovakia) | The Prielbrusie State National Park (Russia) |
|---|---|---|
| **Total area** | 104503 ha | 101200 ha |
| **Present ownership structure** | 52% of the land is owned by the state, the remainder (48%) is owned by private owners and by local communities | 62.5% of the land is owned by the state, the remainder (37.5%) is owned by private owners or communities |
| **Elevation range** | 610 m (Spišská Belá) – 2655 m (Gerlachovský štít) | 1480 m (Chelmas river mouth) – 5642 m (Elbrus) |
| **The highest permanent settlement** | Štrbské Pleso (1355 m) | Terskol (2130 m) |
| **Dominant types of landforms** | • Glacial and paleoglacial landforms<br>• glaciofluvial landforms<br>• erosion landforms<br>• karst forms of relief<br>• talus cones<br>• denudation landforms<br>• fault slopes | • glacial and paleoglacial landforms<br>• glaciofluvial landforms<br>• erosion landforms<br>• mudflow and avalanche cones<br>• talus cones<br>• volcanic landforms<br>• denudation landforms<br>• fault slopes |
| **Mountain ranges** | 26 km (in the High Tatras), 14 km (in the Belianske Tatras) and 37 km (in the Western Tatras) | The Main Caucasus range (32 km) and Bokovoi range (30 km) |
| **Number of lakes and mineral springs** | • more than 120 lakes (they are a result of glacial activity during the last Glacial period)<br>• several tens of mineral and thermal springs (9 localities with geothermal and 4 with mineral water) | • near 10 rather big and some small lakes (mainly of glacial genesis)<br>• near 100 mineral and thermal springs with total debit of 50 mil. litres per day |
| **Number of natural reservations and their whole area** | • 27 National nature reserves (37977.13 ha)<br>• 24 Nature reserves (1063.34 ha)<br>• 3 National nature monument (caves)<br>• Natural monument (11.18 ha)<br>• others (7.24 ha) | • 55327 ha (74.1%) – the reserve zone<br>• 15984 ha (21.4%) – the recreation zone<br>• 3340 ha (4.5%) – the economy zone |