Gd-ratio as a quantitative geoindicator of geodiversity assessment

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Recently, there have been many methods for assessing geodiversity. During comparative studies, not all of these methods allow you to clearly identify which area is more or less geodiverse. We propose the Gd-ratio geoindicator, which defines the ratio of areas with very_low_and_low geodiversity to areas with high_and_very_high geodiversity. The values of this geoindicator can vary from 0 to infinity. However, the key values have values in three ranges: 0-1 – rich geodiversity, 1-2 – moderate geodiversity and above 2 – modest geodiversity. The interpretation possibilities of the Gd-ratio geoindicator were tested in three areas of national parks in Poland, which are located in different morphogenetic zones: mountain, upland and lowland.

The Karkonosze National Park lies in SW Poland, along the border with the Czechia. It consists of the Karkonosze Mountains, the highest mountain range in the Sudetes. The characteristic features of its landscape are the glacial kettles with boulders and ponds hidden inside. Weathered granite rocks shaped like mushrooms or maces can also be found on the mountainsides. It cover an area of 55.76 km².

The Roztocze National Park is located in the picturesque middle-eastern part of Poland, in the upper Wieprz river valley, close to the Polish-Ukrainian border. It protects Roztocze, a land encompassing a 180-kilometre-long stretch of hills that are several dozen meters high. Its current size is 84.83 km². Roztocze is a densely forested land filled with natural incisions. Geomorphological, mites is typically upland region in which the main elements of the relief have very close links with geological structure.

The Wolin National Park is situated on the island of Wolin, at the mouth of Oder River, in the far north-west of Poland, close to the Polish-German border. It covers an area of 109.37 km². The landscape of the Park varies greatly, including its characteristic element: 15 km long and up to 95 m high cliffs. The crown of the cliff goes back about 80 cm per year. Moraine hills predominate in the morphological landscape.

The same spatial and non-spatial data have been completed for these three national parks. Based on this data, seven factor maps were created: relief energy, geomorphological map, map of landform appearance, geological map, soil map, hydrographic map, mesoclimatic map. Automatic classifications (Jenks natural break optimization) and expert classifications were used to reclassify the factor maps into five geodiversity classes. The final geodiversity map for each park was obtained by map algebra using the weighted sum algorithm. Weights for factor maps were
assigned based on the AHP method (using Satty's classification).

It turns out that the mountainous Karkonosze National Park is characterized by moderate geodiversity (Gd-ratio = 1.28), while the other two parks have rich geodiversity: the lowland Wolin National Park (Gd-ratio = 0.32) and the upland Roztocze National Park (Gd-ratio = 0.72). The obtained results are so interesting that it would seem that mountain areas have the highest geodiversity, while lowland areas - the lowest geodiversity. But the results show the opposite image. **This thesis should be absolutely verified in more test areas.**