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Preparing the geodiversity map of Hungary in line with the UNESCO SDGs

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Abstract:

In 2021, UNESCO has adopted the International Geodiversity Day initiative, and since 2022 it is celebrated worldwide on 6 October (UNESCO, 2021). The term ‘geodiversity’ incorporates every natural abiotic element and value of our planet. These elements are mainly the subjects of geosciences: geology, geomorphology, geography, and hydrography. All of them affect our everyday life: we use and utilise their intrinsic, cultural, aesthetic, economic, functional, and scientific values. Many studies have been published that investigate threats to geodiversity and use various methods to identify their importance to society as the ‘backbone of geoheritage’ (Gray, 2013). In fact, geodiversity is the foundation of the ecosystem and life itself, because the processes of Earth affect the condition of every living creature. Therefore, the recognition of geodiversity’s importance is one of the main pillars of the UN’s 2030 Agenda for Sustainable Development and influences nearly all the 17 Sustainable Development Goals (SDGs, Brilha et al., 2018).

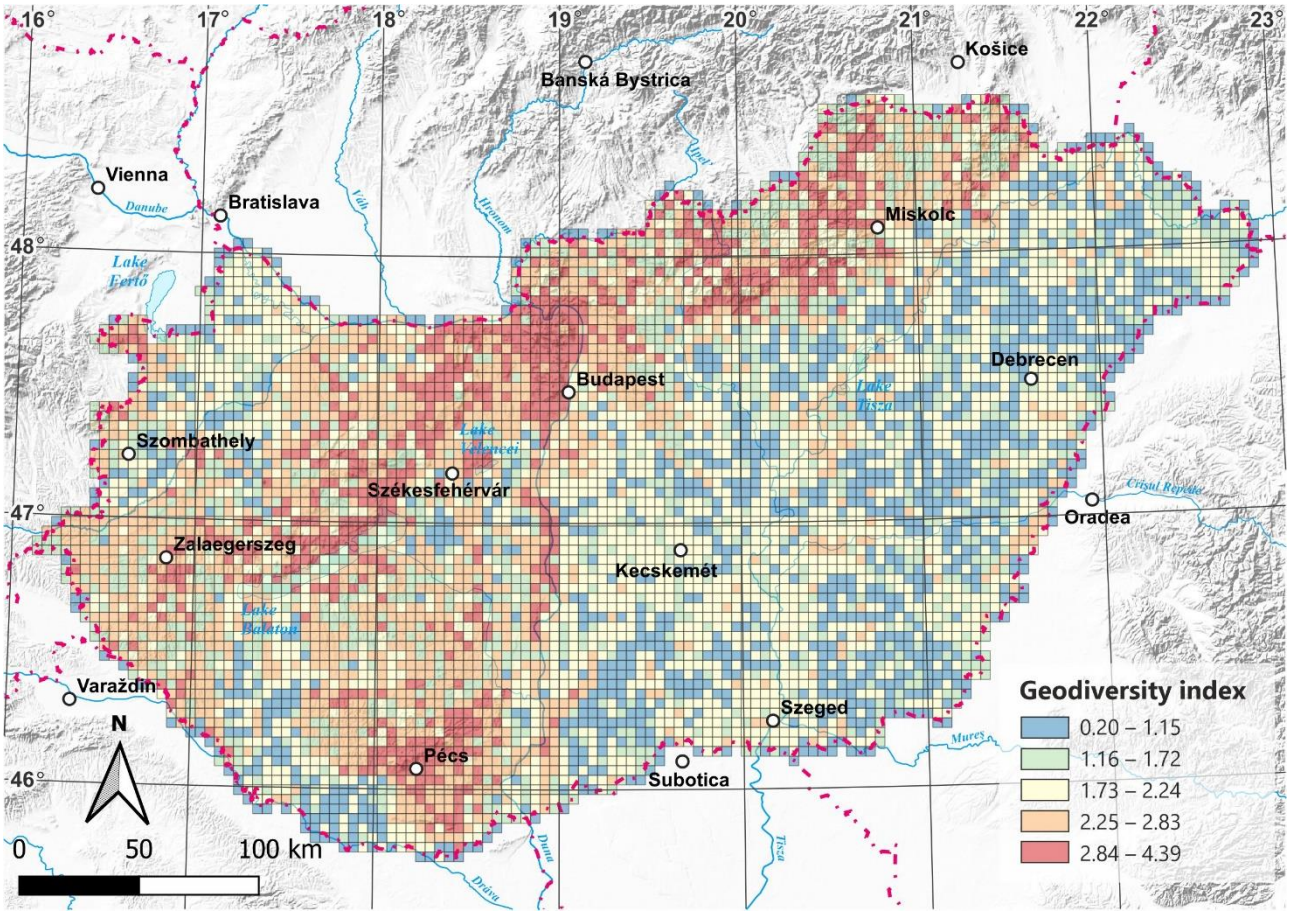

Figure 1. The geodiversity map of Hungary

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In many parts of the world, geodiversity has been calculated using a variety of methods, both qualitative and quantitative (Zwoliński et al. 2018). Almost all assessments have two main objectives: 1) to explore geodiversity to protect abiotic natural values, and 2) to present their scientific content to the public to raise awareness of sustainable tourism and their contribution to nature conservation. Following these objectives, various territories were evaluated and became part of the international knowledge. Raising awareness of the geodiversity of an area can improve the SDGs in several ways, but free access to information is also an important element of many of the SDGs.

Our goal was to create a geodiversity map of Hungary based on the well-established GIS-based method of Pereira et al. (2013) but modified to use mainly open-source data and to automate the assessment with free-source GIS tools (Pál and Albert, 2021, 2022). After experimenting with sample areas in Hungary and the neighbouring countries, we have compiled the geodiversity map of Hungary (Fig. 1).

We have included 6 different subindices in the evaluation method: lithology (using geological maps), landforms (applying the geomorphon theory), hydrology (using lakes from OpenStreetMap and an automatically determined drainage network), mineralogy (using data from the European Geological Data Infrastructure) and palaeontology (using a national dataset). The evaluation was performed in QGIS 3.22 using the Geodiversity Calculator plugin (developed by Pál, M): after providing all available base data, the tool calculated the geodiversity index for the sample area for the cells of the size we specified (5x5 km). The resulting indices were normalised: this way none of the subindices are overrepresented in the map.

The main conclusions drawn from the results are as follows:

- This middle-scale geodiversity map is good for highlighting the most complex areas of Hungary from the aspect of geosciences. It can also serve as a basis for larger-scale exploratory studies to assess areas of high geodiversity that are yet to be studied.
- The map is intended to serve as a tool for promoting geodiversity in schools, existing geotourism centres and through online media. As this is a new type of thematic map, further cartographic research should focus on the various ways of visualisation, its interpretability, and its suitability for the purposes for which it is intended.
- The open data used to create the map and the open-access plugin developed for this purpose increase the compatibility of geodiversity mapping with the UNESCO SDGs compared to previous similar methods.

The map is going to be validated on the field when assembling the Hungarian National Geosite Inventory. This database would be the basis for the establishment of national geoparks, infrastructural developments and science communication enhancement.

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