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Geomorphosites assessment methods: comparative analysis and typology

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Since the 1990s, several studies on geoconservation have been carried out involving inventories and quantitative assessment of geomorphological heritage. Following the increasing number of studies, several assessment methods were developed by various research groups. Despite the large number of published studies, criteria and parameters used in qualitative and quantitative assessment are often unclear and ambiguous. This study aims to analyse how the methods for qualitative and quantitative evaluation of geomorphological heritage have developed and to compare them. From this analysis it proposes a typology of the methods published until now.
A bibliographic survey was carried out based on the following criteria: (i) works written in English; (ii) research published in scientific journals; and (iii) use of at least one of the following keywords in the title: geomorphological heritage, geomorphological site, or geomorphosite.
From these criteria 71 papers were selected and analysed according to the following characteristics: (i) general aspects - geomorphological heritage was the central topic; the touristic value was the most evaluated; the scale was mostly based on political boundaries; and the majority of the main objectives aimed to support touristic activities; (ii) methods of qualitative assessment - 73% of the papers applied this step and most of them described the procedures used, while others applied previous methods. The main procedures used for selecting geomorphosites were bibliographic research, fieldwork, interpretation of maps and cartographic products, geomorphological mapping, and researchers' experience. Only 56% of the studies used descriptive cards and the others did not present standardized data; and (iii) methods of quantitative evaluation - 69% of the papers applied this step; among them, 61% developed a new method and the others applied previous ones. The most used assessment criteria were: scientific value: rareness, representativeness, integrity, and experts' knowledge; additional values: cultural interest, historical importance, aesthetics, and ecological impact; use value: accessibility, visibility, and educational use; management and protection values: vulnerability, fragility, and official level of protection.
Based on the results, the published papers were classified into five categories: (i) application of previous methods (6 papers); (ii) creation of new methods (41); (iii) application of previous methods combined with new methods (12); (iv) methods comparison (6); and (v) no method described (6).
The data analysis allowed concluding that the imbrication of scales needs to be more discussed considering the specificities of the evaluation of geomorphosites and the methods selected and/or applied should better take into account the main purpose of the assessment. Concerning the assessment, the qualitative methods should be more systematic and explicit according to the criteria used for selecting geomorphosites and the purpose of the evaluation. The quantitative evaluation must focus on the reduction of the weaknesses associated with overlapping and lack of transparency of some criteria.