

## INTEGRATING RELIEF ELEMENTS AND RAIL TRANSPORT IN THE DEVELOPMENT OF SUSTAINABLE TOURISM IN THE TIMIȘU DE JOS - COMARNIC RAILWAY SECTOR

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### Abstract

Natural resources offer now perhaps more than ever the possibility to be exploited through tourism. The need to escape into nature appears as a necessary addition. Through rail transport in the Timișul de Jos-Comarnic sector of the Prahova Valley, these natural components can be discovered and then exploited for tourism. The study aims to carry out a detailed analysis of the degree of exploitation of environmental components as natural resources for tourism, the role of the railway network for this activity and the importance of maintaining a balance between tourism and environmental exploitation. Results obtained from the applied methods have led to favorable results for the environment. These results are also based to some extent on the role played by rail transport in this sector, identifying areas where infrastructure supports sustainable tourism.

**Key words:** sustainability, natural resources, rail network, environmental protection

### Introduction

Sustainable development involves economic growth in keeping with the requirements of ecological balance and human development, involving people's relations with the environment, as well as the responsibility of the current generation towards future generations (Mateoc-Sîrb, 2022). Sustainable tourism is gaining importance in national agendas to encourage economic growth, social inclusion and protection of cultural and natural assets (Mitrică, 2021). Sustainable tourism has been conceived and advocated in an attempt to manage all resources so that the economic, social and aesthetic needs of an area are met while maintaining cultural integrity, essential ecological processes, biological diversity and life support systems (Mateoc-Sîrb, 2022). Sustainable development is defined by the World Commission on Environment and Development in 1987 as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland, 1987). This approach can be explained using the three pillars of sustainability: economic, social and environmental (Negrușă, 2015). The notion of sustainable tourism took root only later in the policy statements and planning documents of the United Nations World Tourism Organization (UNWTO), World Travel and Tourism Council (WTTC) (Scutariu, 2017). The analysis of sustainable tourism in Romania shows that tourism performance is more strengthened in big cities, the Black Sea coast, the Danube Delta and the Carpathian Mountains (Mitrică, 2021). Thus, the Prahova Valley area is considered, according to the number of annual tourists and the level of development, as the most developed tourist axis in the Romanian Carpathian Mountains, and the Timișu de Jos - Comarnic railway sector represents the tourist hub, which includes the major tourist resorts of national interest, such as Predeal, Azuga, Busteni and Sinaia, as well as the tourist resort of local interest, Comarnic. These towns are linked by road and rail, but the most accessible, efficient and sustainable means of transportation is the train. Being transected by the CF 300 main line, the analyzed sector is visited by a large number of tourists annually, both national and international. The area is delimited by a developed natural setting, with the role of supporting an impressive mass tourism, reaching a number of 583.211 tourists in 2024 (INS - County Statistics Department PRAHOVA, 2025). Therefore, the 11 CFR train stations provide access to mountain (summer and winter) and cultural tourism. A comparison between road and rail transport in the Prahova Valley, according to EcoPassenger (2025), shows that the environmental impact of rail transport is half that of road transport in terms of carbon dioxide emissions, energy consumption, suspended substances, nitrogen oxides and non-methane hydrocarbons (Chyba! Nenalezen zdroj odkazů.,Chyba! Nenalezen zdroj odkazů.,Chyba! Nenalezen zdroj odkazů.) (A. Jipa, 2024)



Start/destination	Details	Term	Transport
 COMARNIC (Romania) [RO] TIMISU DE JOS (Romania) [RO]	from Su, 09.03.25, 17:20 to Su, 09.03.25, 18:47 <a href="#">DETAILS</a> <a href="#">GOOGLE EARTH</a> <a href="#">SOONER</a> <a href="#">LATER</a>	1:27	RE 3025
 COMARNIC (Romania) [RO] TIMISU DE JOS (Romania) [RO]	Middle class; Diesel EURO 4;	0:51	Car

Fig. 1: Compared subjects (train vs. automobile)  
Source: <https://ecopassenger.org/>

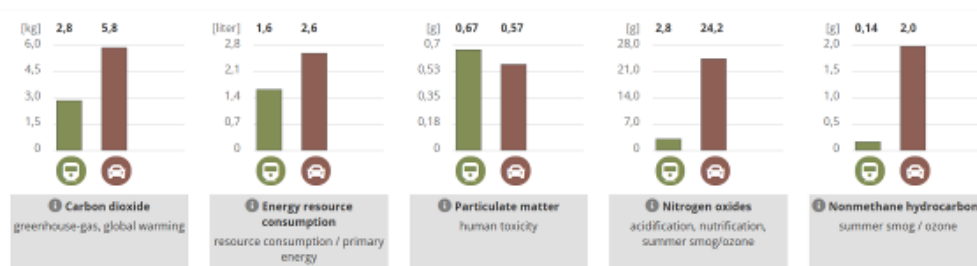


Fig. 2: Emissions generated by the two means of transport  
Sursa: <https://ecopassenger.org/>

COMPONENT	Train	Car
Carbon dioxide <i>kilograms</i>	2,8	5,8
Energy resource consumption <i>liter gasoline equivalent</i>	1,6	2,6
Particulate matter <i>grams</i>	0,67	0,57
Nitrogen oxides <i>grams</i>	2,8	24,2
Nonmethane hydrocarbons <i>grams</i>	0,14	2,0

Fig. 3: The amount of emissions from the two means of transport  
Source: <https://ecopassenger.org/>

## Material and methods

In terms of methodology, the work begins with the research of other sources on the topic, including the method of data mining from SCOPUS databases, to be followed by the cartographic method in the realization of maps. Vector (point, line, polygon) and raster (DEM) data, processed in ArcMap 10.6.1, were used to localize the area and map all the natural and anthropogenic tourism markers. Also, the observation method and the comparison method added value to the research by comparing with other areas that combine landform elements with sustainable tourism.

## Results

The area between Timișu de Jos and Comarnic is part of the Prahova Valley tourist area (Fig. 4). It is a region renowned for its spectacular mountain landscapes, dense forests and rich biodiversity. Due to its diversified and fragmented geomorphologic and geomorphologic setting, the studied area features a multitude of relief elements that can be exploited in a form of sustainable tourism, such as hiking, winter sports (skiing) or ecotourism. The natural setting offers tourists a rich and ramified hydrographic network, waterfalls, caves, interesting species of fauna and flora, as well as a multitude of hiking trails in the Bucegi Mountains, Baiului Mountains, Piatra Mare Massif and Postăvaru Massif (Fig. 4). Accessibility to these sustainable tourism resources is also guaranteed by the train, the means of transportation that crosses the entire Prahova river valley. With only 11 stations, this means of transportation considerably reduces travel time from the place of residence and reduces the carbon footprint of tourists compared to cars. Leaving aside the fact that regio-express, interregio or intercity trains do not run through all stations, it is certain that 6 pairs of regio trains connect these tourist resorts with two major tourist destinations in Romania, Bucharest and Brasov, thanks to the 300 CF main line. In addition to their natural tourism potential, these localities also face some obstacles in integrating the relief features and the train into sustainable tourism, such as the lack of modernization of stations and intermodal transport for better accessibility, the lack of promotion and diversification of the tourist offer as an eco-destination, and the implementation of broader measures for sustainable tourism.

An example of a mountain area that integrates the elements of relief and rail into an ecofriendly tourism is the Central Switzerland area. Here railway transportation is a central pillar of sustainable tourism. High-performance electric trains link towns, mountain resorts and other points of interest and are perfectly synchronized with cable cars, gondolas and buses. This intermodal system allows tourists to explore the area without using their own car, significantly reducing carbon emissions. For example, initiatives such as the Swiss Travel Pass encourage the use of public transport through integrated travel packages and discounts for tourist attractions. In addition, Switzerland is investing heavily in trains powered by green energy, strengthening its position as a leader in green tourism. In addition, Switzerland has made sustainability a priority. Tourism development is strictly regulated and infrastructure is designed to reduce environmental impact. For example, many mountain resorts discourage cars, promoting green transportation and reducing congestion.

## Discussion

In Romania, tourism development is guided by Romania's National Strategy for Tourism Development 2023-2035, elaborated by the Ministry of Economy, Entrepreneurship and Tourism, with the aim of sustainably developing Romanian tourism by 2035. Among the main objectives are the consolidation of Romania's image as a world-class tourist destination, the valorization of its natural and cultural heritage, as well as increasing its visibility on international markets. The strategy emphasizes the importance of sustainable tourism development, integrating principles of sustainable tourism and ecotourism (Ministry of Entrepreneurship and Tourism, 2023). Applying the strategy to the study area, the study area can benefit from the promotion of ecotourism through the development of ecotourism trails and nature-based activities that attract tourists interested in authentic and sustainable experiences, the conservation of natural heritage through the implementation of projects that protect the environment, and the development of green infrastructure through investments in rail transportation network, bicycle paths, green public transportation and other hiking facilities. Local authorities are added to this strategy to fulfill the objectives.

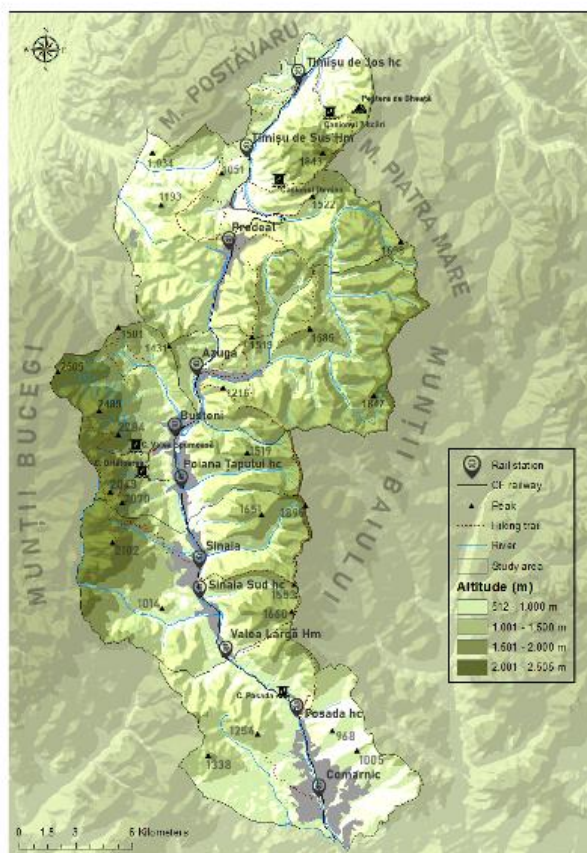


Fig. 4: Relief elements capitalized on in sustainable tourism  
Source: Jipa, A., 2025

## Conclusion

The study highlights the importance of responsible exploitation of natural resources in the Timișu de Jos - Comarnic sector of the Prahova Valley. The mountain landscapes, rich biodiversity and geomorphological resources offer significant opportunities for the development of sustainable tourism, including hiking, winter sports and ecotourism. Rail transport is a sustainable and efficient means of access to tourism resources. Trains make a significant contribution to reducing carbon emissions and the consumption of energy resources compared to road transport, thus enhancing the positive environmental impact of tourism in the area. There is also a need to maintain a balance between tourism growth and environmental conservation. The promotion of sustainable tourism in the Prahova Valley must be achieved through well-founded policies that support both the local economy and environmental protection.

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## Souhrn

Studie zdůrazňuje potenciál sektoru Timișu de Jos - Comarnic v údolí Prahova pro udržitelný cestovní ruch prostřednictvím odpovědného využívání přírodních zdrojů, využívání železniční dopravy jako udržitelného způsobu přístupu a podpory rovnováhy mezi rozvojem cestovního ruchu a ochranou životního prostředí.

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