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PRELIMINARY GEOMORPHOSITES ASSESSMENT ALONG THE PANORAMA ROUTE OF MPUMALANGA PROVINCE, SOUTH AFRICA

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Abstract : South Africa's geomorphological diversity offers spectacular landscapes recognized for their ecological and cultural/archaeological associations, making the landscapes important sites for geoheritage and geotourism activities. Evaluation of value types in geomorphosites has gained in popularity in geomorphological heritage research. This study aims to apply a comprehensive methodology for South Africa using several guidelines for geomorphosite assessment. Methodological procedures focusing on geomorphosite specificities were used with numerical assessment for fifteen geomorphosites. The approach integrated qualitative and quantitative procedures for the inventory and quantification of geomorphosites of South Africa. Using a modified criterion, geosite assessments and inventories of the Panorama Route were achieved focusing on specific attributes of the locality. Fifteen geomorphosites were studied and four geomorphosite obtained high scores in Geomorphological Value (GmV) and Management Value (MgV) and consequently high score in Total Value (TV) and Ranking Value (Rk). The results for each indicator are used for ranking and comparison between sites with the interpretation of the results used for supporting site management decisions. The assessment of the geomorphosites along the Panorama Route demonstrates the potential of this type of methodology has for the understanding of geomorphosites and tourism in the province.

Key words: Geomorphosites, Assessment criteria, Landscapes, Geotourism, Panorama Route, Mpumalanga

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INTRODUCTION

Geomorphological features of a landscape are known as geomorphosites. Panizza (2001) indicates that the term is a contraction of 'geomorphological sites'. Three attributes bring out the differences between geomorphological features and geomorphosites owing largely to their aesthetics, dynamics, and size making them specific kinds of geosites. Panizza and Piacente (1993) have argued that human perception or

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exploitation of geomorphosites have resulted in a special value being attached to landforms. This is a relative value and is likely to vary in any of the following five forms as argued by Reynard (2005); 1. Scientific, 2. Ecologist, 3. Cultural, 4. Aesthetic and/or, 5. Economic. Grandgirard (1997) and Reynard (2005) considered the constraints offered by the meaning of the term and opined that a geomorphosite could be any part of the Earth's surface that is important for the knowledge of Earth, climate and life history.

A general acceptance considers that geomorphosites can only exist if they have one or more types of value. The consideration given to the scientific value is high and is regarded as a fundamental value for recognition, although other types of value are also important criteria in the selection and comparison of geomorphosites. The purpose of undertaking activities such as geomorphosite evaluation according to Comanescu et al. (2011) and Comanescu & Dobre (2009) is to develop proper solutions for their protection and even their promotion as tourist destinations. When the economic value is considered, it, therefore, refers mainly to the tourism potential of sites.

Geomorphosite research focuses on one of the most important issues relating to the methodologies which look at the value evaluation present in geomorphosites. The use of and the expertise of assessors combined with qualitative procedures in the selection of geomorphosites constitutes one of the two main types of assessment commonly used. Watson and Slaymaker (1966) popularized the qualitative approach and the method used in different types of inventories during the 1960s. Since the 1990s the quantitative approach has been particularly developed to rank the sites (Grandgirard, 1997; Rivas et al., 1997). There are no universal guidelines as national geomorphological contexts and objectives are different. Bilhar (2016) proposes methodological procedures which focus on geomorphosite specificities while other researchers had different views which give rise to the existence of various groups of researchers on the subject. The unsystematic approaches to the process of geomorphosite selection have placed attention on numerical assessment resulting in high levels of objectivity expressed by the results obtained. Assessment approaches that are qualitative and quantitative are direct and indirect (or parametric) methods, respectively, as observed by Bruschi and Cendrero (2009) and Bonachea et al. (2005).

Experts supporting the identification and selection of the geomorphosites in the scope of inventories have grown in numbers. The selection criteria tend to be not well explained and becomes highly subjective. Using numerically quantified criteria, on the contrary, is possible to obtain clear and replicable results using parametric methods as they are objective. The parametric approach used by the Geomorphosites Working Group methods aims at the quantitative assessment of previously selected geomorphosites. The approach does not clarify exactly how the sites were identified and selected Pereira and Pereira (2010). The identification of potential geosites must be considered before any accurate quantitative assessment can be done. In that context, integrating quantitative and qualitative procedures for the inventory and quantification of geomorphosites would be in line with the Geomorphosites Working Group's goals.

In this study, we demonstrate the use of a comprehensive methodology that can function in the different stages and approaches of geomorphosite assessment using Pereira and Pereira (2010) study model. The methodology supports the selection of appropriate geomorphosites amongst several geomorphological assets and is used for comparison and ranking of the selected geomorphosites. The geomorphosite assessment of both approaches and the essential criteria for the compilation of qualitative and numerical values is of great relevance in this study. Kubalíková (2013) argues that the use of several assessment methods that represent a significant tool for geoconservation and geotourism purposes are necessary for geomorphosite assessment consideration. The assessment then can be carried out from several perspectives with an emphasis on scientific, cultural and economic parameters of the fifteen sites along the Panorama Route.

MATERIALS AND METHODS

Geomorphosite Assessment Criteria

Assessment methodologies used for geomorphosites generally conform to the goal of evaluating landform heritage features and the determination of the types of values. Reynard (2005) argues that there is a general acceptance of the value attached to geomorphosites. Such value should meet a criterion of either being scientific, ecological, cultural, aesthetic and/or economic. Although Gray (2004) considers both physical and biological functional value of landforms as they support environmental systems. Scientific value is the essential value related to methodological proposals generally accepted (Grandgirard, 1997, 1999; Coratza & Giusti 2005).

Categories that include assessment criteria like cultural, aesthetic, ecological, and other non-intrinsic values that can be assessed for management purposes related to the potential for use and the need to protect geomorphosites can be considered.

There is a consensus on the features to be valued as revealed in several works of literature dealing with the assessment criteria proposed. In the category of scientific value, criteria like rarity, representativeness, integrity, and diversity of geomorphological features are considered, including other criteria like scientific knowledge and Paleo-geographical value (Reynard, 2009). Pereira (2006), argued that the additional value, as a criterion is generally less precise depending on the levels of sensitivity the assessor would have to accomplish the assessment. Management concerns have been focused mostly on the criteria dealing with accessibility and visibility, for instance, vulnerability to measure the need for protection. Bruschi and Cendrero (2005, 2009) argue for the usefulness of measures for evaluating the potential of use and need for protection include the relationship with existing planning or limits of acceptable change as supported by Serrano and González-Trueba (2005) in their contention that the proximity of facilities and services are useful criteria also.

Inventory Quantification

The methodology used in this study is adapted from the works of Pereira (2006) and Pereira and Pereira (2010). The methodology is characterised by an approach that considers two approaches, the first one being an inventory and quantification stage and the second being a six sub-stages approach (Figure 1). Geomorphosites selection and characterization are the predominant activity during the inventory stage and in the second approach the quantification stage, the numerical assessment of criteria of sites is determined by their importance. This allows the comparison of sites to be done. Three types of geomorphosites define the meaning of the methodological approach which is based on a predetermined observation scale: (single places, fields and panoramic viewpoints approach). This observation scale is shown in (Figure 2).

When dealing with the scale, its assessment accuracy is important by future management activities. The observation scale types of geomorphosites are made up of one or more groups of landforms. The landscapes can only be seen by the observer moving into an area, consequently, such activity gives rise to large landforms with panoramic viewpoints which can be perceived. This approach observing landforms considers three categories including local points, single points and areas as units of observation. Geomorphological knowledge of an area establishes the foundation for this assessment method. At the regional setting, the main landforms and processes, structural framework, climatic features, human activities, and geomorphological mapping, are necessary information sources as well as other relevant natural and cultural aspects. Using such kind of information which is scientific, ecological, cultural and aesthetic, the diverse characteristics of landforms may be identified.

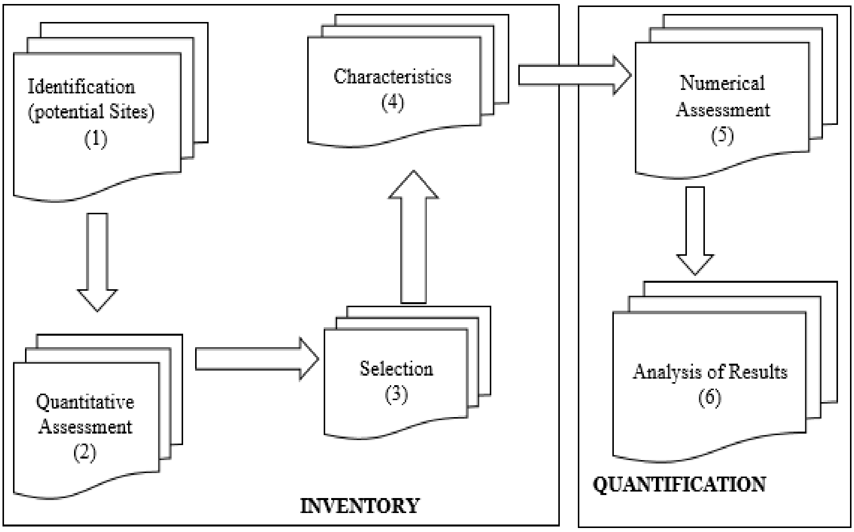

Figure 1. Inventory and quantification stages and sub-stages of geomorphosite assessment used in the study (Source: After Pereira, 2006; Pereira et al., 2007; Pereira and Pereira 2010)

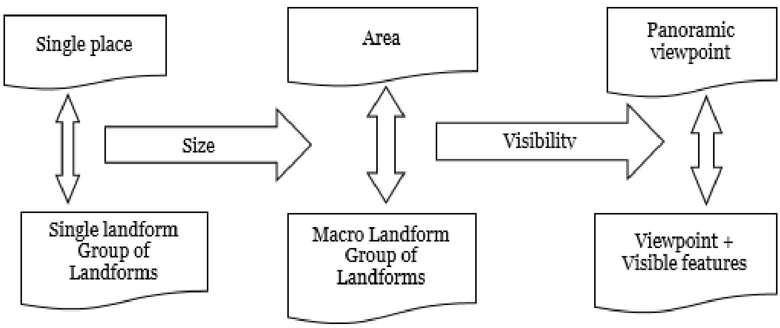

Figure 2. The observation scale that defines a typology of geomorphosites used in the study (Source: After Pereira, 2006)

Six Sub-stages for Inventory Quantification

Sub-stage 1: The identification procedure at this level focuses on a predefined range of measures. This is indicated in Table 1. The inventory quantification stage focuses on the selection of landforms which will be defined as geomorphosites or potential geomorphosites. Sub-stage 2: The determination of intrinsic value, potential usage, and required protection are constructed employing a qualitative evaluation process. The definition of the intrinsic value is achieved using the scientific, ecological, cultural and aesthetic features, with scores being assigned from 'nil' values to 'very high' values for ecological, cultural and aesthetic criteria (Table 2).

Table 1. Criteria for Potential Geomorphosites Identification (PGI)
(Data source: Framework adapted from Pereira, 2006)

Number	Criteria for PGI
I.	Scientific relevance recognized during the geomorphological survey of the area or by early scientific works
II.	Landform aesthetics and peculiarity, compared with other sites in the same or other fields
III.	Links between landforms and cultural factors such as archaeological features, population settlements, castles, farming, and so on
IV.	Links between landforms and ecological topics such as fauna and flora settlements

Table 2 Assessment of Potential Geomorphosites Criteria used in the study
(Data source: Framework adapted from Pereira, 2006)

CRITERIA		ASSESSMENT SCORE
Geomorphological Intrinsic Value (IV)	• Scientific (Sc)	1. Low 2. Medium 3. High 4. Very high
	• Other geomorphological values (Ogv) • Ecological (Ec) • Cultural (Cul)	0. Nil 1. Very low 2. Low 3. Medium 4. High 5. Very high
Potential Use (Pu)	• Accessibility (Ac) • Visibility (Vi) • Use of other natural or cultural values (Oth)	1. Very difficult 2. Difficult 3. Medium 4. Easy/good 5. Very easy/good
Need for Protection (NP)	• Deterioration (De) • Vulnerability (Vu)	1. Low 2. Medium 3. High

As can be observed from Table 2 there is a variation of the category of scientific value scores from 'low' values to 'very high' values. The assessment potential as proposed by Pereira (2006) confirms the methodology based on the previously identified potential geomorphosites. The results stand out as having scientific relevance (Table 2). Resultantly, the criteria 'potential use' is therefore defined based on three primary criteria: accessibility, visibility, and evidence of importance in other disciplines.

The last criteria in the table also take the current promotion and use of a site in other fields into account. The need for a protection category includes assessment of levels of deterioration and vulnerability, with scores ranging from 'high' to 'low'. This criterion allows the inclusion of the past (deterioration due) or future (vulnerability Vu) threats during the assessment. Although the qualitative assessment is characterised by being brief, subjective, and strongly influenced by the assessor's understanding of geomorphology, it is a fundamental step in the overall assessment. The effects, therefore, serve as a foundation for further sub-stages in the inventory phase.

Sub-stage 3: The previous qualitative assessment is used for the selection of geomorphosites and rank performance of sites showing overall highest scores. These are selected for further characterization (Table 3). Potential geomorphosites were selected using indicators listed in Table 3 with indicator selection criteria such as 'very high' scientific value, without considering their performance in other criteria (Type I). Further, with some measure of independence sites with the criteria of 'high' geomorphological intrinsic value, 'high' potential use (accessibility, visibility, and use of other natural or cultural values) and low deterioration and vulnerability were selected and made up the Type II category. All single places or areas which required protection were selected only if they showed 'high' scientific value or 'high' or 'very high' score in one or more of the other geomorphological values giving the category of Type III characteristics. Panoramic viewpoints located outside of the study area were selected if they had at least a 'high' scientific value and furthermore a 'very high' ecological, cultural or aesthetic value and good conditions of accessibility and visibility qualifying them to belong to category Type IV.

Table 3. Geomorphosite selection criteria used in the study
(Data source: Framework adapted from Pereira, 2006)

SELECTION CRITERIA	
TYPE	
I	Sc = 5
II	Sc = 4 or Sc = 3 and Ec > 4 or Cul > 4 or Ae > 4; Ac > 3 and Vi > 4 or Oth > 4; De < 2 and Vu = 1
III	Single places and areas Sc = 4 or Sc = 3 and Ec > 4 or Cul > 4 or Ae > 4; De < 2 and Vu > 2 (urgent need for protection)
IV	Panoramic viewpoints outside the study area Sc = 4 or Ec = 5 or Cul = 5 or Ae = 5; Ac > 3 or Vi = 4

Sub-stage 4: The compilation of the detailed description of complete inventory using each of the selected geomorphosites was based on processes that focused on the cartographic data as well as information on geomorphology, 'heritage value', and use and management. The latter category dealt with half a dozen points, including aspects related to accessibility, visibility, present uses, conservation, vulnerability, legal position and supporting infrastructures. The information collected directly would support the fifth assessment sub-stage, which would benefit future management initiatives.

The process of quantifying then considers two sub-stages: numerical assessment and geomorphosite ranking. Geomorphosite characterization culminates in data compilation necessary during that sub-stage process and to be used for comparison purposes of the inventoried geomorphosites. Sub-stage 5: The numerical assessment is based on the criteria introduced in Sub-stage 4, divided into different categories to create two new levels: principal and secondary indicators. The protection or promotion of geomorphosites and the possible targets of the assessment criteria are significant. The principal indicator 'geomorphological value' includes the secondary indicators 'scientific value' and 'additional values'. 'Management value', as the second principal indicator, integrates the secondary indicators 'use-value' and 'protection value'. The weighting of results, 'geomorphological value' and 'management value' as shown in Table 4 are treated the same with a maximum of ten points each.

The total value of the geomorphosite is a product of all indicators.

Sub-stage 6: The quantification table is used to record the results of the numerical assessment (Table 5) with each of the geomorphosites being subjected to the assessment criteria. A direct comparison of site ranks is possible with data entered in the table (Table 6). The primary and secondary indicators are shown as the total value (TV) after being summed up and rank positions established according to indicators (primary and secondary) giving the final ranking (Rk). The sites with the lowest final ranking scores may be seen to be the most valuable geomorphosites in the area being measured from the rankings. To bring about relative value or homogeneity of criteria, rank average results in the geomorphosite assessment must be stressed. Thus, the best-placed geomorphosites in the final ranking score well over the entire spectrum of indicators. Differences from Total Value results are produced as a result of the method (Table 6, Geomorphosites 2 and 5).

Table 4. Geomorphosite numerical assessment indicators and criteria
(Data source: Framework adapted from Pereira, 2006)

GEOMORPHOLOGICAL VALUE (GmV; ScV+AdV) (maximum 10)	
SCIENTIFIC VALUE (**ScV**; Ra+In+Rp+Dv+Ge+Kn+Rn: maximum 5.5)	
Ra	Rarity inside the area (max 1)
In	Integrity (max 1)
Rp	Representative of geomorphological processes and pedagogical interest (max 1)
Dv	Number of interesting geomorphological features (diversity) (max 1)
Ge	Other geological features with heritage value (max 0.5)
Kn	Scientific knowledge of geomorphological uses (max 0.5)
Rn	Rarity at the national level (max 0.5)
ADDITIONAL VALUE (**AdV**; Cult+Aest+Ecol; maximum 4.5	
Cul	Cultural value (max 1.5)
Ae	Aesthetic value (max 1.5)
Ec	Ecological value (max 1.5)
MANAGEMENT VALUE (MgV; UsV+PrV) (maximum 10)	
USE VALUE (**UsV**; Ac+Vi+Gu+Ou+Lp+Eq; maximum 7.0)	
Ac	Accessibility (max 1.5)
Vi	Visibility (max 1.5)
Gu	Present use of the geomorphological interest (1.5)
Ou	Present use of other natural interests (max 1)
Lp	Legal protection and use limitations (max 1)
Eq	Equipment and support services (max 1)
PROTECTION VALUE (**PrV**; In+ Vu; maximum 3.0)	
In	Integrity (max 1)
Vu	Vulnerability of use as Geomorphosite (max 2)

RESULTS DISCUSSIONS

The findings of this study demonstrate the methodological sequence adopted whose aim was to use both types of assessment procedures as proposed by Bruschi and Cendrero (2005, 2009). The geomorphosite selection using the direct and parametric methods was dependent on the assessor's geomorphological knowledge approach. The ranking and comparison of geomorphosites relied on numbers, clear standards and indicators used. Inventory and quantification assessment stages were placed in the same process methodology groups. The identification of potential geomorphosites, their comparison, and analysis for management decisions was included in the process. The scale of observation of types of geomorphosites helped in effecting both assessment and management processes. This study did not determine or consider preexistence of inventories and assessment objectives as it is the first in the area. The assessment set forth with the numerical approach since the appraisal was to identify and inventory the geomorphosites of the Panorama Route. Thus, the first stage (inventory stage) sufficiently collaborated findings by Pereira et al., (2017). Following Grandgirard (1999)'s assessment recommendations three critical questions informed our assessment: What? Why? How?

Arguably so the 'What?' question refers to the scope in terms of area size and geomorphological environment of the Panorama route. Followed by the 'Why?' which refers to the definition of one or more main objective, such as identification, inventorying and site protection or promotion of the study sites. The 'How?' question refers to the choice of assessment method we applied in the study. This choice also took into consideration the scope and aims. The findings of this study furthermore, are grounded firmly on a holistic approach to geomorphosite assessment and geomorphosite management as argued by (Pereira et al., 2007). Thus, the assessment, in as much as it did not only involve the classification of sites, suggestions for the geomorphosite protection, promotion, and monitoring are offered. The selection of geomorphosites based on the results of the geomorphological study relied on the numerical assessment following Pereira (2006), Pereira et al. (2007) and Reynard (2009).

The numerical assessment is part of a larger procedure that included the proposals for protection or promotion of geomorphosites. The role of different indicators is particularly useful for supporting site management decisions like measures for the protection, education, and promotion of geomorphosites. While it was possible to obtain a mean geomorphosite ranking these integrated numerical results have no extra significance in terms of management opined Reynard (2009). Contribution to protection or promotion decisions attributed to indicators such as Total Value (TV) or Ranking Value (Rk) did not influence any decision towards protection strategies. The analysis focused on each of the disciplines of the assessment and in that respect, it was desirable to prefer presentation and analysis of results by indicators (scientific, additional, use and protection values) to support better management decisions.

Table 6. Results of Fifteen (15) Geomorphosites Quantified
(Data source: Framework adapted from Pereira, 2006)

	QUANTIFIED RESULTS OF GEOMORPHOSITES						
Geomorphosite	**ScV**	**AdV**	**GmV**	**UsV**	**PrV**	**MgV**	**TV**
Sabie Falls (GS_1),	3,2	4	7,2	6,9	2,5	9,4	16,6
Lone Creek Falls (GS_2),	4,7	4,4	9,1	6,9	2,5	9,4	18,5
Bridal Veil Falls (GS_3),	3,6	4,1	7,7	6,6	3	9,6	17,3
Mac-Mac Falls (GS_4),	3,3	3,8	7,1	6	3	9	16,1
Jock of the Bushveld (GS_5),	2,8	3,8	6,6	5,1	1,5	6,6	13,2
Pinnacle (GS_6),	5,5	4,1	9,6	6,4	3	9,4	19
God's Window (GS_7),	5,5	4,5	10	7	3	10	20
Lisbon Falls (GS_8),	3	3,9	6,9	6,5	2	8,5	15,4
Berlin Falls (GS_9),	3	3,9	6,9	5,9	2	7,9	14,8
Bourke's Luck Potholes (GS_{10})	5,5	4,5	10	7	3	10	20
Blyde River Canyon (GS_{11}),	5,5	4,5	10	7	3	10	20
Three Rondavels (GS_{12}),	5,5	4,5	10	7	3	10	20
Eco Caves (GS_{13}),	5	4	9	7	3	10	19
Long Tom (GS_{14}),	2,8	2,2	5	5,8	2,5	8,3	13,3
Sudwala Caves (GS_{15})	5	4	9	7	3	10	19

Illustrating this, geomorphosite GS7, 10,11, and 12 (Table 6 and Table 7) obtained high scores in Geomorphological Value (GmV) and Management Value (MgV) and consequently high score in Total Value (TV) and Ranking Value (Rk). This partial analysis was excluded from eventual promotion initiatives to be protected. The criteria used which included this method are the outcome of the analysis of other methodological proposals concerning the quantitative assessment of geomorphosites. These criteria with regards to the Panorama Route were considered as most representative of the heritage value of landforms for each of the proposed indicators. It is thus contended that even the selection of criteria brings some subjectivity to the process and such observation is supported by the existence of different standards in each of the analysed methods. However, independently of the criteria used in the Panorama Route assessment, it was important to observe how the assessment organized and divided into the intrinsic value (scientific and extra) and management value (potential function and need for protection), demonstrating the comfort with which the assessment was achieved and supporting management strategy. Lastly, we observe that this arrangement by main assessment indicators/subjects the criteria are the same, independently of the level of the assessment (inventory or quantification).

Table 7 Ranking Results Using Fifteen (15) Geomorphosites
(Data source: Author 2019, framework adapted from Pereira, 2006)

#	ScV	AdV	GmV	UsV	PrV	MgV	TV	RK
1	(GS12) 5,5	(GS7) 4,5	(GS7) 10	(GS7) 7	(GS3) 3	(GS7) 10	(GS7) 20	(GS5) 13,2
2	(GS6) 5,5	(GS10) 4,5	(GS10) 10	(GS10) 7	(GS4) 3	(GS10) 10	(GS10) 20	(GS14) 13,3
3	(GS7) 5,5	(GS11) 4,5	(GS11) 10	(GS11) 7	(GS6) 3	(GS11) 10	(GS11) 20	(GS9) 14,8
4	(GS10) 5,5	(GS12) 4,5	(GS12) 10	(GS12) 7	(GS7) 3	(GS12) 10	(GS12) 20	(GS8) 15,4
5	(GS11) 5,5	(GS2) 4,4	(GS6) 9,6	(GS13) 7	(GS10) 3	(GS13) 10	(GS6) 19	(GS4) 16,1
6	(GS15) 5	(GS3) 4,1	(GS2) 9,1	(GS15) 7	(GS11) 3	(GS15) 10	(GS13) 19	(GS1) 16,6
7	(GS13) 5	(GS6) 4,1	(GS13) 9	(GS1) 6,9	(GS12) 3	(GS3) 9,6	(GS15) 19	(GS3) 17,3
8	(GS2) 4,7	(GS1) 4	(GS15) 9	(GS2) 6,9	(GS13) 3	(GS1) 9,4	(GS2) 18,5	(GS2) 18,5
9	(GS3) 3,6	(GS13) 4	(GS3) 7,7	(GS3) 6,6	(GS15) 3	(GS2) 9,4	(GS3) 17,3	(GS15) 19
10	(GS4) 3,3	(GS15) 4	(GS1) 7,2	(GS8) 6,5	(GS1) 2,5	(GS6) 9,4	(GS1) 16,6	(GS13) 19
11	(GS1) 3,2	(GS8) 3,9	(GS4) 7,1	(GS6) 6,4	(GS2) 2,5	(GS4) 9	(GS4) 16,1	(GS6) 19
12	(GS8) 3	(GS9) 3,9	(GS8) 6,9	(GS4) 6	(GS14) 2,5	(GS8) 8,5	(GS8) 15,4	(GS12) 20
13	(GS9) 3	(GS4) 3,8	(GS9) 6,9	(GS9) 5,9	(GS8) 2	(GS14) 8,3	(GS9) 14,8	(GS11) 20
14	(GS14) 2,8	(GS5) 3,8	(GS5) 6,6	(GS14) 5,8	(GS9) 2	(GS9) 7,9	(GS14) 13,3	(GS10) 20
15	(GS5) 2,8	(GS14) 2,2	(GS14) 5	(GS5) 5,1	(GS5) 1,5	(GS5) 6,6	(GS5) 13,2	(GS7

CONCLUSION

The main goals pursued by many studies leading to the international task force working on geomorphosites assessment methodology acknowledging the difficulty of coming with a standard methodology prompted the current study in the southern African region. Several studies conducted so far to establish a universal methodology for geomorphosite assessment have produced differences in opinion in coming up with a common methodology. The method employed in this work was adopted as part of a contribution to the methodology used in the assessment and inventorying of geomorphosites in different types of geomorphological environments. The study focus was to alter the standards applied by the international task force and use the method in geosite assessments and the inventory of geological heritage along the Panorama Route.

Our argument recognises that this methodological proposal is not meant to establish universal methodological guidelines. We nevertheless, contribute to the discussion on one of the principal subjects of geomorphological heritage. The studies that have been done so far show a consensus well accepted based on the argument that the development of such universal guidelines is very complex owing to the diversity of geomorphological environments, the different assessment purposes and the inherent subjectivity in all the assessment procedures. Nevertheless, the specificities of this method were considered as important guidelines for geomorphosite assessment. The recognition of geomorphosite assessment as a broad procedure based on the geomorphological study, the selection of geomorphosites based on the results, the numerical assessment and the proposals for protection or promotion of geomorphosites;

the organisation of criteria by subject, concerning intrinsic values (scientific and additional) and management values (potential for use, threats and need for protection); the representation and analysis of results using these indicators, in order to support accurate management decisions was achieved for the Panorama Route study.

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